Note: To assist the reader in reviewing the NEC ROP, a preprint of Proposed NFPA 70 is available and may be downloaded from NFPA's (or separate NEC) website, www.nfpa.org. It is also available per request on CD ROM or in print copy from NFPA by calling Customer Service at 1-800-344-3555.

(Log #1158n)

1- 1 - (Entire Document): Accept

NOTE: The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures" with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:

Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:

Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept.

PANEL STATEMENT: CMP-1 recommends that the TCC correlate this proposal.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

COMMENT ON AFFIRMATIVE:

TROGLIA: The word "luminaire" should be replaced first with the former term in parentheses after the word for at least the duration of the next Code cycle in each of the CMPs affected.

(Log #1930)

1- 2 - (Entire Document): Accept in Principle

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The Panel believes its action on Proposal 1-1 meets the intent of the Submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1158)

2- 1 - (Entire Document): Accept

NOTE: The Technical Correlating Committee understands that the panel has accepted those portions of the Proposal which fall under its Scope. The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures" with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:

Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:

Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63,

530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel is concerned with the average electrician's recognition of this term as it is not found in Webster's Encyclopedia unabridged dictionary of the English language.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1930a)

2- 2 - (Entire Document): Accept

NOTE: See the Technical Correlating Committee Note on Proposal 2-1.

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept.

PANEL STATEMENT: See panel statement on Proposal 2-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1158b)

3- 1 - (Entire Document): Accept in Principle in Part

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures" with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:

Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:

Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The

term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.
PANEL ACTION: Accept in Principle in Part.
Replace the terms "fixture" with "luminaire (fixture)" appearing throughout the following Sections: 300-3, 300-15, 300-16, 305-4,
Replace "fixtures" with "luminaires (fixtures)" in the following sections: 300-11, 300-14, 300-15, 300-22, and 690-7.
PANEL STATEMENT: The panel accepted the change to those sections which are the responsibility of CMP 3. The existing terminology was retained in parentheses as an aid to the code user.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1930b)

3- 2 - (Entire Document): Accept in Principle
SUBMITTER: Jon P. Farren, Farren Engineering, Inc.
RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.
SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.
Also, this will reduce confusion with reference to plumbing fixtures.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1930c)

4- 1 - (Entire Document): Accept in Principle
SUBMITTER: Jon P. Farren, Farren Engineering, Inc.
RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.
SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.
Also, this will reduce confusion with reference to plumbing fixtures.
PANEL ACTION: Accept in Principle.
Accept the proposed changes to those sections under the jurisdiction of CMP 4 with the retention of the current term as a parenthetical reference after each change in terms.
The panel has identified that the proposed terminology change will occur only in Section 225-7(c).
PANEL STATEMENT: The panel's action will aid the industry in understanding the change in terminology.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1158a)

5- 1 - (Entire Document): Accept
Note: The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.
SUBMITTER: William Buckson, Hubbell Lighting Inc.
RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures"
with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.
Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.
Replace "Fixture" with "Luminaire" in the following Sections:
Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.
Replace "Fixtures" with "Luminaires" in the following Sections:
Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.
Replace "Lighting Fixture" with "Luminaire" in the following Sections:
Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.
Replace "Lighting Fixtures" with "Luminaires" in the following Sections:
Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.
SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).
2. The Canadian Electrical Code has used the luminaire term for the last ten years.
3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.
4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".
5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.
6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.
7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.
8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.
9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.
PANEL ACTION: Accept.
PANEL STATEMENT: Accept those parts that apply to the jurisdiction of Panel 5 only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
COMMENT ON AFFIRMATIVE:
BRETT: I agree with the Panel's Action on this proposal but because of the low recognition factor of "luminare" or "luminaries" I believe usability would be served if the current word or phrase being replaced should appear in parentheses immediately after the replaced term for at least the 2002 code.
DOBROWSKY: The changes to existing Section 250-4 are dependent on corresponding changes to Article 410.

WHITE: Although I am voting in the affirmative I recommend that the term "luminare" be placed first with the former term in parentheses after it for at least the duration of the next code cycle.

(Log #1930d)

5- 2 - (Entire Document): Reject
SUBMITTER: Jon P. Farren, Farren Engineering, Inc.
RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.
SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.
Also, this will reduce confusion with reference to plumbing fixtures.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no specific recommendation made by the submitter in the proposal. Section 4.3.3(c) of the Regulations Governing Committee Projects requires proposals to include proposed text, including the wording to be added, revised (and/or) revise, or deleted. However, see action on Proposal 5-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
WHITE: Although I am voting in the affirmative I recommend that the term "luminaire" be placed first with the former term in parentheses after it for at least the duration of the next code cycle.

(Log #1158k)

6- 1 - (Entire Document): Accept
Note: The Technical Correlating Committee understands that the panel has accepted those portions of the Proposal which fall under its Scope. The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.
SUBMITTER: William Buckson, Hubbell Lighting Inc.
RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures"
with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.
Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.
Replace "Fixture" with "Luminaire" in the following Sections:
Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.
Replace "Fixtures" with "Luminaires" in the following Sections:
Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.
Replace "Lighting Fixture" with "Luminaire" in the following Sections:
Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.
Replace "Lighting Fixtures" with "Luminaires" in the following Sections:
Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.
SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).
2. The Canadian Electrical Code has used the luminaire term for the last ten years.
3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.
4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".
5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.
6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.
7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.
8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.
9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP602)

6- 1a - (Entire document): Accept
SUBMITTER: CMP 6
RECOMMENDATION: Delete "AF" and text only associated with and applicable to "AF" throughout the Code.
SUBSTANTIATION: AF is no longer manufactured.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Schauffele

(Log #1930e)

6- 2 - (Entire Document): Accept
Note: The Technical Correlating Committee understands that the panel has accepted those portions of the Proposal which fall under its Scope. The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.
SUBMITTER: Jon P. Farren, Farren Engineering, Inc.
RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.
SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.
Also, this will reduce confusion with reference to plumbing fixtures.
PANEL ACTION: Accept.
PANEL STATEMENT: See Proposal 6-1 for additional information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1158j)

7- 1 - (Entire Document): Accept in Principle in Part
SUBMITTER: William Buckson, Hubbell Lighting Inc.
RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures" with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:
Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:
Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:
Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:
Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept in Principle in Part.
Accept the proposed changes to those sections under the jurisdiction of CMP 7 with the retention of the current term as a parenthetical reference after each change in terms. Do not make the proposed change to 363-12.

PANEL STATEMENT: The panel's action is to aid the industry in understanding the terminology change. The reference in 363-12 refers to more than just luminaires. Not all fixtures are luminaires. There is equipment that contains lamps (such as a paddle fan) that is not a luminaire.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1930f)

7- 2 - (Entire Document): Accept in Principle in Part
SUBMITTER: Jon P. Farren, Farren Engineering, Inc.
RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.
SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept in Principle in Part.
Accept the proposed changes to those sections under the jurisdiction of CMP 7 with the retention of the current term as a parenthetical reference after each change in terms. Do not make the proposed change to 363-12.

PANEL STATEMENT: The panel's action is to aid the industry in understanding the terminology change. The reference in 363-12 refers to more than just luminaires. Not all fixtures are luminaires. There is equipment that contains lamps (such as a paddle fan) that is not a luminaire.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1158c)

8- 1 - (Entire Document): Accept in Principle
SUBMITTER: William Buckson, Hubbell Lighting Inc.
RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures" with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:
Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:
Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-

21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept in Principle.

Accept the proposed changes to those sections under the jurisdiction of CMP 8 with the retention of the current term as a parethetical reference after each change in terms.

PANEL STATEMENT: The panel's action is to aid the industry in understanding the terminology change.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #1930g)

8- 2 - (Entire Document): Reject

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Reject.

PANEL STATEMENT: There was no specific recommendation made by the submitter. Section 4-3.3(c) of the Regulations Governing Commitee Projects requires proposals to include proposed text, including the words to be added, revised (and how revised), or deleted.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #1930h)

9- 1 - (Entire Document): Accept in Principle

Note: The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept in Principle.

In Section 370-16(b)(1) Exception, change "fixture" to "luminaire".

In Section 370-23(e), change the title to read "… Without Devices, Luminaries, or Lampholders." Revise the text to read "… support a luminaire, lampholder, or other equipment." The panel advises that this action modifies the panel action on Proposal 9-29.

In Section 370-23(f), change the title to read "… With Devices, Luminaries, or Lampholders." Revise the text to read "… support a luminaire, lampholder, or other equipment …". The panel advises that this action modifies the panel action on Proposal 9-29.

In Section 370-23(f) Exception No. 2, change as follows:

In the parent text, revise to read "… luminaire or lampholder support, or to support a wiring enclosure that is an integral part of a luminaire."

In item (c), change "fixture" to "luminaire or lampholder".

In item (d), change "fixture" to "luminaire".

In item (f), revise to read "at the luminaire or lampholder end, the …" and "… the luminaire shall be secured directly …".

The panel advises that this action modifies the panel action on Proposal 9-29.

In Section 370-23(h)(2), change "lighting fixtures" to "luminaries" in the first paragraph, and change "at the fixture end" to "at the luminaire end." In the second paragraph, change "A fixture supported" to "A luminaire supported".

In Section 370-25 change "or fixture canopy" to "or luminaire canopy".

In Section 370-25 FPN, change "fixture" to "luminaire".

In Section 370-25(b), change "fixture" to "luminaire".

In Section 370-27(a), revise the title to read "Boxes at Luminaire Outlets." In the text, change "lighting fixture outlets" to "luminaire or lampholder outlets" and change "a lighting fixture" to "a luminaire".

In Section 370-27(a) Exception, change "A fixture" to "A luminaire or lampholder" and "… provided the fixture or its supporting yoke" to "… provided the lampholder, luminaire, or its supporting yoke ..."

The panel advises that this action modifies the panel action on Proposal 9-39.

In Section 370-27(b) as created by panel action on Proposal 9-36, change "Fixture" to "Luminaire" in the title. Change "lighting fixtures" to "luminaries" and "lighting fixture" to "luminaire."

PANEL STATEMENT: The panel action meets the intent of the submitter. Lampholders are not the same as luminaries, and need to be considered separately in order to properly implement the change in terminology.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

CROUSHORE: I affirm the panel's action to change to the term "luminaire" throughout Article 370. However, the former terms such as (fixture) or (lighting fixture) should be placed in parenthesis after the word "luminaire" for at least the duration of the next code cycle to aid in understanding the change. The term "fixture" is widely used and understood throughout the electrical industry. The term fixture typically relates more to the enclosure and hardware of the equipment rather than the light producing elements such as the lamps, the reflectors and the diffuser. This change may cause confusion due to the elimination of the common term of "fixture".

(Log #1930i)

10- 1 - (Entire Document): Accept

Note: The Technical Correlating Committee understands that the panel has accepted those portions of the Proposal which fall under its Scope. The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:

ELDRIDGE: I agree with the panel action to accept the term "luminaire". However, the word "luminaire" should be placed first with the word "fixture" in parentheses after the words for "at least" the duration of the next code cycle.

(Log #1158m)

11- 1 - (Entire Document): Reject

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures"

with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:

Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:

Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Reject.

PANEL STATEMENT: The fixtures in 670-2 are not lighting fixtures.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #1930j)

11- 2 - (Entire Document): Reject

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Reject.

PANEL STATEMENT: See the Panel action on Proposal 11-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #1158h)

12- 1 - (Entire Document): Accept in Part

Note: The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures"

with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:

Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:

Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept in Part.

Replace the term "Fixture(s)" with "luminaire(s)" in 610-12 and 620-21.

PANEL STATEMENT: The panel is acting only on those sections over which it has jurisdiction. The panel concurs with the new definition in Article 100 and the panel also concurs with the deletion of the FPN 410-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

NOT RETURNED: 2 Kelly, Laney

(Log #1930k)

12- 2 - (Entire Document): Accept in Principle

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept in Principle.

Refer to the panel action on Proposal 12-1.

PANEL STATEMENT: The action on Proposal 12-1 should meet the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

NOT RETURNED: 2 Kelly, Laney

(Log #1930l)

13- 1 - (Entire Document): Reject

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Reject.

PANEL STATEMENT: The term "lighting fixture" and "fixture" is not used in any of the articles under this panel.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #1158e)

14- 1 - (Entire Document): Accept

Note: The Technical Correlating Committee understands that the panel has accepted those portions of the Proposal which fall under its Scope. The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures" with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:

Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:

Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept.

PANEL STATEMENT: The action on this proposal is contingent upon acceptance by Code Making Panel 18 of an identical proposal on Article 410.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

OMEARA: The original term(s) being replaced should be retained in parenthetical form for one code cycle.

(Log #1930m)

14- 2 - (Entire Document): Accept

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept.

PANEL STATEMENT: See action on Proposal 14-1 (Log #1158e).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

OMEARA: The original term(s) being replaced should be retained in parenthetical form for one code cycle.

(Log #1158f)

15- 1 - (Entire Document): Accept in Principle in Part

Note: The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures" with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:

Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:

Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept in Principle in Part.

The following items of the submitter's recommendation are accepted:

In 520-2, replace the words "lighting fixture" with the word "luminaire" in the definitions of the terms "Stand Lamp (Work Light)" and "Strip Light."

In 520-81,replace the words "lighting fixtures" with the word "luminaires."

In 525-13(g), replace the word "fixture" with the word "luminaire."

In 530-2, replace the words "lighting fixture" with the word "luminaire" in the definition of the term "Stand Lamp (Work Light)."

In 530-18(g), replace the word "fixtures" with the word "luminaires."

In 700-9(b)2, and 3, replace the words "lighting fixtures" with the word "luminaires."

The following items of the submitter's recommendation are accepted in principle:

In 520-42, replace the words "strip light fixtures" with the words "strip lights."

In 520-45, delete the words "or fixtures."

In 520-61, replace the words "lamp fixtures" with the word "lamps" in three places.

In 530-17, replace the words "lamp fixtures" with the word "lamps" in four places.

In 700-12(e) [not 701-12], replace the words "Emergency illumination fixtures" with the words "Emergency luminaires" in the last sentence of the last paragraph.

In 701-11(f), replace the words "Legally required standby illumination fixtures" with the words "Legally required standby luminaires" in the last sentence of the last paragraph.

The following item of the submitter's recommendation are rejected:

In 530-51, the proposed change from "fixtures" to "luminaires."

The remaining items of the submitter's recommendation are not within the scope of CMP 15.

PANEL STATEMENT: The items accepted in principle are revised to more clearly reflect the requirements of the code and meet the intent of the submitter.

The item for 530-51 was rejected because the fixture may not be a luminaire, so the more generic usage of fixture is appropriate.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

HIRSCHLER: I believe this action is ill advised: the panel should consider whether this is not a change that will make the NEC less user friendly, as there are many more people who know what a "lighting fixture" is than people who know what a "luminaire" is, and the first group certainly includes me. A search for the word "luminaire" in dictionaries, including the Encyclopedia Britannica and the "spell-check" function of word processors fails to find the term.

KLEIN: Illuminating Engineering Society of North America's definition of Luminaire:

"A complete lighting unit consisting of a lamp or lamps and ballast(s) (when applicable) together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply."

The Panel members are reminded while reviewing this negative response, that a lamp without a connection to power does not produce light of heat or potential hazard. Once connected to power, a lamp is part of a luminaire.

520-2 Currently the code reads:

"Border Light. A permanently installed overhead strip light." I believe, in response to Proposal 15-1 it should read as follows:

Border Light. A permanently installed overhead strip luminaire.

The accepted Panel motion revises the definition of Stand Lamp (Work Light). As follows:

"A portable stand that contains a general-purpose luminaire or lamp holder with guard for the purpose of providing general illumination on the stage or in the auditorium."

I believe in response to Proposal 15-1 and in light (no pun intended) of the definition of a luminaire the code text should read as follows omitting the reference to "a lamp holder with guard" which is within the definition of a luminaire:

Stand Lamp (Work Light). A portable stand that contains a general-purpose luminaire for the purpose of providing general illumination on the stage or in the auditorium.

525-13(g) Inside Tents and Concessions. The accepted Panel motion revises the code text as follows:

"All temporary lamps for general illumination shall be protected from accidental breakage by a suitable luminaire or lampholder." I believe in response to proposal 15-1 and in accord with the definition of luminaire, the code text should read as follows omitting the reference to "lamp holder" which is within the definition of a luminaire:

All temporary lamps for general illumination shall be protected from accidental breakage by a suitable luminaire.

520-2 The accepted Panel motion revises the definition of Stand Lamp (Work Light) as follows:

"A portable stand that contains a general-purpose luminaire or lamp holder with guard for the purpose of providing general illumination in the studio or stage."

I believe in response to Proposal 15-1 and in accord with the definition of a luminaire, the code text should read as follows omitting the reference to a "lamp holder with guard" which is within the definition of a luminaire:

Stand Lamp (Work Light). A portable stand that contains a general-purpose luminaire for the purpose of providing general illumination in the studio or stage.

530-18(g) No comment – Panel Action acceptable.

700-9(b) 2 & 3 No comment – Panel Action acceptable.

520-42 Panel Action acceptable.

520-45: The deletion of the words "or fixtures" changes the meaning of this section of the code and does not address the submitter's intention. The intention of this code section is to require permanent receptacles on stages to be rated in amperes with branch circuit conductors installed in accordance with Articles 310 and 400, <u>whether or not they are used for power or lighting equipment.</u> Deletion of the words "or fixtures" would eliminate the application of this section to permanently installed receptacles used for lighting equipment on stages.

I believe the first sentence of Section 520-45 Receptacles should read as follows:

Receptacles for electrical equipment or luminaires on stages shall be rated in amperes.

520-61 The existing text of this section is as follows:

520-61 Arc Lamp Fixtures. Arc lamp fixtures, including enclosed arc lamp fixtures and associated ballasts, shall be listed. Interconnecting cord sets and interconnecting cords and cables shall be extra-hard usage type and listed.

The proposed wording based upon the Panel Action is:

520-61 Arc Lamps. Arc lamps, including enclosed arc lamps and associated ballasts, shall be listed. Interconnecting cord sets and interconnecting cords and cables shall be extra-hard usage type and listed.

This proposed wording, if interpreted literally, would only require the listing of the lamp, the ballast, and the interconnecting cords and cables – NOT the socket, the parts designed to distribute the light, the parts to position and protect the lamps, the lamp enclosure and the connection of the ballasts to a power supply. For these reasons, I believe a more precise interpretation of the submitter's intention to be as follows.

Section 520-61 should be retitled to Arc Lamp Luminaires and the first sentence should be modified to read as follows:

Arc lamp luminaires, including enclosed arc lamp luminaires and associated ballasts shall be listed.

530-17 Applying the same logic as in Section 520-61 above, I believe the appropriate modification to this section is as follows:

Section 530-17 should be retitled to Portable Arc Lamp Luminaires with the two subsections renamed and their first sentences modified as follows:

(b)Portable Carbon Arc Luminaires

Portable carbon arc luminaires shall be substantially constructed.

(a)Portable Noncarbon Arc Electric-Discharge Luminaires

Portable Noncarbon Arc Electric-Discharge Luminaires

Portable noncarbon arc luminaires, including enclosed arc lamp luminaires and their associated ballasts shall be listed.

700-12(e) No comment – Panel Action acceptable.

701-11(f) No comment – Panel Action acceptable.

530-51 Based upon the definition of a luminaire, the connection of a lamp to power occurs at or within a luminaire. If a lamp is installed in or at a "fixture" which is energized, it is a luminaire by definition. The Panel Statement, therefore is incorrect.

The current code language is:

Lamps in Cellulose Nitrate Film Storage Vaults. Lamps in cellulose nitrate film storage vaults shall be installed in rigid fixtures of the glass-enclosed and gasketed type. Lamps shall be controlled by a switch having a pole in each ungrounded conductor…

This code section should be modified as follows:

Luminaires in Cellulose Nitrate Film Storage Vaults. Luminaires in cellulose nitrate film storage vaults shall be of the glass-enclosed and gasketed type rigidly fastened to the surface on which they are mounted. These luminaires shall be controlled by a switch having a pole in each ungrounded conductor…

In addition to the submitter's proposed Panel Actions, I believe the intention of the proposer would be best served by modification of the following code sections:

Current code language:

520-62 Bracket Fixture Wiring.

(a) Bracket Wiring. Brackets for use on scenery shall be wired internally, and the fixture stem shall be carried through to the back of the scenery where a bushing shall be placed on the end of the stem. Externally wired brackets or other fixtures shall be permitted where wired with cords designed for hard usage that extend through scenery and without joint or splice in canopy of fixture back and terminate in an approved-type stage connector located, where practical, within 18 in. (457 mm) of the fixture.

(b) Mounting. Fixtures shall be securely fastened in place.

Proposed code language:

520-63 Bracket Luminaire Wiring.

(c) Bracket Wiring. Brackets for use on scenery shall be wired internally and the luminaire stem shall be carried through to the back of the scenery where a bushing shall be placed on the end of the stem. Externally wired brackets or other luminaires shall be permitted where wired with cords designed for hard usage that extend through scenery and without joint or splice in canopy of luminaire and terminate in an approved-type stage connector located, where practical, within 18 in. (457 mm).

(d)Mounting. Bracket Luminaires shall be securely fastened in place.

Current code language (based upon Panel Action):

Old Section 520-13(g) Inside Tents and Concessions

New Section: 525-21(b) Portable Wiring Inside Tents and Concessions. Electrical wiring for lighting, where installed inside of tents and concessions, shall be securely installed, and where subject to physical damage, shall be provided with mechanical protection. All lamps for general illumination shall be protected from accidental breakage by a suitable fixture or lampholder with a guard.

Proposed code language:

525-21(b) Portable Wiring Inside Tents and Concessions. Electrical wiring for lighting, where installed inside of tents and concessions, shall be securely installed, and where subject to physical damage, shall be provided with mechanical protection. All lamps for general illumination shall be protected from accidental breakage by a guard or installed within a protective luminaire.

Current code language:

530-16. Portable Lamps. Portable lamps and work lights shall be equipped with flexible cords, composition or metal sheathed porcelain sockets, and substantial guards.

Exception: Portable lamps used as properties in a motion picture set or television stage set, on a studio stage or lot, or on location shall not be considered to be portable lamps for the purpose of this section.

Proposed code language:

530-16 Portable Lamps. Portable luminaires and work lights shall be equipped with flexible cords, and composition or metal sheathed porcelain sockets, and substantial guards.

Exception: Portable luminaires used as properties in a motion picture set or television stage set, on a studio stage or lot, or on location shall not be considered to be portable luminaires for the purpose of this section.

Current code language:

D. Viewing, Cutting, and Patching Tables

530-41 Lamps at Tables. Only composition or metal-sheathed, porcelain, keyless lampholders equipped with suitable means to guard lamps from physical damage and from film scrap shall be used at patching, viewing, and cutting tables.

Proposed code language

D. Viewing, Cutting, and Patching Tables

530-42 Luminaires at Tables. Only composition or metal-sheathed, porcelain, keyless luminaires equipped with suitable means to guard lamps from physical damage and from film scrap shall be used at patching, viewing, and cutting tables.

Current code language:

700-16 Emergency Illumination. Emergency illumination shall include all required means of egress lighting, illuminated exit signs, and all other lights specified as necessary to provide required illumination…

Proposed code language:

700-16 Emergency Illumination. Emergency illumination shall include all required means of egress lighting, illuminated exit signs, and all other luminaires specified as necessary to provide required illumination…

Current code language:

700-17 Circuits for Emergency Lighting. Such installations shall provide either one of the following: (1) an emergency lighting supply, independent of the general lighting supply with provisions for automatically transferring the emergency lights upon the event of failure of the general lighting system supply, or (2)…

Proposed code language:

700-17 Circuits for Emergency Lighting. Such installations shall provide either one of the following: (1) an emergency lighting supply, independent of the general lighting supply, with provisions for automatically transferring the emergency luminaires upon the event of failure of the general lighting system supply, or (2)…

Current code language:

700-20 Exception No. 2: Additional switches that act only to put emergency lights into operation but not disconnect them shall be permissible.

Proposed code language:

700-20 Exception No. 2: Additional switches that act only to put emergency luminaires into operation but not disconnect them shall be permissible.

Current code language:

700-22 Exterior Lights. Those lights on the exterior of a building that are not required for illumination when there is sufficient daylight shall be permitted to be controlled by an automatic light-actuated device.

Proposed code language:

700-23 Exterior Luminaries. Those luminaires on the exterior of a building that are not required for illumination when there is sufficient daylight shall be permitted to be controlled by an automatic light-actuated device.

LANNI: The word luminaire is not in general use, thus it will add confusion, and it is not user friendly. Luminaire is not in the dictionary in Microsoft word, or in the American Heritage dictionary. It is not used by the electrical trades or the set lighting trades as the description of a lighting apparatus. When using the Internet, YAHOO! shows 278 matches for lighting fixtures and only 23 for luminaire, a difference of 255 sites. Other search engines reflect the same results. If manufactures don't list their products as luminaires it is because they realize that their customers don't recognize the term. If the people who buy, sell, install, and use lighting fixtures do not use the word luminaire, the NEC shouldn't use it either. Luminaire may be a European word, however, English is a more global language than French.

COMMENT ON AFFIRMATIVE:

AMOS: I agree with the Panel's Action to change the reference to fixtures, to Luminaries. However, the word "Luminaire" should be placed first, with the former term in parentheses after for at least the next Code cycle to ensure a common understanding.

(Log #1930n)

15- 2 - (Entire Document): Accept in Principle in Part

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: Refer to panel action and statement on Proposal 15-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

HIRSCHLER: See my Explanation of Negative Vote on Proposal 15-1.

KLEIN: See my Explanation of Negative Vote on Proposal 5-1.

LANNI: The National Electrical Code is not a design manual, and lighting engineers preferences shouldn't be accepted if the result is that the majority of users are forced to learn a new term. The submitter's suggestion that anyone referring to an electrical code would confuse it with a plumbing code is rather far fetched. This change will cause confusion among electricians, inspectors, and the buying public. As the French are so concerned with keeping their language "pure" why are we inserting a French word into our terminology thus making it inconsistent with our usage of the word light. Lights, downlights, indirect light, lighting, sunlight, worklight, exit light, daylight, high light, candlelight, moonlight, lighting systems, are all terms used in conjunction with lighting fixtures. Are we to refer to a downlight as a ??? A spotlight is a spot luminaire? A flashlight is now what? The word light is combined with other words to form the text of our language and substituting "luminaire" is not as simple a change as some would have us believe. English is confusing by the very fact that is combines German and Latin and Greek roots and rules and is inconsistent. This is a classic case of inserting a Latin root into a German form. English is taught as a second language in many, many countries and is more global than French. The Europeans should be adapting to English instead of the reverse.

None of my IBEW electricians use the word luminaire, the Local 728 Set Lighting Electricians do not use the term either. Manufactures advertise their products as lighting fixtures. See YAHOO - Search examples I have provided. We have put a lot of effort to make the code user friendly, why reverse the trend. If the word (luminaire) was printed next to the term "lighting fixture" the NEC would become just as consistent with other codes not in English.

Note: Supporting material is available for review at NFPA Headquarters.

(Log #1930o)

16- 1 - (Entire Document): Accept in Principle

NOTE: The Technical Correlating Committee understands that the panel has accepted those portions of the Proposal which fall under its Scope.

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term <u>luminaire.</u>

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term <u>luminaire.</u>

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept in Principle.

The panel agrees with the substitution of the word "luminaire" for lighting fixture. Add the words "(lighting fixture)" after the term "luminaire"

PANEL STATEMENT: The added wording in parentheses is needed for those who may not be familiar with the term.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

KAHN: While many organizations may prefer the term "luminaire", I believe that many users of the Code might be confused with a substitution of terms at this time. The Panel correctly added the parenthesis with the term "lighting fixture" but I do not think that goes far enough. To properly introduce the term "luminaire", it should be the term added in the parenthesis for the 2002 NEC. For the following code the change as approved would follow. By that time code users will have become familiar with the change.

I do not agree with the submitter's substantiation that this change "will reduce confusion with reference to plumbing fixtures". The NEC does not apply to plumbing fixtures.

LANNI: The word luminaire is not in general use, thus it will add confusion and it is not user friendly. Luminaire is not in the dictionary in microsoft word, or in the American Heritage Dictionary. It is not used by the electrical trades or the set lighting trades as the description of a lighting apparatus. When using the internet, YAHOO shows 278 matches for lighting fixtures and only 23 for luminaire, a difference of 255 sites. Other search engines reflect the same results. If manufacturers don't list their products as luminaires, it is because they realize that their customers don't recognize the term. If the people who buy, sell, install, and use lighting fixtures do not use the word luminaire, the NEC shouldn't use it either. Luminaire may be a European word, however, English is a more global language than French.

SPEER: The panel's statement indicates that users of the code may not be familiar with the term "luminaire", I concur. The original term "lighting fixture" is recognized throughout the industry and should remain in use. No improvement to the code, either in use or application, will result from this proposed change.

(Log #1930p)

17- 2 - (Entire Document): Accept in Principle

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term <u>luminaire.</u>

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term <u>luminaire.</u>

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action on Proposal 17-1 which meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 3 Clark, Nash, Telecky

EXPLANATION OF NEGATIVE:

HILLEBRAND: While many organizations may prefer the term "luminaire", I believe that many of the users of the code might be confused with a substitution of terms at this time. To properly introduce the term "luminaire", it should be introduced in a parenthesis right after each place where the term "lighting fixture" is used for the 2002 NEC. In the following code, the parenthesis can be deleted. By that time code users will have become familiar with the change.

I do not agree with the submitter's substantiation that this change "will reduce confusion with reference to plumbing fixtures". The NEC does not apply to plumbing fixtures.

(Log #1158l)

17- 1 - (Entire Document): Accept

NOTE: The Technical Correlating Committee understands that the panel has accepted those portions of the Proposal which fall under its Scope. The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures"

with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

<u>Replace "Fixture" with "Luminaire"</u> in the following Sections: Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

<u>Replace "Fixtures" with "Luminaires"</u> in the following Sections: Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7,

Sections 701-11, 701-12.
Replace "Lighting Fixture" with "Luminaire" in the following Sections:
Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.
Replace "Lighting Fixtures" with "Luminaires" in the following Sections:
Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.
SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).
2. The Canadian Electrical Code has used the luminaire term for the last ten years.
3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.
4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".
5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.
6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.
7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.
8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.
9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 3 Clark, Nash, Telecky
EXPLANATION OF NEGATIVE:
HILLEBRAND: While many organizations may prefer the term "luminaire", I believe that many of the users of the code might be confused with a substitution of terms at this time. To properly introduce the term "luminaire", it should be introduced in a parenthesis right after each place where the term "lighting fixture" is used for the 2002 NEC. In the following code the parenthesis can be deleted. By that time code users will have become familiar with the change.

(Log #1158d)

18- 1 - (Entire Document): Accept in Part
Note: The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.
SUBMITTER: William Buckson, Hubbell Lighting Inc.
RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures"
with "luminare", "luminaries" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.
Please see companion proposal, adding the term luminare to Article 100, definitions, and deleting the FPN in Article 410-1.
Replace "Fixture" with "Luminaire" in the following Sections:
Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.
Replace "Fixtures" with "Luminaires" in the following Sections:
Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.
Replace "Lighting Fixture" with "Luminaire" in the following Sections:
Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.
Replace "Lighting Fixtures" with "Luminaires" in the following Sections:
Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.
SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).
2. The Canadian Electrical Code has used the luminaire term for the last ten years.
3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.
4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".
5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.
6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.
7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.
8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.
9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.
PANEL ACTION: Accept in Part.
The panel accepts the proposal but limits acceptance to Articles 410, 411, and 600, and refers the proposal to all other appropriate code panels.
PANEL STATEMENT: CMP 18 acted on only those articles under their jurisdiction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
WALL: The terms "lighting fixture," "lighting fixtures," "fixture" and "fixtures" are more widely recognized in the United States than "luminaire(s)": however, "luminaire(s)" is more widely recognized internationally. To ease the transition, both terms should be included for one code cycle: the term "luminaire(s)" followed by the term "lighting fixture(s)" in parentheses, for example: "luminaire (lighting fixture)."

(Log #1930q)

18- 2 - (Entire Document): Accept in Principle
SUBMITTER: Jon P. Farren, Farren Engineering, Inc.
RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.
SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.
Also, this will reduce confusion with reference to plumbing fixtures.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement under Proposal 18-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1158g)

19- 1 - (Entire Document): Accept in Principle in Part
Note: The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis on all Proposals except those amended by Panel Action Text. This action is intended to provide consistency throughout the code. In additon, the Technical Correlating Committee directs the panel to clarify their action relative to the last line of the Panel Action. This action will be considered by the Panel as a Public Comment.
SUBMITTER: William Buckson, Hubbell Lighting Inc.
RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures"
with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.
Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.
Replace "Fixture" with "Luminaire" in the following Sections:
Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.
Replace "Fixtures" with "Luminaires" in the following Sections:
Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.
Replace "Lighting Fixture" with "Luminaire" in the following Sections:
Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.
Replace "Lighting Fixtures" with "Luminaires" in the following Sections:
Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.
SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).
2. The Canadian Electrical Code has used the luminaire term for the last ten years.
3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.
4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".
5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.
6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.
7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.
8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.
9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.
PANEL ACTION: Accept in Principle in Part.
Accept all proposals in Articles 545, 547, 550, 551, 552, 553, 555, 604, and 675 except those amended as follows:
551-20(d) title and text----change "Fixtures" to "Fixtures, Including Luminaires," and "Fixtures" to "Fixtures, including luminaires,".
551-43(b) --first reference, change "fixture" to "fixture, including a luminaire," (second reference accepted as proposed).
551-60(a) --change "Fixtures" to "Fixtures, including luminaires,".
552-20(d) title and text-- change "Fixtures" to "Fixtures, Including Luminaires," and "Fixtures" to "Fixtures, including luminaires," respectively.
552-56(e)-- change "fixture" to "fixture, including a luminaire,".
552-59 title and text-- change "Fixtures" to "Fixtures, Including Luminaires," and "fixtures" to "fixtures, including luminaires,".
552-60(a)--Change "Fixtures" to "Fixtures, including luminaires,".
604-6(a)(2) Exception 1-- change "fixtures" to "fixtures, including luminaires,".
PANEL STATEMENT: Only the proposals in Articles 545, 547, 550, 551, 552, 553, 555, 604, and 675 are within the scope of CMP 19. The proposal is too broad in its recommendation. While the use of the existing word "fixture(s)" and term "lighting fixture(s)" often is clearly in reference to lighting products, in other places, the word "fixture(s)" may be interpreted to include a broader range of equipment. The panel considered the word "equipment" to replace "fixture(s)" where lighting products may not be exclusively intended but believed it to be too broad a reference as defined in the NEC. In such situations, our recommendation "(a) fixture(s), including (a) luminaire(s),..." serves to sufficiently expand the scope of "fixture(s)" while not expanding it so broadly as "equipment."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
SABIN-MERCADO: EL&P affirms Panel actions to change to the term "luminaire" throughout the Code. An affirmative comment will be made that indicates the word "luminaire" should be placed first with the former term in parentheses after the word for at least the duration of the next Code cycle in each of the CMPs affected.

(Log #1930r)

19- 2 - (Entire Document): Accept in Principle in Part

NOTE: See Technical Correlating Committee Note on Proposal 19-1.

SUBMITTER: Jon P. Farren, Farren Engineering, Inc.

RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.

SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.

Also, this will reduce confusion with reference to plumbing fixtures.

PANEL ACTION: Accept in Principle in Part.

Accept all proposals in Articles 545, 547, 550, 551, 552, 553, 555, 604, and 675 except those amended as follows:

551-20(d) title and text---change "Fixtures" to "Fixtures, Including Luminaires," and "Fixtures" to "Fixtures, including luminaires,".

551-43(b) --first reference, change "fixture" to "fixture, including a luminaire," (second reference accepted as proposed).

551-60(a) --change "Fixtures" to "Fixtures, including luminaires,".

552-20(d) title and text-- change "Fixtures" to "Fixtures, Including Luminaires," and "Fixtures" to "Fixtures, including luminaires," respectively.

552-56(e)-- change "fixture" to "fixture, including a luminaire,".

552-59 title and text-- change "Fixtures" to "Fixtures, Including Luminaires," and "fixtures" to "fixtures, including luminaires,".

552-60(a)--Change "Fixtures" to "Fixtures, including luminaires,".

604-6(a)(2) Exception 1-- change "fixtures" to "fixtures, including luminaires,".

PANEL STATEMENT: Only the proposals in Articles 545, 547, 550, 551, 552, 553, 555, 604, and 675 are within the scope of CMP 19. The proposal is too broad in its recommendation. While the use of the existing word "fixture(s)" and term "lighting fixture(s)" often is clearly in reference to lighting products, in other places, the word "fixture(s)" may be interpreted to include a broader range of equipment. The panel considered the word "equipment" to replace "fixture(s)" where lighting products may not be exclusively intended but believed it to be too broad a reference as defined in the NEC. In such situations, our recommendation "(a) fixture(s), including (a) luminaire(s),..." serves to sufficiently expand the scope of "fixture(s)" while not expanding it so broadly as "equipment."

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

COMMENT ON AFFIRMATIVE:

SABIN-MERCADO: See my Comment on Affirmative on Proposal 19-1.

(Log #1158i)

20- 1 - (Entire Document): Accept in Principle in Part

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Replace the terms "lighting fixture", "lighting fixtures" and "fixture", "fixtures"

with "luminaire", "luminaires" appearing throughout the following Sections. Exception, where fixture or fixtures are used in conjunction with wire or wires, or in Chapter 8.

Please see companion proposal, adding the term luminaire to Article 100, definitions, and deleting the FPN in Article 410-1.

Replace "Fixture" with "Luminaire" in the following Sections:

Sections 210-6, 210-19, 220-3, 250-148, Sections 300-3, 300-15, 300-16,, 305-4, 331-11, 350-10, 350-18, 351-8, 351-27, 363-12, 364-12, 370-16, 370-23, 370-25, 370-27, Sections 410-3, 410 B, 410-4, 410-6, 410-8, 410-C, 410-10, 410-11, 410-12, 410-13, 410-14, 410 D, 410-15, 410-16, 410-18, 410-22, 410-23, 410-28, 410-30, 410-35, 410-37, 410-46, 410-65, 410-66, 410-67, 410-71, 410-73, 410-76, 410-77, 410-91, 410-105, Sections 501-9, 502-11, 503-9, 520-63, 525-13, 547-7, 550-11, 551-41, 551-43, 551-53, 551-55, 552-54, 552-56, Sections 604-6, 610-12, 680-4, 680-6, 680-20, 680-21, 680-22, 680-32, 680-51.

Replace "Fixtures" with "Luminaires" in the following Sections:

Sections 210-19, 225-7, 250-4, Sections 300-11, 300-14, 300-15, 300-22, 331-4, 331-11, 333-7, 342-7, 347-2, 347-3, 348-5, 349-10, 350-10, 350-18, 351-8, 351-24, 351-27, 364-12, 370-23, Sections 400-7, 402-10, 410-1, 410-3, 410-4, 410-5, 410-6, 410-7, 410-8, 410-11, 410-15, 410-16, 410-17, 410-18, 410-20, 410-21, 410-22, 410-23, 410-24, 410-30, 410-31, 410G, 410-35, 410-36, 410-37, 410-39, 410-46, 410 M, 410-64, 410-65, 410N, 410-68, 410-70, 410-73, 410-74, 410-76, 410-77, 410-81, 410-104, 424-38, 424-39, 424-41, 424-93, Sections 501-9, 502-11, 503-9, 511-6, 513-5, 517-13, 517-61, 517-63, 520-42, 520-45, 520-61, 520-63, 530-17, 530-18, 530-51, 550-1, 550-2, 550-8, 550-9, 550-12, 550-15, 551-20, 551-53, 551-60, 552-20, 552-54, 552-58, 552-60, Sections 620-21, 670-2, 680-5, 680-6, 680-20, 680-25, 680-41, 680-51, 690-7, Sections 701-11, 701-12.

Replace "Lighting Fixture" with "Luminaire" in the following Sections:

Article 100, Sections 210-52, 220-3, Sections 334-10, 336-18, 370-27, Article 410, Sections 410-16, 410-77, Sections 501-9, 520-2, 530-2, 547-7, 550-9, 551-53, 551-55, 552-41, 552-54, 552-56, Sections 680-4, 680-6, 680-7, 680-20, 680-21, 680-25, 680-32, 680-51.

Replace "Lighting Fixtures" with "Luminaires" in the following Sections:

Article 100, Section 110-26, Sections 210-6, 210-23, 210-24, 220-3, 225-7, 240-2, 240-10, 250-4, 250-112, Sections 331-11, 333-7, 342-7, 349-10, 350-10, 351-24, 351-27, 364-12, 370-23, Sections 400-11, 402-2, 402-10, Article 410, Sections 410-1, 410-14, 410-15, 410-16, 410-30, 410-73, 410-80, 410-100, 411-2, 424-39, 424-93, Sections 500-5, 501-6, 501-9, 502-11, 503-9, 503-12, 517-30, 517-41, 517-61, 520-81, 547-7, 550-9, 551-10, 551-43, 551-53, 552-10, 552-54, Sections 600-3, 680-6, 680-20, 680-24, 680-25, 680-32, 680-41, 680-51, 680-61, 680-62, 680-71, Section 700-9.

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL luminaire standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a luminaire standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to Luminaire Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into luminaire (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept in Principle in Part.

In Article 424, replace the terms "fixture", "fixtures", "lighting fixture", and "lighting fixtures" with "luminaire" or "luminaires", as appropriate, in the locations noted. Also, for each occurrence of these terms, include the former term in parentheses after the word "luminaire(s)".

E.G. "luminaire (lighting fixture)".

In 424-38(C): 1 place

In 424-39: 2 places

In 424-41(J): 1 place

In 424-93(A)(3): 2 places

In Proposal 20-30a, the rewrite of Article 680, replace the terms "fixture", "fixtures", "lighting fixture", and "lighting fixtures" with "luminaire" or "luminaires", as appropriate, in the locations noted in the following table. Also, for each occurrence of these terms, include the former term in parentheses after the word "luminaire(s)".

E.G. "luminaire (lighting fixture)"

Luminaire(s)	
Section	Number of Occurrances
680.2	8
680.6	1
680.7	1
680.22	
B	1
B1	1
B21	1
B3	1
B4	1
B5	2
680.23	2
A1	3
A2	1
A3	2
A4	1
A5	5
A6	2
A7	1
A8	2
B	1
B1	2
B3	1
B4	5
B5	4
C	1
C1	1
C2	1
D	2
F1	2
F2	1
a	3
b	2
680.24	
A	1
A2	2
B	1
D	1
E	1
F	2
680.26	
B2	1
680.33	2
A	1
A2	1
A3	1
B	1
B2	1
B4	1
680.43	
B	1
B1	1
B1c	1
B1c1	1
B1c2	1
B2	1
680.51	1
B	1
C	4
F	1
680.61, Exception	1
680.62	
F	2
680.72	1
	95

PANEL STATEMENT: The panel accepts this change to "luminaire(s)" on the condition that panels 1 and 18 also accept this change. This requires a definition acceptable to Panel 1 to be added to Article 100. These changes need to be incorporated into Article 424 and into the rewrite of Article 680 in Panel Proposal 20-30a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Ryan

(Log #1930s)

20- 2 - (Entire Document): Accept in Principle in Part
SUBMITTER: Jon P. Farren, Farren Engineering, Inc.
RECOMMENDATION: For entire document, replace "lighting fixture" and "fixture" with the correct term luminaire.
SUBSTANTIATION: Illuminating Engineering Society of North America (IESNA), Lighting Design Lab in Seattle, WA and all other professional lighting organizations prefer the term luminaire.
Also, this will reduce confusion with reference to plumbing fixtures.
PANEL ACTION: Accept in Principle in Part.
See Proposal 20-1.
PANEL STATEMENT: Proposal 20-1 addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Ryan

(Log #1768)

1- 3 - (80): Accept
NOTE: The Technical Correlating Committee directs that this proposal be reviewed relative to the NFPA definition of the "Authority Having Jurisdiction" and determine if it is appropriate for this Article. In the Scope, change "shall be" to "are" to comply with the NEC Style Manual. The Technical Correlating Committee accepts the Scope as modified by this note. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION:

Article 80 - Administration and Enforcement

(*This article is informative unless specifically adopted by the local jurisdiction adopting the National Electrical Code. See Section 80-5.***)**

80-1 Scope. The following functions shall be covered:
(1) The inspection of electrical installations as covered by Section 90-2
(2) The investigation of fires caused by electrical installations
(3) The review of construction plans, drawings, and specifications for electrical systems
(4) The design, alteration, modification, construction, maintenance, and testing of electrical systems and equipment
(5) The regulation and control of electrical installations at special events including but not limited to exhibits, trade shows, amusement parks, and other similar special occupancies.

80-2 Definitions.
Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, an installation, or procedure.
FPN: See 80-13(a) for use of this term.
Electrical Inspector. An individual meeting the requirements of 80-27 and authorized to perform electrical inspections.
Chief Electrical Inspector. An electrical inspector who is either the authority having jurisdiction or is designated by the authority having jurisdiction and is responsible for administering the requirements of this Code.
80-3 Purpose. The purpose of this article shall be to provide requirements for administration and enforcement of the National Electrical Code.
80-5 Adoption. Article 80 shall not apply unless specifically adopted by the local jurisdiction adopting the National Electrical Code.
80-7 Title. The title of this Code shall be NFPA 70, National Electrical Code®, of the National Fire Protection Association. The short title of this Code shall be the NEC®.
80-9 Application.
(a) New Installations. This Code applies to new installations. Buildings with construction permits dated after the adoption of this shall comply with the requirements of this Code.
(b) Existing Installations. Existing electrical installations that do not comply with the provisions of this Code shall be permitted to be continued in use unless the authority having jurisdiction determines that the lack of conformity with this Code presents an imminent danger to occupants. Where changes are required for correction of hazards, a reasonable amount of time shall be given for compliance, depending on the degree of the hazard.

(c) Additions, Alterations, or Repairs. Additions, alterations, or repairs to any building, structure, or premises shall conform to that required of a new building without requiring the existing building to comply with all the requirements of this Code. Additions, alterations, installations, or repairs shall not cause an existing building to become unsafe or adversely affect the performance of the building as determined by the authority having jurisdiction. Electrical wiring added to an existing service, feeder, or branch circuit shall not result in an installation that violates the provisions of the Code in force at the time the additions are made.

80-11 Occupancy of Building or Structure.

(a) New Construction. No newly constructed building shall be occupied in whole or in part in violation of the provisions of this Code.

(b) Existing Buildings. Existing buildings that are occupied at the time of adoption of this Code shall be permitted to remain in use provided:

(1) The occupancy classification remains unchanged, and
(2) There exists no condition deemed hazardous to life or property that would constitute an imminent danger

80-13 Authority. Where used in this Article, the term authority having jurisdiction shall include the chief electrical inspector or other individuals designated by the governing body. This Code shall be administered and enforced by the authority having jurisdiction designated by the governing authority as follows:

(a) The authority having jurisdiction shall be permitted to render interpretations of this Code in order to provide clarification to its requirements, as permitted by Section 90-4.

(b) When the use of any electrical equipment or its installations shall be found to be dangerous to human life or property, the authority having jurisdiction is hereby empowered to have the premises disconnected from its source of electric supply, as established by the Board. When such equipment or installation has been so condemned and/or disconnected, a notice shall be placed thereon listing the causes for the condemnation or disconnection or both and the penalty under 80-23 for the unlawful use thereof, and written notice of such condemnation and/or disconnection and the causes therefore shall be given within 24 hours to the owners and/or the occupant of such building, structure, or premises. It shall be unlawful for any person to remove the said notice and/or reconnect the electric equipment to its source of electric supply, and/or to use or permit to be used electric power in any such electric equipment until such causes for the condemnation and/or disconnection have been remedied to the satisfaction of the inspection authorities.

(c) The authority having jurisdiction shall be permitted to delegate to other qualified individuals such powers as necessary for the proper administration and enforcement of this Code.

(d) Police, fire, and other enforcement agencies shall have authority to render necessary assistance in the enforcement of this Code when requested to do so by the authority having jurisdiction.

(e) The authority having jurisdiction shall be authorized to inspect, at all reasonable times, any building or premises for dangerous or hazardous conditions or equipment as set forth in this Code . The authority having jurisdiction shall be permitted to order any person(s) to remove or remedy such dangerous or hazardous condition or equipment. Any person(s) failing to comply with such order shall be in violation of this Code.

(f) Where the authority having jurisdiction deems that conditions hazardous to life and property exist, the authority having jurisdiction shall be permitted to require such hazardous conditions that are in violation of this Code to be corrected.

(g) To the full extent permitted by law, any authority having jurisdiction engaged in inspection work shall be authorized at all reasonable times to enter and examine any building, structure, or premises for the purpose of making electrical inspections. Before entering a premises, the authority having jurisdiction shall obtain the consent of the occupant thereof or obtain a court warrant authorizing entry for the purpose of inspection except in those instances where an emergency exists. As used in this section, "emergency" means circumstances that the authority having jurisdiction knows, or has reason to believe, exist and that reasonably can constitute immediate danger to life and property.

(h) Persons authorized to enter and inspect buildings, structures, and premises as herein set forth shall be identified by proper credentials issued by this governing authority.

(i) Persons shall not interfere with an authority having jurisdiction carrying out any duties or functions prescribed by this Code.

(j) Persons shall not use a badge, uniform, or other credentials to impersonate the authority having jurisdiction.

(k) The authority having jurisdiction shall be permitted to investigate the cause, origin, and circumstances of any fire, explosion, or other hazardous condition.

(l) The authority having jurisdiction shall be permitted to require plans and specifications to ensure compliance with this Code.

(m) Whenever any installation subject to inspection prior to use is covered or concealed without having first been inspected, the authority having jurisdiction shall be permitted to require that such work be exposed for inspection. The authority having jurisdiction shall be notified when the installation is ready for inspection and shall conduct the inspection within ___ days.

(n) The authority having jurisdiction shall be permitted to order the immediate evacuation of any occupied building deemed unsafe when such building has hazardous conditions that present imminent danger to building occupants.

(o) The authority having jurisdiction shall be permitted to waive specific requirements in this Code or permit alternate methods where it is assured that equivalent objectives can be achieved by establishing and maintaining effective safety. Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency and the system, method, or device is approved for the intended purpose.

(p) Each application for a waiver of a specific electrical requirement shall be filed with the authority having jurisdiction and shall be accompanied by such evidence, letters, statements, results of tests, or other supporting information as required to justify the request. The authority having jurisdiction shall keep a record of actions on such applications, and a signed copy of the authority having jurisdiction's decision shall be provided for the applicant.

80-15 Electrical Board.

(a) Creation of the Electrical Board. There is hereby created the Electrical Board of the _____ of _____ hereinafter designated as the Board.

(b) Appointments. Board members shall be appointed by the Governor with the advice and consent of the Senate (or by the Mayor with the advice and consent of the Council, or the equivalent).

(1) Members of the Board shall be chosen in a manner to reflect a balanced representation of individuals or organizations. The Chair of the Board shall be elected by the Board membership.

(2) The Chief Electrical Inspector in the jurisdiction adopting this Article authorized in 80-15(b)(3(a) shall be the nonvoting secretary of the Board. Where the Chief Electrical Inspector of a local municipality serves a Board at a state level, he or she shall be permitted to serve as a voting member of the Board.

(3) The board shall consist of not fewer than five voting members. Board members shall be selected from the following:

(a) Chief Electrical Inspector from a local government (for State Board only)
(b) An electrical contractor operating in the jurisdiction
(c) A licensed professional engineer engaged primarily in the design or maintenance of electrical installations
(d) A journeyman electrician

(4) Additional membership shall be selected from the:

(a) A master (supervising) electrician
(b) The Fire Marshal (or Fire Chief).
(c) A representative of the property/casualty insurance industry.
(d) A representative of an electric power utility operating in the jurisdiction.
(e) A representative of electrical manufacturers primarily and actively engaged in producing materials, fittings, devices, appliances, fixtures, or apparatus used as part of or in connection with electrical installations.
(f) A member of the labor organization that represents the primary electrical workforce.
(g) A member from the public who is not affiliated with any other designated group.

(c) Terms. Of the members first appointed, _____ shall be appointed for a term of 1 year, _____ for a term of 2 years, _____ for a term of 3 years, and _____ for a term of 4 years, and thereafter each appointment shall be for a term of 4 years or until a successor is appointed. The Chair of the Board shall appointed for a term not to exceed ____ years.

(d) Compensation. Each appointed member shall receive the sum of _____dollars ($_____) for each day during which the member attends a meeting of the Board and, in addition thereto, shall be reimbursed for direct lodging, travel and meal expenses as covered by policies and procedures established by the jurisdiction.

(e) Quorum. A quorum as established by the Board operating procedures shall be required to conduct Board business. The Board shall hold such meetings as necessary to carry out the purposes of Article 80. The Chair or a majority of the members of the Board shall have the authority to call meetings of the Board.

(f) Duties. It shall be the duty of the Board to:
(1) Adopt the necessary rules and regulations to administer and enforce Article 80.
(2) Establish qualifications of electrical inspectors.
(3) To revoke or suspend the recognition of any inspector's certificate for the jurisdiction.
(4) After advance notice of the public hearings and the execution of such hearings, as established by law, the Board is authorized to establish and update the provisions for the safety of electrical installations to conform with the current edition of the National Electrical Code (NFPA 70) and other nationally recognized safety standards for electrical installations, and;
(5) Establish procedures for recognition of electrical safety standards and acceptance of equipment conforming to these standards.

(g) Appeals.
(1) Review of Decisions. Any person, firm or corporation may register an appeal with the Board for a review of any decision of the Chief Electrical Inspector or of any Electrical Inspector, provided that such appeal is made in writing within fifteen (15) days after such person, firm or corporation shall have been notified. Upon receipt of such appeal, said Board shall, if requested by the person making the appeal, hold a public hearing and proceed to determine whether the action of the Board, or the Chief Electrical Inspector or of the Electrical Inspector complies with this law and, within fifteen (15) days after receipt of the appeal or after holding the hearing shall make a decision in accordance with its findings.
(2) Conditions. Any person shall be permitted to appeal a decision of the authority having jurisdiction to the Board when it is claimed that any one or more of the following conditions exist:
(a) The true intent of the codes or ordinances described in this Code has been incorrectly interpreted
(b) The provisions of the codes or ordinances do not fully apply
(c) A decision is unreasonable or arbitrary as it applies to alternatives or new materials
(3) Submission of Appeals. An appeal shall be submitted to the authority having jurisdiction in writing within 15 calendar days of notification of violation outlining the Code provision from which relief is sought and the remedy proposed.

(h) Meetings and Records. Meetings and records of the Board shall conform to the following:
(1) Meetings of the Board shall be open to the public as required by law.
(2) Records of meetings of the Board shall be available for review during normal business hours, as required by law.

80-17 Records and Reports. The authority having jurisdiction shall retain records as follows:

(a) Retention. The authority having jurisdiction shall keep a record of all electrical inspections, including the date of such inspections and a summary of any violations found to exist, the date of the services of notices, and a record of the final disposition of all violations. All required records shall be maintained until their usefulness has been served or as otherwise required by law.

(b) Availability. A record of examinations, approvals, and variances granted shall be maintained by the authority having jurisdiction and shall be available for public review as prescribed by law during normal business hours.

80-19 Permits and Approvals. Permits and approvals shall conform to the following:

(a) Application.

(1) Activity authorized by a permit issued under this Code shall be conducted by the permittee or the permittee's agents or employees in compliance with all requirements of this Code applicable thereto and in accordance with the approved plans and specifications. No permit issued under this Code shall be interpreted to justify a violation of any provision of this Code or any other applicable law or regulation. Any addition or alteration of approved plans or specifications shall be approved in advance by the authority having jurisdiction, as evidenced by the issuance of a new or amended permit.

(2) A copy of the permit shall be posted or otherwise readily accessible at each work site or carried by the permit holder as specified by the authority having jurisdiction.

(b) Content. Permits shall be issued by the authority having jurisdiction and shall bear the name and signature of the authority having jurisdiction or that of the authority having jurisdiction's designated representative. In addition, the permit shall indicate:
(1) Operation or activities for which the permit is issued.
(2) Address or location where the operation or activity is to be conducted
(3) Name and address of the permittee
(4) Permit number and date of issuance
(5) Period of validity of the permit
(6) Inspection requirements

(c) Issuance of Permits. The authority having jurisdiction shall be authorized to establish and issue permits, certificates, notices, and approvals, or orders pertaining to electrical safety hazards pursuant to 80-23, except that no permit will be required to execute any of the classes of electrical work specified in the following:
(1) Installation or replacement of equipment such as lamps, and electric utilization equipment approved for connection to suitable permanently installed receptacles. Replacement of flush or snap switches, fuses, lamp sockets and receptacles, and other minor maintenance and repair work, such as replacing worn cords and tightening connections on a wiring device.
(2) The process of manufacturing, testing, servicing, or repairing of electric equipment or apparatus.

(d) Annual Permits. In lieu of an individual permit for each installation or alteration, an annual permit shall, upon application, therefore, be issued to any person, firm or corporation regularly employing one or more employees for the installation, alteration, and maintenance of electric equipment in or on buildings or premises owned or occupied by the applicant for the permit. Upon application, an electrical contractor as agent for the owner or tenant shall be issued an annual permit. The applicant shall keep records of all work done and such records shall be transmitted periodically to the Electrical Inspector.

(e) Fees. Any political subdivision which has been provided for electrical inspection in accordance with the provisions of Article 80 may establish fees which shall be paid by the applicant for a permit before the permit is issued.

(f) Inspection and Approvals.
(1) Upon the completion of any installation of electrical equipment which has been made under a permit other than an annual permit, it shall be the duty of the person, firm or corporation making the installation to notify the Electrical Inspector having jurisdiction, who shall inspect the work within a reasonable time.
(2) Where the Inspector finds the installation to be in conformity with the statutes of all applicable local ordinances, and all rules and regulations, the Inspector shall issue to the person, firm or corporation making the installation a certificate of approval, with duplicate copy for delivery to the owner, authorizing the connection to the supply of electricity and shall send written notice of such authorization to the supplier of electric service. When a certificate of temporary approval is issued authorizing the connection of an installation, such certificates shall be issued to expire at a time to be stated therein and shall be revocable by the Electrical Inspector for cause.
(3) When any portion of the electrical installation within the jurisdiction of an Electrical Inspector is to be hidden from view by the permanent placement of parts of the building, the person, firm or corporation installing the equipment shall notify the Electrical Inspector, and such equipment shall not be concealed until it has been approved by the Electrical Inspector or until _____ days have elapsed from the time of such notification; provided that on large installations, where the concealment of equipment proceeds continuously, the person, firm or corporation installing the equipment shall give the Electrical

Inspector due notice in advance, and inspections shall be made periodically during the progress of the work.

(4) At regular intervals, the Electrical Inspector having jurisdiction shall visit all buildings and premises where work may be done under annual permits and shall inspect all electric equipment installed under such permits since the date of the previous inspection. The Electrical Inspector shall issue a certificate of approval for such work as is found to be in conformity with the provisions of Article 80 and all applicable ordinances, orders, rules and regulations, after payments of all required fees.

(5) If, upon inspection, any installation is found not be fully in conformity with the provisions of Article 80, and all applicable ordinances, rules and regulations, the Inspector making the inspection shall at once forward to the person, firm or corporation making the installation a written notice stating the defects which have been found to exist.

Revocation of Permits. Revocation of permits shall conform to the following:

(1) The authority having jurisdiction shall be permitted to revoke a permit or approval issued if any violation of this Code is found upon inspection or in case there have been any false statements or misrepresentations submitted in the application or plans on which the permit or approval was based.

(2) Any attempt to defraud or otherwise deliberately or knowingly design, install, service, maintain, operate, sell, represent for sale, falsify records, reports, or applications, or other related activity in violation of the requirements prescribed by this Code shall be a violation of this Code. Such violations shall be cause for immediate suspension or revocation of any related licenses, certificates, or permits issued by this jurisdiction. In addition, any such violation shall be subject to any other criminal or civil penalties as available by the laws of this jurisdiction.

(3) Revocation shall be constituted when the permittee is duly notified by the authority having jurisdiction.

(4) Any person who engages in any business, operation, or occupation, or uses any premises, after the permit issued therefore has been suspended or revoked pursuant to the provisions of this Code, and before such suspended permit has been reinstated or a new permit issued, shall be in violation of this Code.

(5) A permit shall be predicated upon compliance with the requirements of this Code and shall constitute written authority issued by the authority having jurisdiction to install electrical equipment. Any permit issued under this Code shall not take the place of any other license or permit required by other regulations or laws of this jurisdiction.

(6) The authority having jurisdiction shall be permitted to require an inspection prior to the issuance of a permit.

A permit issued under this Code shall continue until revoked or for the period of time designated on the permit. The permit shall be issued to one person or business only and for the location or purpose described in the permit. Any change that affects any of the conditions of the permit shall require a new or amended permit.

(g) Applications and Extensions. Applications and extensions of permits shall conform to the following:

(1) The authority having jurisdiction shall be permitted to grant an extension of the permit time period upon presentation by the permittee of a satisfactory reason for failure to start or complete the work or activity authorized by the permit.

(2) Applications for permits shall be made to the authority having jurisdiction on forms provided by the jurisdiction and shall include the applicant's answers in full to inquiries set forth on such forms. Applications for permits shall be accompanied by such data as required by the authority having jurisdiction, such as plans and specifications, location, etc. Fees shall be determined as required by local laws.

(3) The authority having jurisdiction shall review all applications submitted and issue permits as required. If an application for a permit is rejected by the authority having jurisdiction, the applicant shall be advised of the reasons for such rejection. Permits for activities requiring evidence of financial responsibility by the jurisdiction shall not be issued unless proof of required financial responsibility is furnished.

80-21 Plans Review. Review of plans and specifications shall conform to the following:

(a) Authority. For new construction, modification, or rehabilitation, the authority having jurisdiction shall be permitted to review construction documents and drawings.

(b) Responsibility of the Applicant. It shall be the responsibility of the applicant to ensure that:

(1) The construction documents include all of the electrical requirements

(2) The construction documents and drawings are correct and in compliance with the applicable codes and standards

(c) Responsibility of the Authority Having Jurisdiction. It shall be the responsibility of the authority having jurisdiction to promulgate rules that cover the following:

(1) Review of construction documents and drawings within established time frames for the purpose of acceptance or providing reasons for non-acceptance

(2) Review and approval by the authority having jurisdiction shall not relieve the applicant of the responsibility of compliance with this Code.

(3) Where field conditions necessitate any substantial change from the approved plan, the authority having jurisdiction shall be permitted to require the corrected plans be submitted for approval.

80-23 Notice of Violations, Penalties. Notice of violations and penalties shall conform to the following:

(a) Violations.

(1) Whenever the authority having jurisdiction determines that there are violations of this Code, a written notice shall be issued to confirm such findings.

(2) Any order or notice issued pursuant to this Code shall be served upon the owner, operator, occupant, or other person responsible for the condition or violation, either by personal service, mail, or by delivering the same to, and leaving it with, some person of responsibility upon the premises. For unattended or abandoned locations, a copy of such order or notice shall be posted on the premises in a conspicuous place at or near the entrance to such premises and the order or notice shall be mailed by registered or certified mail, with return receipt requested, to the last known address of the owner, occupant, or both.

(b) Penalties.

(1) Any person who fails to comply with the provisions of this Code or who fails to carry out an order made pursuant of this Code or violates any condition attached to a permit, approval, or certificate shall be subject to the penalties established by this jurisdiction.

(2) Failure to comply with the time limits of an abatement notice or other corrective notice issued by the authority having jurisdiction shall result in each day that such violation continues being regarded as a new and separate offense.

(3) Any person, firm, or corporation who shall willfully violate any of the applicable provisions of this article shall be guilty of a misdemeanor and, and upon conviction thereof, shall be punished by a fine of not less than _____dollars ($_____) nor more than _____dollars ($_____) for each offense, together with the costs of prosecution and/or imprisonment for not less than_____(_____) days nor more than_____(_____)days.

80-25 Connection to Electricity Supply. Connections to the electric supply shall conform to the following:

(a) Authorization. Except where work is done under an annual permit and except as otherwise provided in 80-25, it shall be unlawful for any person, firm or corporation to make connection to a supply of electricity or to supply electricity to any electric equipment installation for which a permit is required or which has been disconnected or ordered to be disconnected.

(b) Special Consideration. By special permission of the authority having jurisdiction, temporary power shall be permitted to be supplied to the premises for specific needs of the construction project. The Board shall determine what needs are permitted under this provision.

(c) Notification. If, within _____ business days after the Electrical Inspector is notified of the completion of an installation of electric equipment, other than a temporary approval installation, the Electrical Inspector has neither authorized connection nor disapproved the installation, the supplier of electricity is authorized to make connections and supply electricity to such installation.

(d) Other Territories. If an installation or electric equipment is located in any territory where an Electrical Inspector has not been authorized or is not required to make inspections, the supplier of electricity is authorized to make connections and supply electricity to such installations.
(e) Disconnection. Where a connection is made to an installation that has not been inspected, as outlined in the preceding paragraphs of this Section, the supplier of electricity shall immediately report such connection to the Chief Electrical Inspector. If, upon subsequent inspection, it is found that the installation is not in conformity with the provisions of Article 80, the Chief Electrical Inspector shall notify the person, firm, or corporation making the installation to rectify the defects and, if such work is not completed within fifteen (15) business days or a longer period which may be specified by the Board, the Board shall have the authority to cause the disconnection of that portion of the installation that is not in conformity.

80-27 Inspector's Qualifications.
(a) Certificate. All electrical inspectors shall be certified by a nationally recognized inspector certification program accepted by the Board. The certification program shall specifically qualify the inspector in electrical inspections. No person shall be employed as an Electrical Inspector unless that person is the holder of an Electrical Inspector's certificate of qualification issued by the Board, except that any person who on the date on which this law went into effect was serving as a legally appointed Electrical Inspector of _____ shall, upon application and payment of the prescribed fee and without examination, be issued a special certificate permitting him or her to continue to serve as an Electrical Inspector in the same territory.
(b) Experience. Electrical inspector applicants shall:
(1) have a demonstrated knowledge of the standard materials and methods used in the installation of electric equipment, and
(2) be well versed in the approved methods of construction for safety to persons and property, and
(3) be well versed in the statues of _____ relating to electrical work and the National Electrical Code, as approved by the American National Standards Institute, and
(4) have had at least ____ years experience as an Electrical Inspector or ____ years in the installation of electrical equipment. In lieu of such experience, the applicant shall be a graduate in electrical engineering, or of a similar curriculum of a college or university considered by the Board as having suitable requirements for graduation and shall have had two ____ years practical electrical experience.
(c) Re-certification. Electrical inspectors shall be re-certified as established by provisions of the applicable certification program.
(d) Revocation and Suspension of Authority. The Board shall have the authority to revoke an inspector's authority to conduct inspections within a jurisdiction.

80-29 Liability for Damages. Article 80 shall be construed to affect the responsibility or liability of any party owning, operating, controlling, or installing any electric equipment for damages to persons or property caused by an defect therein, not shall the _____ nor any of its employees be held as assuming any such liability by reason of the inspection, re-inspection, or other examination authorized.

80-31 Validity. If any section, subsection, sentence, clause, or phrase of Article 80 is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of Article 80.

80-33 Repeal of Conflicting Acts. All Acts or parts of Acts in conflict with the provisions of Article 80 are hereby repealed.

80-35 Effective Date. Article 80 shall take effect_____(_____) days after its passage and publication.

SUBSTANTIATION: This proposed material was developed to provide a standardized set of administrative rules for use with the National Electrical Code® (NEC®). Standardized administrative rules will allow for more consistent adoption, use, and enforcement of the NEC®. Additionally, the proposed requirements develop requirements for establishment of electrical board and qualification requirements for inspection officials. This new article replaces NFPA 70L, Administrative Rules, and consolidates the requirements of NFPA 70L with the NEC®. NFPA 70L was a separate document and has been out of print since 1987. It should be noted that Article 80 would only be part of the NEC® if specifically adopted by the adopting jurisdiction.

The NEC® Task Group on Administrative Rules developed this proposal.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

ARTICLE 90 — INTRODUCTION

(Log #2105)

1- 4 - (90-1(a), FPN (New)): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add a Fine Print Note at the end of Article 90-1(a) as follows:
FPN: For more information on electrical safety, consult NFPA 70E, 1995 edition, Electrical Safety Requirements for Employee Workplaces.
SUBSTANTIATION: This Fine Print Note would aid individuals and companies that use the NEC in finding additional printed information on safety.
PANEL ACTION: Reject.
PANEL STATEMENT: This section explains the purpose of the NEC. Adding a reference to another standard does not help in explaining the purpose of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
PRICHARD: The NEC addresses electrical installations. A FPN referencing NFPA 70E is needed to inform users where to look for electrical safety requirements for employee workplaces.

(Log #2867)

1- 5 - (90-1(c)): Accept
SUBMITTER: J. F. Cox, Wylie, TX
RECOMMENDATION: Delete the wording:
~~(c) Intention. This Code is not intended as a design specification nor an instruction manual for untrained persons.~~
SUBSTANTIATION: Section 90-1(a) describes the purpose of the National Electrical Code. There is no need to identify what it not intended to accomplish. There have been occasions where the wording in Section 90-1(c) has been used to oppose the addition of Code rules because they included requirements involving design criteria even though the objective of those rules was safety. Many rules are included in the Code that are design in nature but still fall within the "practical safeguarding of persons and property from hazards arising from the use of electricity." It is also unnecessary to state that the Code is not intended as "an instruction manual for untrained persons". Section 90-1(c) is not necessary for the proper interpretation and application of the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
DINI: I agree with Mr. Minick's Comment on Negative Vote. No technical substantiation was submitted to remove the wording that clarifies the NEC is not an instructional manual for untrained persons. Many Code-Making Panels depend on this second declaration in 90-1(c) to make it clear that the many technical terms and technical requirements incorporated into the Code's language are not directed at persons not trained in the ability to understand such language and provisions. This proposal should be rejected.
MINICK: This historic Code section declaration provides clarity involving those persons attempting to use the rules of the National Electrical Code and should be retained. The clarity provided for users of the Code in this section far outweigh any negative ramifications involving misdirected opposition to any specific proposal. This clarifying statement can be traced back to the 1937 NEC when the wording stated, "The Code is to be regarded neither as a design specification nor as an instruction manual for untrained persons". Proposal 1-5 is merely an alternative approach concerning a desire by the submitter to mirror a similar ill-advised proposal

from the same base source in the 1999 NEC revision cycle. The present wording provides all Code-Making Panels with a much needed and desired reference in dealing with design proposals to the NEC. There is no technical substantiation to try and foster the concept that design requirements should be generally incorporated into the Code merely because it is stated by some that the Code currently contains many design related requirements. While it continues that there are numerous installations, which may require something, more than the minimum requirements of the NEC, it also continues to be the designer, not the NEC, who must determine if additional provisions are necessary for a safe installation.

Also, no technical substantiation was submitted to remove the wording that clarifies the NEC is not an instruction manual for untrained persons. All NEC Code-Making Panels depend on this second declaration in 90-1(c) to make clear that the many technical terms and technical requirements incorporated into the Code's language are not directed at persons not trained in the ability to understand such language and provisions. If this deletion moves forward, does the electrical industry now believe that anyone with any level of electrical ability should be able to install electrical materials in a safe and workmanlike manner using the NEC? It is hoped that is not the case as the requirements that have been developed over the many years of the NEC editions have clearly depended on skilled installers to properly apply the requirements that have been developed. This proposal should be rejected.

PARKS: I fully agree with Mr. Minick's Comment on Negative Vote.

(Log #1)

1- 6 - (90-1(d) (New)): Accept

NOTE: This Proposal originates from Tentative Interim Amendment 99-1 issued by the Standards Council on January 14, 1999.

SUBMITTER: Paul Duks, Underwriters Laboratories Inc.

RECOMMENDATION: Add a new 90-1(d) and Fine Print Note (FPN) to read as follows:

(d) Relation to International Standards. The requirements in this Code address the fundamental principles of protection for safety contained in International Standard "Electrical Installations of Buildings, IEC 60364-1, Section 131.

FPN: IEC 60364-1, Section 131 contains fundamental principles of protection for safety that encompass: protection against electric shock, protection against thermal effects, protection against overcurrent, protection against fault currents, and protection against overvoltage. All of the above potential hazards are addressed by the requirements in this Code.

SUBSTANTIATION: The National Electrical Code has been adopted and used in a number of countries of the world for some time, Yet suitability of the Code for use internationally is not evident from the document itself. Addition of Section 90-1(d) on relation of the Code to international standards would provide confirmation that the fundamental principles of protection for safety, as published by the International Electrotechnical Commission (IEC), are addressed in the NEC, and therefore, would enhance the adoption of the Code with or without local amendments in countries which do not have established rules for electrical installations.

The potential hazards which the fundamental principles of protection for safety cover are contained in the NEC as follows:

General - Sec. 90-1(a) Purpose; Sec. 110-3 Examination, Identification, Installation, and Use of Equipment.

Protection Against Electric Shock - Sec. 110-17(a) Live Parts Guarded Against Accidental Contact; Sec. 110-34 Workspace and Guarding; Art. 430, Part K Protection of Live Parts (motor installations); Sec. 725-2 Class 2 Circuits.

Protection Against thermal Effects - Sec. 110-18 Arcing Parts; Sec. 410-5 Fixtures Near Combustible Material; Sec. 384-7 Location Relative to Easily Ignitable Material.

Protection Against Overcurrent - Art. 240 Overcurrent protection.

Protection Against Fault Currents - Sec. 250-51 Effect Grounding Path; Art. 240 Overcurrent Protection; Art. 430, Parts D & E Motor Feeder and Branch Circuit Short-Circuit and Ground Fault Protection.

Protection Against Overvoltage -

Fault between circuits: Sec. 300-3(c) Conductors of Different Systems; Sec. 725-54 Installation of Conductors and Equipment (Class 2 Circuits).

Due to atmospheric phenomena or switching: Art. 280 Surge Arresters; Art. 800, Part C Protection (Communications Circuits); Product Standards.

Emergency Nature: It is noted that significant efforts are being made in many areas of the world to promote IEC and ISO (International Organization on Standardization) standards. The NEC is an essential part of the US Safety System, and its future can be enhanced by the Code gaining more international acceptance. It is necessary that the proposed statement be incorporated into the NEC at the earliest possible time to be in synchronism with the present efforts being made by the National Fire Protection Assn. in promotion of NFPA standards internationally. The proposed TIA does not contain any technical changes.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1496)

1- 7 - (90-1(d) (New)): Accept

SUBMITTER: Paul Duks, Buffalo Grove, IL

RECOMMENDATION: Add underlined words:

(d) Relation to International Standards. The requirements in this Code address the fundamental principles of protection for safety contained in International <u>Electrotechnical Commission</u> Standard "Electrical Installations of Buildings," IEC 60364-1, Section 131.

FPN unchanged.

SUBSTANTIATION: The organization responsible for the referenced standard needs to be identified.

PANEL ACTION: Accept.

The Panel modifies the text accepted in proposal 1-6 in accordance with this recommendation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1674)

1- 8 - (90-1(d) (New)): Reject

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Add Section 90-1(d) as follows:

90-1(d) Retroactivity. Unless otherwise noted, provisions of the current edition of this code shall not apply to existing facilities, equipment, structures, or installations that have been previously approved as complying with earlier editions of this code unless the authority having jurisdiction has determined that the existing facilities, equipment, structures, or installations involve a distinct hazard to persons or property. Existing facilities, equipment, structures, or installations shall be those in place prior to the adoption of this edition of the Code by the authority having jurisdiction. This code edition shall apply to additions or modifications to portions of existing facilities, equipment, structures, or installations that are performed subsequent to its adoption by the authority having jurisdiction.

SUBSTANTIATION: The code currently contains no statement regarding its retroactivity, leaving the interpretation of this important matter to users and enforcers of the code. This has led to confusion regarding the application of new requirements, nonuniform enforcement by authorities having jurisdiction, and local unauthorized interpretations regarding retroactivity.

This proposal attempts to provide guidance to both users and enforcers of the code regarding its application in situations where existing facilities, equipment, structures, or installations are being modified, but much of the existing installation remains untouched. It also provides the authority having jurisdiction the opportunity, where safety is a concern, to require upgrading of the entire installation. Finally, it provides clear direction that the newly added or modified facilities, equipment, structures, or installations must meet the current edition of the code subsequent to its adoption by the authority having jurisdiction.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 90-1(a) identifies the purpose of the code as the practical safeguarding of persons and properties arising from the use of electricity and Section 90-4 states that it is intended to be suitable for mandatory application. Adopting jurisdictions should be the ones that make the determination as to the retroactivity of code rules. The NEC can not usurp the authority of the local jurisdiction in adopting ordinances.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
ANTHONY: This is a good proposal and strikes resonance with design professionals who often face tough choices when building new systems upon old, operationally inadequate, and unsafe systems. I will only add that the Panel Statement on this proposal might have referred the submitter to Article 80 included in Proposal 1-3 (Log #1768). Section 80-9 of that article contains some language on the subject of how the Authority Having Jurisdiction should handle hazards in existing installations.
PARKS: The panel statement failed to deal with the submitter's real problem that local inspectors are usurping their own jurisdiction's authority by requiring retrofit of existing electrical installations. This appears to be the reason that the new Article 80 includes a nonretroactivity clause which will clarify the Authority Having Jurisdiction's intent to its inspectors. While the panel is correct that the NEC cannot usurp the authority of local jurisdictions, it could clarify the NEC intent, which obviously is not to make new code provisions retroactive.

(Log #51)

1- 9 - (90-2): Accept in Principle
NOTE: The following proposal consists of Comment 1-18 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-13 was:
Add:
(6) Installations of conductors and equipment for lighting, installed by the electric utility for use by others in or on public or private buildings or other structures; along public highways, streets, roads, etc.; or outdoors on private property.
SUBMITTER: Albert L. Washington, H.B Frazer
RECOMMENDATION: The Panel should accept this proposal as revised:
(6) The installation of equipment and conductors by utilities on public or private buildings, including outdoors.
SUBSTANTIATION: Electrical installations by electric utilities on private property must fall under the rule of the NEC. This must be enforced to maintain "The safeguarding of persons and property." Anytime electrical installation is done in the private market, it must be done in accordance with NFPA 70.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not necessarily agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #52)

1- 10 - (90-2): Accept in Principle
NOTE: The following proposal consists of Comment 1-18a on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: CMP 1
RECOMMENDATION: The panel chooses to make the following changes to Section 90-2 of the 1996 NEC:
Revise the wording in existing Section 90-2(a)(1) to read as follows:
(1) Installations of electric conductors and equipment within or on public and private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings; and other premises such as yards, carnivals, commercial and private parking, and other lots, and industrial substations."
Revise existing Section 90-2(b)(5) to read as follows:
(5) Installations, including associated lighting, under the exclusive control and use of electric utilities, for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electric energy. Such installations shall be located in buildings used exclusively for such purposes; outdoors on property owned or leased by the utility, on or along public highways, streets, roadways, etc.; or outdoors on private property by easements or other established rights."
Add a new Item (6) to Section 90-2(b) to read as follows:
(6) Installations under the exclusive control of electric utilities for lighting along public highways, streets, roadways, etc."
SUBSTANTIATION: To clarify the intent of the applicability of the Code and to meet the intent of numerous public comments dealing with this issue.
PANEL ACTION: Accept in Principle.
1.) Revise 90-2(a) to read as follows:
90-2(a) Covered. This Code covers the installation of electric conductors, electric equipment, signaling and communications conductors and equipment, and fiber optic cables and raceways for the following:
1. Public and private premises including buildings, structures, mobile homes, recreational vehicles, and floating buildings.
2. Yards, lots, parking lots, carnivals, and industrial substations.
3. Installations of conductors and equipment that connect to the supply of electricity.
4. Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center.
The existing FPN to remain as is.
2.) Revise 90-2(b)(5) to read as follows:
90-2(b)(5) Installations under the exclusive control of an electric utility where such installations consist of wiring for service drops or laterals or are located in legally established easements, right-of-ways, or on property owned or leased by the electric utility for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electric energy.
PANEL STATEMENT: 1.) This proposal is the result of the Technical Correlating Committee reporting as "hold" proposal number 1-13 and comment number 1-18a from the 1999 NEC cycle.
2.) Section 90-2(a) is editorially revised to add clarity by grouping similar types of installations together.
3.) The revised wording of Section 90-2(b)(5) is an effort to simplify the provisions regarding the types of installations not covered by the NEC and to retain the original meaning. Section 90-2 has addressed the issues that have caused much disagreement over the past several years. Section 90-2(a) has clearly included wiring in parking lots for decades. Older versions of the Code simply refer to those areas not covered as installations or equipment employed by a electric utility "in the exercise of its function as a utility..."
When the wording was revised to specifically identify the types of installations as being for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electric energy, it reflected the types of installations considered necessary for a electric utility to exercise its function as a utility. This type of coverage identifies aspects of utility functions from the generation of power to the delivery to the customer. Only those types of installations are not covered by the Code. End-use installations, such as building wiring, area lighting, parking lot lighting, irrigation pumps, etc., are covered by the NEC and are not excluded by this Section.
Equipment mounted on or included as part of the types of installations listed in this Section are not covered by the NEC. This includes lighting equipment installed on utility installations, such as poles supporting transmission or distribution lines.
It is recognized that some Public Service Commissions, Utility Commissions, or other state and local jurisdictions may adopt rules or standards covering electric utilities regarding street lighting, area lighting, or other types of installations that differ from those contained in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: The Panel Statement refers to older versions of the code in which installations of equipment employed by an electric utility "in the exercise of its function as a utility": were referred to as not covered. Street and area lighting installations are considered by most utility regulatory bodies as utility functions under their jurisdiction. This remains as true today as it has for the last century. When many utilities first started out, their "only" business was street and area lighting. Most utilities have been in the outdoor lighting business longer than any of the contractors working in their service areas. To say that outdoor area lighting installations are not recognized as an "exercise of its function as a utility" may make sense to anyone who doesn't want utilities to be in the business, but it certainly doesn't make sense to those of us who work for utilities and have been installing outdoor area lights for our entire working careers. There is absolutely no historical basis for mistakenly assuming that "installing outdoor area lighting" is not a recognized

utility function! It was 100 years ago, it is now, and it probably will still be 100 years from now. We recognize it, our utility regulatory commissions recognize it, and our customers recognize it. The only ones who don't recognize this as a legitimate utility business function are those who would gain financially if we were forced out of the business. With the acceptance of this proposed text, jurisdictions adopting the NEC will be in conflict with the jurisdictions regulating utilities under the NESC. This conflict will have to be resolved in each and every jurisdiction adopting the 2002 NEC. This does not facilitate the objective of developing a code that is uniformly and readily adoptable by the jurisdictions without change.

I believe that the objective of clarifying the scope of the NEC and facilitating its uniform and ready adoption without change is best met by accepting the concepts presented in Proposal 1-11 (Log #4151). That proposal establishes the "service point" as the demarcation between "premises wiring" covered by the NEC, and supply system wiring covered by the NESC. The terms "Service Point" and "Premises Wiring System" are clearly defined in the NEC and are readily identifiable on any premises. Although the Service Point may be in a different location on different installations, it is still a very clearly identified and defined point of location on every premises. In my opinion, using the NEC approved and accepted definition of the service point is the only way to reconcile the differences between the scopes of the NEC and the NESC. See my comment on vote on Proposal 1-11 (Log #4151).

The Panel should also reconsider their action in revising the text of 90-2(b)(5) for unintended consequences. As revised, the NEC would cover utility revenue metering unless it is on utility owned or leased property or in legally established easements or rights-of-way. The NEC has never covered utility metering, under their exclusive control regardless of its location. This can be corrected by revising the proposed text as follows:

90-2(b)(5) Installations under exclusive control of an electric utility where such installations consist of wiring for service drops, laterals or metering ~~laterals~~ or are located in legally established easements, right-of-ways, or on property owned or leased by the electric utility for the purpose of communications, ~~metering,~~ generation control transformation, transmission, or distribution of electric energy.

COMMENT ON AFFIRMATIVE:

COX: I support the Panel Action to accept this proposal but recommend consideration of alternative wording that may more clearly identify what is intended by the terms "easements" and "right-of-ways". It seems clear that the majority of CMP-1 members understand these designated areas as being those either established by governmental agencies, such as Public Service Commissions, or recognized by those agencies and are not just contractual agreements between an electric utility and a property owner to install electrical wiring on the customer's property. It is recommended that the wording in 90-2(b)(5) be revised by adding the words shown by the underline and deleting the characters identified by ~~strikeout~~.

"90-2(b)(5) Installations under the exclusive control of an electric utility where such installations consist of wiring for service drops or laterals or are located in legally established easements, or right-of-ways either designated by or recognized by Public Service Commissions, Utility Commissions or other regulatory agency having jurisdiction for such installations; or on property owned or leased by the electric utility, for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electric energy."

(Log #4151)

1- 11 - (90-2): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

(a) Covered. This Code covers the following.

(1) Installations of premises wiring systems including electric conductors and equipment within or on public and private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings; and other premises such as yards, carnival, parking, and other lots, and industrial substations.

~~FPN: For additional information concerning such installations in an industrial or multibuilding complex, see the National Electrical Safety Code, ANSI C2 1997.~~

~~(2) Installations of conductors and equipment that connect to the supply of electricity.~~

~~(3)~~ (2) Installations of other outside conductors and equipment ~~on the premises~~ that are a part of the premises wiring system.

(3) Installation of electrical power sources not under the exclusive control of electric utilities.

(4) Installations of optical fiber cables and raceways.

(5) Installations in buildings used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center.

(6) Installations of electric utilities on the load side of the service point of a premises wiring system other than those under their exclusive control and for their exclusive use for the purposes of metering, control, and communications.

(7) Installations of electric utilities on the supply side of the service points of premises wiring systems that are not under their exclusive control.

(b) Not Covered. This Code does not cover the following.

(1) Installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles.

FPN: While the scope of this Code indicates that the Code does not cover installations in ships, portions of this Code are incorporated by reference into Title 46, Code of Federal Regulations, Parts 110-113.

(2) Installations underground in mines and self-propelled mobile surface mining machinery and its attendant electrical trailing cable.

(3) Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communications purposes.

(4) Installations of communications equipment under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations.

~~(5) Installations, including associated lighting, under the exclusive control of electric utilities for the purpose of communications, metering, generation, control, transformation, transmission, or distribution of electric energy. Such installations shall be located in buildings used exclusively by utilities for such purposes; outdoors on property owned or leased by the utility; on or along public highways, streets, roads, etc.; or outdoors on private property by established rights such as easements.~~

(5) Installations on the supply side of the service point, and exclusively operated, maintained, and controlled on a continuing basis by electric utilities, or by entities recognized by the jurisdiction as having substantially equivalent organizational permanence, engineering supervision, and workforce training.

FPN: For additional information concerning such installations in an industrial or multibuilding complex, see the National Electrical Safety Code, ANSI C2-1997.

(c) Special Permission. The authority having jurisdiction for enforcing this Code may grant exception for the installation of conductors and equipment that are not under the exclusive control of the electric utilities and are used to connect the electric utility supply system to the service-entrance conductors of the premises served, provided such installations are outside a building or terminate immediately inside a building wall.

SUBSTANTIATION: This proposal is based in part on the work of a TCC authorized task group that met in June, 1999, but which failed to sustain consensus on the letter ballot and through the TCC afterwards. It is substantially altered, however, based on my comment on vote within the task group. The proposal (equivalent to the task group in this respect) relocates existing Section 90-2(b)(5) into Section 90-2(a) as shown by recasting the language affirmatively, in terms of what the Code does cover. The most important difference from the task group recommendation, however, is that this proposal recommends a new Section 90-2(b)(5).

This single paragraph holds the key to finally end approximately seventy years of conflict and overlapping jurisdictional boundaries between the NESC and the NEC. Unless we focus on these concepts we miss the premises that underlie the NESC. If we look at NESC requirements outside this context, we inevitably see a free lunch for utilities and an unacceptable diminution of safety. Such a view is unfair, and intellectually dishonest. The NESC trades off reductions in installation requirements for increases in supervision by virtue of its intended audience.

Criticizing the lack of separate equipment grounding (per NESC) out of this context, for example, has as much consistency as criticizing a major industrial occupancy for running a medium-voltage transformer with 250% secondary protection. Now, the industrial occupancy traded off a reduction in secondary protection for enhanced supervision. Is it unsafe? If improperly supervised for the foreseeable future, yes. If properly supervised as contemplated in Table 450-3(a), no. Therefore, is it less safe than the normal 125%? Here's the real point: It's only less safe if you ignore the

operational context. That sort of tradeoff occurs all over the NEC. By now we're used to it.

Is a street light grounded to the grounded conductor unsafe? If it isn't exclusively under the control of utility (or equivalent) personnel for the foreseeable future, yes. If properly operated and controlled as contemplated in the NESC, no. There won't be any peace between the two codes until we look at their differences in this context. This proposal clearly establishes that context through this paragraph. What follows is a more detailed analysis of its provisions. The key is exempting certain highly qualified entities from NEC provisions upon a showing that they possess equivalence to traditional utility operational performance.

They would need to show equivalence in engineering supervision. This would presumably involve a track record of qualified engineering supervision of this work, by people who are accountable to state licensing authorities for their work in the electrical discipline.

They would need to show equivalence in workforce training. This would presumably involve similar training as that provided for utility line crews operating with equivalent voltages and other conditions. This would involve training significantly over and beyond the fact of electrical trade licensure in my jurisdiction. Too often we think of a license as demonstrative of qualification. This work involves a different code than the one under which trade electricians receive licensure. Under no trade licensure program I am aware of, in this country or elsewhere, do licensing authorities judge workforce qualifications under the NESC. Remember, the NESC isn't just an installation standard. It's also a maintenance and workplace safety standard.

They would need to demonstrate organizational permanence. There must be evidence that the entity assuming this responsibility will, in fact, carry out its responsibilities under the premise that there be continuing control, maintenance, and supervision. The word "continuing" is without limit as to time, and therefore means the foreseeable future.

With respect to procedure, the phrasing "recognized by the jurisdiction" is different from the usual reference to an AHJ. This is intentional. No inspector should be engaged in or asked to take responsibility for determinations of organizational permanence, for example. That should involve some formal process established under the prevailing laws and regulations, and presumably allowing for public comment.

A companion proposal redefines service point accordingly. ("The point of connection between the premises wiring and the facilities of the serving utility, or the facilities of a serving entity recognized by the jurisdiction as having substantially equivalent organizational permanence, engineering supervision, and workforce training.") This allows the reapplication of Article 230 to the interior of these industrial facilities (another correlating proposal deletes the phrase "of utility conductors" from the premises wiring definition).

The result would be a Code that tells it as it is. There are large industrial campuses using the NESC for major elements of their outdoor distribution systems. The NEC would otherwise claim these under Article 225. I am a well-bruised but still standing veteran of the battle to include manholes in the NEC, and that effort only succeeded after my panel allowed the DuPonts of the world to continue using the NESC for their outdoor distributions. I frequently represent electrical viewpoints to legislative leaders and committees. Anyone who thinks they're going to fiddle with Section 90-2 and end up forcing these major employers to revamp their campuses so as to become the sole province of conventional electrical trade licensure needs to meet some of the people I deal with in this process.

To accept this proposal would demonstrate to political authorities a level of sophistication and maturity unusual in a self-regulated industry. It is squarely rooted in safety and not market share. It removes from our table all competitive issues, because the NEC only gets mud on its face when it tries to influence them. There's no question that some utilities have abused their rate base revenue to compete with electrical contractors. However, in terms of electrical distribution, their activities constitute a natural monopoly, and natural monopolies are always subject to state regulation. That's where those battles must be fought.

In fact, in my state we are seeing the reverse problem, namely, utility attempts to relocate service points in such a manner as to make NESC installations become premises wiring with no assurances of adequate and continuing controls. We are now in the midst of a major regulatory initiative to restrict such activities. We want to retain utility control over this work until and unless it has been reworked to the NEC, and the language in this proposal would strengthen those attempts.

I have not included in this proposal another task group initiative, that of allowing other entities NESC privileges, in effect, for providing parking lot lighting. The reason is that I doubt its practicality; I question whether any contractor would be really able to demonstrate the ability to meet equivalent expectations in terms, for example, of organizational permanence. However, it isn't impossible and the panel may want to think more carefully about this point. What follows is the way I would submit an expanded Section 90-2(c) to address the point. It differs from the task group recommendation in terms of formatting and the use of the term "area" instead of "parking lot," to describe lighting. Most importantly, it incorporates my language defining the essential characteristics of an entity truly qualified to operate on the utility playing field:

(c) Special Permission. The authority having jurisdiction for enforcing this Code may grant exception for the installation of conductors and equipment that are not under the exclusive control of the electric utilities and are used <u>for one of the following purposes:</u>

<u>(1) To connect the electric utility supply system to the service-entrance conductors of the premises served, provided such installations are outside a building or terminate immediately inside a building wall.</u>

<u>(2) To provide area lighting provided such installations are outside and not attached to a building and are exclusively operated, maintained, and controlled by entities recognized by the jurisdiction as having substantially equivalent organizational permanence, engineering supervision, and workforce training to that of electric utilities operating within the same jurisdiction.</u>

I commend this proposal to CMP 1 and also to the TCC to the extent it follows up on the task group suggestions regarding continued efforts to harmonize the NEC and the NESC.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not necessarily agree with the submitter's substantiation. The panel does not agree that the use of the term "service point" will adequately clarify this issue for most users of the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 1 Macias

EXPLANATION OF NEGATIVE:

TROGLIA: In effect, the Panel rejected this proposal. I believe it should be accepted. I agree fully with the proposal and I disagree with the Panel's contention that the use of the term "service point" will not adequately clarify the scope issue. The term is clearly defined in the Code and is readily identifiable on any premises. This proposal reconciles the scopes of the NEC and the NESC and enables their uniform adoption and enforcement without change. It resolves the problems with Proposal 1-10 (Log #52) that are identified in my comment on vote on that proposal.

(Log #53)

1- 12 - (90-2(a), (b)): Accept in Principle

NOTE: The following proposal consists of Comment 1-19 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].

SUBMITTER: Jan Bardin, Florida East Coast Electrical JATC

RECOMMENDATION: Please reconsider and accept this proposal.

SUBSTANTIATION: Allowing utility companies to perform stated work without complying with the NEC, would jeopardize the safety of the public and others and violate the intent of "safeguarding of persons and property from hazards arising from the use of electricity."

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 1 Macias

EXPLANATION OF NEGATIVE:

TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and its substantiation. I disagree that

Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #2923)

1- 13 - (90-2(a)(6) (New)): Accept in Principle
SUBMITTER: Frank Pologruto, Rep. IBEW L.U. 98
RECOMMENDATION: Add a paragraph to 90-2(a) to read:
(6) Installations of conductors for lighting and power on private property by a utility company.
SUBSTANTIATION: Since the deregulation of the utility companies, they have been doing electrical installations on private property using their National Electrical Safety Code, (NESC), which is no comparison to the National Electrical Code.
If electrical contractors have to install electrical conductors and equipment according to the National Electrical Code, why should the utility company doing work on private property get away with installing the job according to their NESC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The substantiation does not appear to support the recommendation. The panel does not agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: I disagree with the proposal and its intent. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #2161)

1- 14 - (90-2(a)(1)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Installation of electric conductors and equipment, within or on public and private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings; and other premises such as yards, carnivals, parking, and other lots~~,~~; and industrial substations.
[replace comma with semicolon after lots]
SUBSTANTIATION: This is an editorial change.
It is current editorial practice to use a semicolon to separate a series of items which themselves contain commas.
One semicolon was used, I believe it was an oversight not to use the other required semicolon.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4005)

1- 15 - (90-2(a)(1)): Reject
SUBMITTER: Lawrence J. Bradley, NECA Penn-Del-Jersey
RECOMMENDATION: Add two new sentences:
90-2. Scope.
(a) Covered. This Code covers the following:
1. Installations of electric conductors and equipment within or on public and private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings; and other premises such as yards, carnival, parking, and other lots, and industrial substations. <u>This shall include all electric conductors and equipment which is owned or leased and maintained by any entity. This shall not apply to residential installations of not more than two dusk to dawn type lights installed on a pole which also supports utility conductors.</u>
SUBSTANTIATION: The problem and reason for this proposal is one that the members of CMP-1 are very familiar with and can be summarized as follows:
The NEC is the most widely recognized and used standard for electrical installations in the United States. The NEC governs all parts of the electrical installation from the service point to the last outlet in any occupancy. Electrical Contractors must follow the rules of the NEC in all installations.
The problem begins with entities (utilities) who claim they are not required to follow the more stringent rules of the NEC. This creates serious problems for all electrical installations.
Good code is easy to read, practical and enforceable.
Is 90-2 easy to read? It would seem to until we attempt to apply it!
Is 90-2 practical? Requiring Electrical Contractors to follow this Code and at the same time, on the same installation allowing utilities to ignore the safety driven requirements of this Code is by no stretch of anyone's imagination practical.
Is 90-2 enforceable? Absolutely not!! The Inspector cannot force the utility to comply with the rules of the NEC when they are on private property installing electric conductors and equipment for private utilization because they claim exemption from a safety driven code due to the fact that an owner chose to lease the conductors or equipment rather than to own them.
The problem has been intensified by the lack of the NEC to clear up 90-2. CMP-1 made an attempt to clear this up only to have the Correlating Committee step in and hold all actions.
The problem here is a simple one. Utility companies want to be excluded from the requirements of the NEC. Utility companies do not use the NEC, they use the NESC.
The primary concern Code Making Panel members on CMP-1 on this issue is to make sure that they can continue to be exempt from the Code.
Mr. Troglia clearly states in his explanation of his negative vote to Comment 1-18a in the last cycle that utilities intend to ignore the safety driven requirements of the National Electrical Code when equipment or conductors are leased. Mr. Troglia does not attempt to place language into the NEC to allow anyone (other than utilities) to be exempt from the requirements of the NEC when leasing electric conductors or equipment.
When will the NEC take a stand on this issue? Should we wait until utilities begin to lease entire distribution systems in large commercial and industrial applications? Or should we wait for contractors to get in the business of leasing electric conductors and equipment and claim the same sanctuary which is now owned by the utilities, we don't need to follow the rules of the NEC this installation is leased!
We are the users of this Code. We do not wish to have the NEC in any way, shape or form even attempt to dictate, who can or cannot do an installation. We want the NEC to apply to all installations without regard to whether the conductors or equipment are owned or leased.
CMP-1 is faced this cycle with a difficult task on this issue. The Panel can take steps to include all conductors and equipment whether owned or leased. This will set the record straight and require all installations be installed in conformance with the NEC.
The Panel may choose to ignore this and other proposals which will continue to allow exceptions from this Code to specific entities and not others doing the same type of installations. To take this road will be a dangerous one for the future of the NEC. Installations which are leased have the same potential to cause damage to property and injury or perhaps death to persons.
We are the users of this code. Why does the NEC continue to be heavily influenced by those who do not use this Code?
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is unclear as to the submitter's definition of the word "entity". In addition, the submitter has not provided technical substantiation to justify the restriction on the number of lighting fixtures permitted on a pole.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #54)

1- 16 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-32 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Robert H. Keis, Dover, DE
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: Regardless of what the panel feels the present wording says, there is much confusion and misunderstanding in interpretation of this section. This proposal will help to clarify

intent. If the wording "along public highways, streets, roads, etc., is a problem, I think most states and cities probably have laws which exempt these areas from code compliance anyway, or delete those words from the new rule. We do need some help on this.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and its substantiation. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #55)

1- 17 - (90-2(a)(6) (New)): Reject
NOTE: The following proposal consists of Comment 1-33 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Henry J. Comperchio, Randolph, MA
RECOMMENDATION: In support of the proposal. Utility companies should stay within the scope of their own boundaries.
SUBSTANTIATION: Lighting, whether on a building or a pole, on private property should be done by a qualified licensed person who upholds the NEC for safety to persons and property.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #56)

1- 18 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-34 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: John P. Widener, Jr.
RECOMMENDATION: The additional language suggested in this proposal is needed in the NEC.
SUBSTANTIATION: The present installation methods followed by a lot of utilities do not provide the safety requirements needed to protect the public.
Please reconsider the negative comments given by CMP members.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: See my Expanation of Negative Vote on Proposal 1-12 (Log #53).

(Log #57)

1- 19 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-35 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: David E. Shapiro, Rep. Safety First Electrical Contracting
RECOMMENDATION: Change wording: "(6) Installations of conductors and equipment for lighting, installed by the electric utility for use by others in or on public or private buildings or other structures; along public highways, streets, roads, etc.; or outdoors on private property." Proposing revised text:
"(6) Conductors and equipment for lighting, installed by the electric utility for use by others.
(7) Installations of conductors and equipment for lighting, in or on private buildings or other structures or on private property."
SUBSTANTIATION: As the negative CMP member comments indicate, unnecessary confusion and disputation remain with the present text. There is a place for utility-installed and -maintained lighting, outside the jurisdiction of the NEC. The NEC must, however, be enforced where nonutility personnel are likely to deal with the systems. The two situations where that is likely to be are where the systems are explicitly installed for use by others, and where the utility intends to control the systems, but where, because of location on others' premises, it is likely that others will nonetheless be involved. Because those are disparate reasons, separate paragraphs seem appropriate.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-35 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #58)

1- 20 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-37 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Thomas Gatins, Malone Electric/Rep. IBEW Local 728
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-37 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #59)

1- 21 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-38 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Robert Klee, Malone Electric/Rep. IBEW Local 728
RECOMMENDATION: I ask the Panel to reconsider and accept this revised proposal:
(6) Installations of conductors and equipment installed by electric utility companies for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The NEC is supposed to provide for "The practical safeguarding of persons and property from hazards arising from the use of electricity" and allowing utilities to be exempt from the Code endangers everyone's safety.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-38 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #60)

1- 22 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-39 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Brian K. Dinkel, Lightning Electric Co. Inc.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide utilization. This must include all public places where general lighting is installed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-39 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #61)

1- 23 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-40 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Tim Sikovski, Malone Electric
RECOMMENDATION: The Panel should reconsider this proposal.
SUBSTANTIATION: Utility companies should not be exempt from provisions of the NEC, like public places where general lighting is installed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not necessarily agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and its substantiation. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #62)

1- 24 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-42 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Rusty Maddox, Olson Electric Co./Rep. IBEW Local 323
RECOMMENDATION: The Panel should reconsider and except the proposal as revised:
(6) Installation of conductors and equipment installed by electric utilities for use by others on or in public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations by utilities must not be granted exception from provisions of the NEC where provided for private utilization.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-42 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #63)

1- 25 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-43 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Larry Chesnut, Rep. IBEW Local 648
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.

SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization. This must include all public places where general lighting is installed. Section 90-2(b)(5) is presently being applied to allow utilities to leave their domain with no requirements for safety by utilities.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-43 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #64)

1- 26 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-44 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Ron W. Landis, Malone Electric/Rep. JATC/IBEW
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization. This must include all public places where general lighting is installed. Section 90-2(b)(5) is presently being applied to allow utilities to leave their domain of generation, transformation, etc. and enter private market with no requirement to provide safe installations in accordance with NFPA 70.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-44 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #65)

1- 27 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-45 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Daniel Nichols, Energy Efficient Elec./Rep. IBEW Local 728
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: Installations performed by utilities must not be granted exemption from the provisions of the NEC where provided for private utilization. This must include all public places where general lighting is installed. Section 90-2(b)(5) is presently being applied to allow utilities to leave their domain of generation and enter the private market.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-45 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #66)

1- 28 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-46 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: James Quinn, Quinn Electric/Rep. IBEW
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: Section 90-2(b)(5) is presently being applied to allow utilities to leave their domain of generation, transformation, etc. and enter the private market with no requirement to provide safe installations in accordance with NFPA 70.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-46 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #67)

1- 29 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-47 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Abel Reyna, Edwards Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installation of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization. This must include all public places where general lighting is installed. Section 90-2(b)(5) allows

utilities to make installations with no requirements for safe installations.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-47 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #68)

1- 30 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-48 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Peter C. Allen, Rep. IBEW Local 728
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-48 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #69)

1- 31 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-49 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Tracy Henderson, Malone Electric Inc.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is the safeguarding of persons and property from hazards that occur from the use of electricity. Installations performed by the utilities must not be granted exemption from the NEC. This must include all public places where general lighting is installed. PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-49 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #70)

1- 32 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-50 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Bob Dummett, Florida East Coast Electrical JATC
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization. This must include all public places where general lighting is installed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-50 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #71)

1- 33 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-51 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: David A. Williams, Delta Twp Lansing, MI
RECOMMENDATION: Add text to read as follows:
(6) Installations of conductors and equipment for lighting by electric utility companies for parking lot and underground street lighting.
SUBSTANTIATION: The deregulation of the utility companies will create additional problems with them doing electrical work and not performing the work to the code. CMP 1 has made it clear that parking lot lighting is covered by the NEC. Due to previous wording of the NEC this message is not being enforced. The area I inspect had an attorney interpret 90-2 to say that the utility companies are exempt from parking lot and street lighting. If the views of the code making panel are not written clearly you might as well not bother. I have seen numerous installations by utility companies for parking lot lighting and underground street lighting that are a death trap waiting to happen. I hope the code panel will consider making corrections to the wording of these sections before we start counting bodies.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-51 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #72)

1- 34 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-52 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Michael O'Connell, Mass Electric Construction Co.
RECOMMENDATION: Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings.
SUBSTANTIATION: The utility companies are not subject to the application of the NEC. The NEC was created to safeguard persons/property. By granting the utility companies the ability to work on the load side of the distribution grid the purpose for creating the NEC will be corrupted.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-52 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #73)

1- 35 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-58 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Carl Lewis, Mass Electric Construction Co.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(c) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outside private property.
SUBSTANTIATION: Is the practical safeguarding of persons and property from hazards present from the use of electricity? Utilities should be recorded to follow NEC when they provide for private use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-58 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #74)

1- 36 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-62 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Francisco Nicoes, Joy Electric
RECOMMENDATION: The Panel should reconsider accept this proposal as revised. Installation of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoor on private property.
SUBSTANTIATION: The purpose of the NEC "the practical safeguarding of person and property from hazard arising from the use of electricity".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-62 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #75)

1- 37 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-68 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: James A. Weldon, Rep. IBEW Local 728
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The utilities are in direct competition with electrical contractors and they jump at every opportunity to get around NEC and local permitting and inspection requirements. Substantiation can be found for utility abuses in Florida. Thousands of load management systems sold by utility companies are installed by sub-subcontractors, often so called, "self employed' who make installations on a piece-work basis who are frequently unlicensed/unqualified installers. This became rampant when the utilities were successful in exempting these load management systems from permitting and inspections by legislative action.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The submitter's substantiation appears to be more related to the local rules and regulations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-68 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #76)

1- 38 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-69 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: John L. Somers, Rep. IBEW Local 728
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: This new article will permit items that I consider to be unsafe in the following areas:
A. (Article 250-84) Ignores the resistance requirements.
B. Will permit the multiple grounding of grounded conductors.
C. (Article 250-83(c)) This change would allow a reduction in the electrode size.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. This substantiation does not support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-69 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #77)

1- 39 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-72 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: James T. Dollard, Jr., Local Union #98 IBEW
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "the practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization. This must include all public places where general lighting is installed. Section 90-2(b)(5) is presently being applied to allow utilities to leave their domain of generation, transformation, etc., and enter the private market with no requirement to provide safe installations in accordance with NFPA 70.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-72 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #78)

1- 40 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-73 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: John Rico, J&M Brown Elec. Co.
RECOMMENDATION: The Panel should reconsider and accept as revised. Six (6) installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The NEC is the safeguard of persons and property from hazards from the use of electricity. Installations performed by utilities must not be granted exemptions from the provisions of the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-73 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #79)

1- 41 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-74 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Mike J. Cheney, R.W. Reid Elec.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised. Installation of conductors and equipment installed by the electric utility for use by others in or on public or private building or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities must not be granted exemption from the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-74 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #80)

1- 42 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-75 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Robert A. Ingalls, Beacon Electric Inc.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised: (6) installation of conductors and equipment installed by utility companies for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the National Electrical Code is "The practical safeguarding of persons and property from hazards arising from the use of electricity."
PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-75 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #81)

1- 43 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-77 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Brendon J. Lydon, T.J. Cunningham Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised: (6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Utility companies should not be exempt from the provisions of the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-77 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #82)

1- 44 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-79 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Anthony R. Mirra, Mass Electric Const. Co.
RECOMMENDATION: The Panel should reconsider and accept this proposal.
SUBSTANTIATION: Utilities must not be granted exception from the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROPand its substantiation. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #83)

1- 45 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-80 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Keith Foley, John A. Penney Co. Inc.
RECOMMENDATION: The Panel should reconsider and accept this proposal or revise:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "the practical safeguarding of persons and property from hazards arising from the use of electricity." Work performed by utilities must not be granted exemption from the provisions of the Code.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-80 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #84)

1- 46 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-81 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Peter O'Neil, Bennett Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installation of conductors and equipment installed by the electric utility company for use by others in or on public and private buildings, or outdoors on private property.
SUBSTANTIATION: The practical safeguarding of person and property from hazards arising from the use of electricity.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-81 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #85)

1- 47 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-82 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9(Log #51)].
SUBMITTER: Richard Antonellis, Beacon Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised. Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "the practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed must not be granted exempt from the NEC where they provide private utilization.
PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-82 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #86)

1- 48 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-83 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Emilio Salvador, Joy Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised.
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities must not be granted exemption from provisions of the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-83 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #87)

1- 49 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-84 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].

SUBMITTER: James F. Walker, Holder Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised.
6. Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: Installations performed by utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization. This must include all public places where general lighting is installed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-84 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #88)

1- 50 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-85 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Daniel N. Internicola, Mass Bay Electrical Corp.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "The practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by utilities which provide for private utilization must not be exempt from the NEC. This must include general lighting in public places.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-85 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #89)

1- 51 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-86 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Kenneth G. Eaves, Mass Electric const. Co./Rep. Mass Electric const. Co.
RECOMMENDATION: The Panel should reconsider and accept as revised:
(6) Installation of conductors and equipment installed by electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: Installation by utilities should not be granted exemptions from provisions of the NEC where the safeguarding of persons and property are at stake including public places where general lighting is installed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-86 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #90)

1- 52 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-87 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: John O'Leary, E.G. Sawyer Elec.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.

SUBSTANTIATION: The purpose of the NEC is safeguarding of persons and property. Installations by the utilities should be done with the same purpose. Section 90-2(b)(5) of the NEC allows utilities to enter the private market without requirements for safe installations.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-87 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #91)

1- 53 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-89 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9(Log #51)].
SUBMITTER: Patrick O'Brien, JM Electrical
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
Installation of conductors and equipment installed by the electric utility for use by others in or on public or private building or outdoors on private property.
SUBSTANTIATION: Installations performed by the utilities must not be granted exemption from the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-89 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #92)

1- 54 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-90 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Tom Duval, Mass Bay Electrical Corp.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised. Installation of conductors and equipment on public or private buildings or outdoors or private property.
SUBSTANTIATION: The NEC is for the safeguarding of persons and property from the hazards arising from the use of electricity.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-90 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #93)

1- 55 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-91 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Michael D. Riley, Gaston Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric company for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is the practical safeguarding of persons and property. The utility company would not comply.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-91 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #94)

1- 56 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-92 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Steven DiFelice, K&H Electrical Systems Inc.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electrical utility for use by others in or on private or public buildings or outdoors on private property.
SUBSTANTIATION: NEC is a set standard on the proper installation of electrical systems. Set standards are a necessity in this world, without it their will be chaos like a city without police, or a country without government, standards are a “fact and not an opinion”.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-92 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #95)

1- 57 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-93 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Eric J. Wilson, J&M Brown

RECOMMENDATION: The Panel should reconsider and accept this proposal as revised. Installations of conductors and equipment installed by the electric utility for the use by others in or on public or private buildings or outdoors or private property.
SUBSTANTIATION: Section 90-2(b)5 is presently being applied to allow utilities to leave their domain of generation, transformation, etc. and enter the private market with no requirement to provide safe installation in accordance with NFPA 70.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-93 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #96)

1- 58 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-100 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Thomas A. Dzeda, D&H Construction Services, Inc.
RECOMMENDATION: Panel should accept proposal.
SUBSTANTIATION: A substantial quantity of utility employees are not licensed, or tested, in "medium" voltage applications. To allow them to work in a position where they are not inspected or required to pull permits and yet still accessible to the general public and following the direction of a distant utility engineer denies the reasons and safety procedures of the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-100 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #97)

1- 59 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-101 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Greg Hines, Mass Electric
RECOMMENDATION: The Panel should reconsider an accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "the practical safeguarding of persons and property from hazards arising from the use of electricity." Utilities must not be granted exception from the provisions of the NEC where they provide for private utilization.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-101 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #98)

1- 60 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-102 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Mark Madden, Peak Electrical Const.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is "the practical safeguarding of persons and property from hazards arising from the use of electricity." Installations performed by the utilities must not be granted exemption from the provisions of the NEC where they provide for private utilization. This must include all public places where general lighting is installed. Section 90-2(b)(5) is presently being applied to allow utilities to leave their domain of generation, transformer, or etc. and enter the private market with no requirement to provide safe installations in accordance with NFPA 70.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-102 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #99)

1- 61 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-104 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Katie Liljegren, J&M Brown
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: Since the purpose of the NEC is to provide "the practical safeguarding of persons and property from hazards arising from the use of electricity" why exempt utilities from these provisions of the NEC? We can't allow utilities to enter the private market with no safety requirements for safe installations.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities

in accordance with the NESC are unsafe. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-104 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #100)

1- 62 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-105 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Vicki Scena, Norfolk Electric
RECOMMENDATION: The Panel should reconsider and accept this revised proposal:
(6) Installation of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is to protect persons and property from the hazards of electrical work. With no inspection, how can we be sure we are safe?
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-105 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #101)

1- 63 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-106 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Kerri Schneider, Lynnwell Electrical Contracting
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electrical utility for use by others in or on public or private buildings or outdoor on private property.
SUBSTANTIATION: The purpose of the NEC is “the practical safeguarding of persons and property from hazards arising from the use of electricity. Installations, must include public places where general lighting is installed. Section 90-2(b)(5) is allowing utilities to enter private work with no requirements to provide safe installation in accordance with NFPA 70.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-106 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #102)

1- 64 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-108 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Richard Wakem, Rotman Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the utility company for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: Utility companies do not have to abide by any code which is unsafe.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-108 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #103)

1- 65 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-109 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Brian Larsen, J&M Brown Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised.
(6) Installations of conductors and equipment installed by the electric utility company for use by others in or on public or private buildings or outdoors or private property.
SUBSTANTIATION: Installations performed by utilities must not be granted exemption from the NEC where they provide for private utilizations.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-109 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #104)

1- 66 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-124 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Erwin E. Schlipf, III
RECOMMENDATION: The Panel should accept this proposal as revised:
(6) The installation of equipment and conductors by utilities on public or private buildings including outdoors.
SUBSTANTIATION: Electrical installations by electric utilities on private property must fall under the rule of the NEC. This must be enforced to maintain "The safeguarding of persons and property." Anytime electrical installation is done in the private market it must be done in accordance with NFPA 70.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-124 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #105)

1- 67 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-125 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Troy Cassel, J. W. Carrigan
RECOMMENDATION: 90-2(a)(6)(New) Installation of electrical equipment and conductors by the electric utilities outdoors on private property and inside and on public or private buildings.
SUBSTANTIATION: At present, electric utilities do not have to abide by NEC's rules for safeguarding persons and property. This gives them the ability to do electrical installations "on private property by established rights such as easements" according to Section 90-2(b)(5).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-125 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #106)

1- 68 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-126 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Palmer Hickman, IBEW Local 380 JATC
RECOMMENDATION: I am requesting CMP 1 reconsider their vote on Proposal 1-13 and accept the proposed revision as submitted to add the following:
(6) Installations of conductors and equipment for lighting installed by the electric utility for use by others in or on public or private buildings or other structures; along public highways, streets, roads, etc.; or outdoors on private property.
SUBSTANTIATION: I disagree with the Panel Statement in their view that this proposal would create more confusion than it attempts to alleviate. Utility companies are apparently broadening the scope of their work including such areas as parking lot lighting on private property. Section 90-2(b)(5) is very clear that easements are granted for installations under the exclusive control of electric utilities for a specific list which does not include private or public buildings used by others.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-126 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #107)

1- 69 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-128 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Mark Alexander, Medlar Electric
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: In this time of deregulation of utilities, I feel that without Proposal 1-13 the confusion and interpretation of Section 90-2(b)(5) could endanger, not safeguard, persons and property from hazards arising from the use of electricity. The utilities must follow the same guidelines when they enter areas of private property, such as parking lot lighting. Proposal 1-13 does not state that utilities cannot perform these installations, but are not exempt from the NEC provision.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-128 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #108)

1- 70 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-131 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Russell Kull, Schleig Elec. Co.
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: I have worked as an electrician in the Philadelphia area for 15 years and do not think it would be safe or fair for utility companies to be exempt from the NEC or the NFPA.

When working in public places and working to safeguard the persons and property involved, every company should follow the NEC and NFPA.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-131 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #109)

1- 71 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-132 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: James M. Naughton, Boston Globe
RECOMMENDATION: I would like the Panel to reconsider this proposal as reviewed to say: Installation of conductors and equipment for lighting on public or private buildings or other structures; along public highways, streets, roads, etc.; or outdoors on private property shall be installed in accordance with NFPA 70.
SUBSTANTIATION: In the workplace there is still very much confusion with the utility companies performing electrical construction work on public and private properties. The 1996 NEC 90-2(a)(5) does not do enough to clear up this problem.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-132 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #110)

1- 72 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-133 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Christopher Pharo, IBEW Local 98/Rep. IBEW Local 98/Eastern Code Advisory
RECOMMENDATION: This proposal should be accepted.
SUBSTANTIATION: Article 90-2(b)(5) explains when and where utility companies can install Code exempt power circuits for lighting "under the exclusive control of electric utilities...". This proposal states that "This Code covers installations of conductors and equipment for lighting, installed by the electric utility for use by others in or on public or private buildings or other structures; along public highways, streets, roads, etc.; or outdoors on private property". The "by others" referred to is clearly not the electric utility and therefore, the installation must be Code compliant. The submitter makes a difficult concept easy to understand.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-133 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #111)

1- 73 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-135 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: William C. Hubbard, C.R. Dunn Inc./Rep. JATC
RECOMMENDATION: The Panel should reconsider and accept this proposal.
SUBSTANTIATION: It is my opinion that the NEC is for the safeguarding of persons and property from hazards of electricity. If the utility company doesn't have to follow the NEC then many people may be affected.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-135 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #112)

1- 74 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-138 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Philip W. Woodard, Florida East Coast JATC/Rep. IBEW
RECOMMENDATION: Agree with new proposal.
SUBSTANTIATION: This assures that utilities will be held to the basic purpose of the NEC which is "the practical safeguarding of persons and property from hazards arising from the use of electricity".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-138 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #113)

1- 75 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-139 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Richard Shawbell, CR Dunn, Inc./Rep. IBEW
RECOMMENDATION: The Panel should reconsider and accept this proposal as revised:
(6) Installation of conductors and equipment installed by the electrical utility for use by others in or on public or private buildings or property.
SUBSTANTIATION: Those who participate in making the rules should be willing to abide by them.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-139 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #114)

1- 76 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-141 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Pam White, Carpenter Electric/Rep. NJATC
RECOMMENDATION: Revise text:
(6) Installation of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: For the practical safeguarding of persons and property from hazards arising from the use and installation of electricity we must maintain conformity, consistency and absolute compliance with the National Electrical Code.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-141 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #115)

1- 77 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-142 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Orlando Alicea, Malone Electric
RECOMMENDATION: The Panel should reconsider and accept as revised
"Installations of conductors and equipment installed by the electric utility for use by others in or on public or private buildings or outdoors on private property."
SUBSTANTIATION: Installations performed by utilities must not be granted exemption from NEC where they provide for private utilization.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-142 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #116)

1- 78 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-144 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: John A. Badini, Jr.
RECOMMENDATION: Panel should accept and reconsider this proposal to be revised.
Add: Installations of conductors and equipment for lighting installed by the electric utility for use by others in or on public or private buildings or other structures, along public highways, street, roads, etc. or outdoors on private property.
SUBSTANTIATION: The purpose of the NEC is to make it as safe and practical for all persons and properties of hazards that arise in the electrical field. Utilities must not be granted exemption from the provisions of the NEC. This should include all public and private places where lighting is installed. They are allowed to leave their domain and enter private areas with no requirements.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-144 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #117)

1- 79 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-145 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: Timothy M. Hasty, Malone Electric/Rep. IBEW Local 728/NJATC
RECOMMENDATION: Revise text:
(6) Installation of conductors and equipment installed by the electric utility for use by other in or on public or private buildings or outdoors on private property.
SUBSTANTIATION: If utilities are not required to follow the NEC, the safety of the general public and to a greater extent electricians, could be at risk.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-145 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #118)

1- 80 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The following proposal consists of Comment 1-146 on Proposal 1-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 1-9 (Log #51)].
SUBMITTER: John R. Creasman, IBEW Local 728
RECOMMENDATION: The Panel should reconsider their decision and accept the proposal for 1-13.
SUBSTANTIATION: Proposal 1-13 is very important to the purpose of the Code, Article 90-1(a). The purpose of this article is the safeguard of persons and property from hazards arising from the use of electricity. Without this proposal, utilities could be installing work any place they deem an easement or right of way, placing the public in direct contact with installations not covered by the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not agree with the submitter's substantiation. No evidence was submitted that installations performed by utilities in accordance with the NESC are unsafe. The present code covers installations on any part of the premises wiring system regardless of who does the work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This proposal should be rejected. I disagree with Proposal 1-13 in the 1998 ROP and Comment 1-146 in the 1998 ROC and their substantiations. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope, however I agree with the Panel Statement on this proposal. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #604)

1- 81 - (90-2(a)(6) (New)): Accept in Principle
NOTE: The Technical Correlating Committee directs that this Proposal be forwarded to Code Making Panel 16 for information.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a new Section 90-2(a)(6) to read as follows:
"Installations of signaling and communications conductors and equipment within or on public and private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings; and other premises such as yards, carnival, parking, and other lots, and industrial substations."
SUBSTANTIATION: This is to clarify that signaling and communications conductors and equipment are included in the scope of electrical conductors and equipment as stated in Section 90-2(a)(1). Task Group discussions have identified that confusion may exist because there are users of the code who do not identify signaling and communications conductors and equipment as a part of the electrical installation. In addition, the Task Group on Communications Systems recommends that this proposal be forwarded to CMP 16 for information and review.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel action and statement on Proposal 1-10 appears to satisfy the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4009)

1- 82 - (90-2(a)(6) (New)): Accept in Principle
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: This proposal is to add Part (6) after Part (5).
Section 90-2(a)(6) (new) Installations of conductors and equipment for commercial or private parking lot lighting.
SUBSTANTIATION: The NEC recognizes the need for less stringent requirements when it comes to the generation and distribution of electrical power. Making the utilities comply with the NEC would be cost prohibitive for the public. The above proposal attempts to clarify a confusing scope issue. If this lighting is needed by the utilities for their generation and distribution of electrical power then, by all means, this installation should not be covered by the NEC. However, if this lighting is necessary for the public's safety in commercial and private parking lots then this installation should, with no question, fall into the jurisdiction of the NEC.
However, in today's atmosphere of deregulation, the utilities see this ever increasing piece of the marketplace. This does not pose a problem, after all, the consumer will ultimately be rewarded for this capitalistic approach. My only concern is that if the utilities want to step outside of their arena, then they should abide by the NEC like everyone else. Perhaps, Mr. Wissman said it best in his explanation of the negative in the previous ROP- "Those who participate in making the rules should be willing to follow the rules."
By placing this Part (6) in Section (a), there leaves no doubt as to exactly what is under the exclusive control of the utilities for their economical generation and distribution of electrical energy.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 1-10. The panel does not necessarily agree with all of the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: I disagree with this proposal and its intent. I disagree that Proposal 1-10 (Log #52) adequately clarifies the NEC scope. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).

(Log #2041)

1- 83 - (90-2(b)): Reject
SUBMITTER: Edward G. Jacobson, Los Alamos, NM
RECOMMENDATION: Add after (5):
"(6) Equipment and installations of equipment used exclusively for scientific research activities and for which conditions of use and supervision ensure that only qualified persons operate, maintain, and modify."
SUBSTANTIATION: It is possible to attempt to apply the Code to equipment and systems of equipment, wiring, and protective devices that the Code is not intended to cover. A simple example was an attempt to apply Article 427 to an installation of heaters on vacuum piping to which access was restricted by three features, there was no explosion hazard, the potential shock hazard was completely mitigated, and any potential fire would have been completely contained. Something more complex is the assembly of mostly unlisted components used to generate 750 kVDC. An elaborate arrangement of mechanical locks, electrical interlocks, Faraday cage, and wire-screen barriers ensures only qualified persons have access. It has been operated, maintained, and modified without incident for over 25 years. One might think it should be obvious to Authorities Having Jurisdiction that the Code does not apply to this installation just as it does not apply to "communications equipment under the exclusive control of communications utilities" 90-2(b)(4) and to non-office and non-shop areas of electric utilities 90-2(b)(5). The analogies are often not obvious: hence, the need for specific mention in the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: Where such exemptions from the requirements of the National Electrical Code are necessary for research activities, they would best be handled by local authorities and on a specific site basis based on the needs and abilities of the affected parties. The exemption requested by this proposal is too broad in scope and could lead to misinterpretation concerning commonly installed electrical equipment. Also, see the present NEC provisions in Section 305-3(c) for temporary installations for tests, experiments, and development work.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
ANTHONY: This situation occurs in many of our nation's universities where a great deal of scientific research occurs in environments which are also classified as places of assembly. Many highly-educated scientific and engineering professionals believe themselves qualified to work on power delivery circuits without specific training. It is best to have the Authority Having Jurisdiction present in such situations to confirm "the abilities of the affected parties" so that they do not put their own lives, or the lives of others at risk.

(Log #3901)

1- 84 - (90-2(b)(5)): Reject
SUBMITTER: Alfred A. Fiorello, Fiorello Electric Inc.
RECOMMENDATION: Last part of last sentence omit "~~or outdoors on private property by established rights such as easements.~~"
SUBSTANTIATION: Many installations of 10 ft parking lot lighting poles with no overcurrent protection and power not marked or identified as being from the utility.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not identify a specific problem that will be solved by deleting the words identified in the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #119)

1- 85 - (90-2(b)(6)): Accept in Principle
NOTE: The following proposal consists of Comment 1-152 on Proposal 1-17 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-17 was:
Add new 90-2(b)(6) to read as follows:
(6) Installations of highway, street and area lighting and traffic signals including associated wiring, under the exclusive control of electric utilities or entity authorized by local government.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: The proposal should be accepted in principle. Instead of the recommended action, however, revise Section 90-2(b)(5) to read as follows:
(5) Installations, including ~~associated lighting~~ utilization equipment, on the line side of the service point and under the exclusive control of electric utilities for the purpose of communications, metering, generation, control, transformation, transmission, ~~or~~ distribution, or utilization of electric energy. Such installations shall be located in buildings used exclusively by utilities for such purposes; outdoors on property owned or leased by the utility; on or along public highways, streets, roads, etc.; or outdoors on private property by established rights such as easements.
SUBSTANTIATION: The submitter is indeed on to a problem in the 1996 NEC: What exactly does the term "associated lighting" really mean? In analyzing that change I drew a commercial parking lot with outdoor lights fed from an overhead distribution line running along a public street. Everyone agreed that the street lighting belonged to the NESC, but after I passed the last transformer and went light to light with what amounted to a branch circuit, was that still "associated" with the electric distribution?
I asked the chair of CMP 1, and he was unequivocal: CMP 1 had definitely clarified that point and the NEC did apply. I asked the utility principal and he was equally unequivocal: CMP 1 had definitely clarified the point and the NEC did not apply. When I put the answers together the waffling began in earnest. Remember, good code isn't necessarily code you agree with, it's code that will be universally understood, interpreted and applied in a consistent way. Obviously the existing wording fails that test.
We need to separate the safety issue from the competitive issue. The safety issue belongs to the Code, and the competitive issue belongs to utility regulators. The entire premise behind allowing the NESC, substantially different from the NEC, to apply to utility work is a simple one: The workforce, training, and workplace culture in the utility environment is fundamentally different than for premises wiring. Therefore different standards can be applied to installations under their exclusive control. The wording in this comment makes that clear. To reinforce the point it resurrects the service point wording that was in the FPN in 1993 but which was lost in the 1996 rewrite.
With that in place, the exclusion can apply to any utilization equipment provided it is in generation facilities, or outdoors, but under exclusive utility control. Remember, street lighting is utilization equipment. Suppose a utility supplies a run of street lights fed from underground cables. Suppose there isn't any distribution associated with this circuit for some reason. For example, suppose the utility distribution runs through back yards, but the municipality agrees to pay for street lighting on the road. That street lighting could be considered to be outside the reach of the present exclusion. Does anyone on CMP 1 seriously believe that such lighting should be under the NEC, but identical lighting sitting above and fed from a utility distribution trench next to the street belongs to the NESC? Is there a single jurisdiction in this country attempting to enforce such a restriction?
This is not a foreign concept to the Code. Throughout the Code there are permissions to relax requirements based on a showing of qualified maintenance and supervision. This is simply another example, one that we have been quite used to for generations. This comment is in basic agreement with the original proposal, but editorially preferable because it doesn't create an additional subsection, covers all utilization equipment, and brings back the service point concept which is critical to the proper application of many Code rules.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See action and statement on Proposal 1-10 for what is covered and what is not covered in the proposed revision of Section 90-2. The panel believes that Proposal 1-10 meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
TROGLIA: I agree with the Panel Action, however I believe Proposal 1-10 (Log #52) does not meet the intent of the submitter. I believe acceptance of Proposal 1-11 (Log #4151) will meet the intent of the submitter.

(Log #614)

1- 86 - (90-2(c)): Reject
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Add to final sentence:
"and an effective measure of safety is established and maintained."
SUBSTANTIATION: In keeping with the rulings of 90-4, safety must be established and maintained with any installation. This is especially true with waivers and exceptions to the rules.
PANEL ACTION: Reject.
PANEL STATEMENT: Equivalent provisions of this proposals are already covered in Section 90-1 and in 90-4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2)

1- 87 - (90-3): Reject
NOTE: The following proposal consists of Comment 1-153 on Proposal 1-21 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-21 was:
In the first paragraph, revise "Chapters 5, 6, and 7" in two places to "Chapters 5, 6, 7, and 8", and delete the second paragraph which begins with "Chapter 8...".
SUBMITTER: George M. Lanier, EST
RECOMMENDATION: Either accept Proposal 1-21 or hold it for further study.
SUBSTANTIATION: I agree with the Panel that giving Chapter 8 special status was originally justified and became a successful time tested provision. But, we all know that times change and that it is risky to stay with old truths without reviewing them in the present context, especially when safety is concerned. I am not sure of the nature of the technical data the Panel is looking for. We all know that the communications industry is no longer the same as the one that was granted the special status. And, I feel certain that most of us

would agree that the changes are of a sufficient magnitude to warrant a Panel review to determine if that special status is still justified. It was my hope that the Panel would appoint a Task Group between the ROP and ROC to conduct the review. Since that did not happen, I would now accept the alternative of holding my Proposal for further study to give the Panel the time it needs to give my Proposal the consideration it deserves.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not provide technical data to warrant a change to a time tested provision to the NEC. The panel reaffirms that Chapter 8 is not subject to the requirements of Chapters 1 through 7, except where those requirements are specifically referenced in Chapter 8. See panel action on proposal 1-91 and 1-92.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
COX: I support the Panel Action to reject this proposal at this time but believe that Chapter 8 should be considered the same as Chapters 5 through 7 as to the application of the general provisions of the Code. It is premature at this time to make Chapter 8 subject to the general provisions of the Code because it has not been clearly demonstrated that all provisions in Chapter 8 have been reviewed to determine what impact the action would have. The submitter of Proposal 1-21 in the 1998 ROP is correct in his conclusion that procedures used for the installation of communications circuits have undergone major changes since the provisions in 90-3 to give independent status for Chapter 8 was adopted. Communications wiring and equipment are functionally associated in many situations and it is important that Code rules are properly applied to provide the necessary level of safety while including provisions to allow the equipment to function properly. Because of the close relationship with wiring and electrical equipment, the status of Chapter 8 should be changed during the 2005 NEC cycle. This will provide sufficient time for all rules in Chapter 8 to be reviewed and substantiation provided for any modification of general Code rules.

(Log #3)

1- 88 - (90-3): Reject
NOTE: The following proposal consists of Comment 1-154 on Proposal 1-21 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-21 was:
In the first paragraph, revise "Chapters 5, 6, and 7" in two places to "Chapters 5, 6, 7, and 8", and delete the second paragraph which begins with "Chapter 8...".
SUBMITTER: Larry Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Accept Proposal 1-21 as written.
SUBSTANTIATION: We agree that giving Chapter 8 special status may have been originally justified while it developed over time, but we all know that times change, as has Chapter 8 and that it is risky to stay with old ideals without reviewing them in the present context, especially when safety is a concern. We all realize that the communications industry is no longer the same as the one that was granted the special status and we feel certain that a majority of NEC users would agree that the changes are of a sufficient magnitude to warrant a Panel review to determine if that special status is still justified.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not provide technical data to warrant a change to a time tested provision to the NEC. The panel reaffirms that Chapter 8 is not subject to the requirements of Chapters 1 through 7, except where those requirements are specifically referenced in Chapter 8. See panel action on proposal 1-91 and 1-92.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
COX: See my Comment on Affirmative on Proposal 1-87.
FISKE: While concurring the the panel action to "accept" the proposal, we remain concerned that the proposed definition is too broad. As proposed, the definition would include driveways and drainage canals among "structures". We do not believe such a sweeping definition would aid in understanding the NEC.

(Log #4)

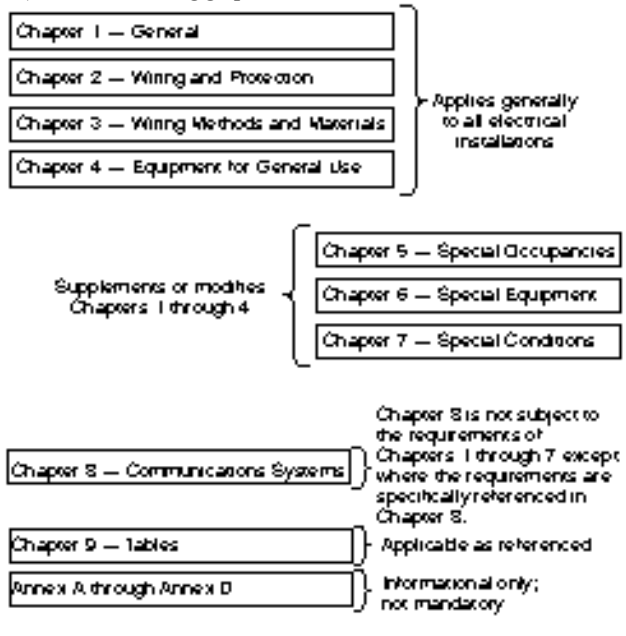
1- 89 - (90-3): Reject
NOTE: The following proposal consists of Comment 1-155 on Proposal 1-23 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-23 was:
90-3. Code Arrangement. This Code is divided into the Introduction and nine chapters. Chapter 1, 2, 3 and 4 apply generally; Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions; Chapter 8 applies to communications systems, specifically as it relates to the communications service entrance to the building or structure. These latter chapters supplement or modify the general rules. Chapters 1 through 4 apply except as amended by Chapters 5, 6, 7, and 8 for the particular conditions.
~~Chapter 8 covers communications systems and is independent of the other chapters except where they are specifically referenced therein.~~
Chapter 9 consists of tables and examples.
Material identified by the superscript letter "x" includes text extracted from other NFPA documents as identified in Appendix A.
SUBMITTER: Roger Witt, State Farm Ins. Co.
RECOMMENDATION: Revise as follows: 90-3. Code Arrangement. This Code is divided into the Introduction and nine chapters. Chapter 1,2,3 and 4 apply generally; Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions; Chapter 8 applies to communications systems, specifically as it relates to the communications service entrance to the building or structure. These latter chapters supplement or modify the general rules. Chapter 1 through 4 apply except as amended by Chapters 5,6,7 and 8 for the particular conditions.
~~Chapter 8 covers communications systems and is independent of the other chapters except where they are specifically referenced therein~~
SUBSTANTIATION: Proposed and rejected with "Panel Statement" "The substantiation does not provide technical data to warrant a change to a time tested provision to the NEC" There is a proposed and "accepted" article in chapter 8: Proposed Article 830 - Network-Powered Broadband Communications Systems: that seriously requires the inclusion of Chapter 8 work subject to the first 7 chapters of the NEC. Proposed article 830 references quite a few provisions of the earlier chapters, but modifies grounding provisions, overcurrent provisions, and possibly a few other rules that are important for the safety of the public. By including Chapter 8, Code enforcement can apply to the communications wiring methods. My original comment was based on code enforcement of grounding to prevent electrical hazards, and with the proposed 830 section it appears even more relevant since the system relating to 830 provides voltage and current to the occupancy.
Futher Research: Prior to the annual meeting, check the grounding on your house and your neighbors house, see if you can determine if the Telephone and TV services have a single point ground common to the electrcial service. This represents only data points, the requirement of single point grounding is valid, as it is stated in the NEC, but the "time tested provision" stated by the ROP PANEL, to me, eludes to the thought that single point grounding is indeed practiced. One of the important parts of a code enforcement program is to ensure or promote the safety and welfare of the public. Without enforceable codes, this cannot happen.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not provide technical data to warrant a change to a time tested provision to the NEC. The panel reaffirms that Chapter 8 is not subject to the requirements of Chapters 1 through 7, except where those requirements are specifically referenced in Chapter 8. See panel action on proposal 1-91 and 1-92.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
COX: See my Comment on Affirmative on Proposal 1-88.
FISKE: While concurring the the panel action to "accept" the proposal, we remain concerned that the proposed definition is too broad. As proposed, the definition would include driveways and drainage canals among "structures". We do not believe such a sweeping definition would aid in understanding the NEC.

(Log #615)

1- 90 - (90-3): Accept in Principle
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Remove last sentence which states:
Material identified by the superscript letter "x" includes text extracted from other National Protection Association (NFPA) documents identified in Appendix A.
SUBSTANTIATION: Duplicate information. Inside cover of documents covers "NOTATIONS USED IN THIS CODE". No need to repeat information.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on proposal 1-91.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
FISKE: While concurring the the panel action to "accept" the proposal, we remain concerned that the proposed definition is too broad. As proposed, the definition would include driveways and drainage canals among "structures". We do not believe such a sweeping definition would aid in understanding the NEC.

(Log #1397)

1- 91 - (90-3): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1) Revise the second paragraph of 90-3 as follows:
Chapter 8 covers communications systems and is ~~independent~~ not subject to the requirements of Chapters 1 through 7 ~~of the other chapters~~ except where ~~they~~ the requirements are specifically referenced ~~therein~~ in Chapter 8.
2) Delete the last sentence of 90-3 ~~"Material identified by the superscript letter "x" includes text extracted from other National Fire Protection Association (NFPA) documents identified in Appendix A."~~
3) Add the following graphic as an FPN before the 90-3 text.



4) Add a new last paragraph as follows: "Annexes are not part of the requirements of this Code, but included for informational purposes only."
SUBSTANTIATION: This proposal was prepared through efforts of the by the NEC Task Group on Usability and the TCC Task group on Communication Systems.
1) The revision to the second paragraph is proposed because the word "independent" has been misinterpreted to imply that communications systems are not covered by the Code and, therefore, not subject to inspection by the authority having jurisdiction.
2) Deleting the last sentence corresponds with the changes in the NEC Style Manual in Clause 4.3.2.3. Extracts will no longer be identified by the superscript method, but by showing the extract reference following the material. This change makes the last sentence of 90-3 unnecessary.
3) The proposed graphic is to add a pictorial view of the Code arrangement. The arrangement of the Code plays a significant role in the proper understanding and application of the rules. Although the present 90-3 indicates the arrangement rules, the Task Group on Usability believes that the graphic will help users in grasping what the text says. The new style manual provides emphasis to the panels to avoid duplicative references to other parts of the Code where the application is already covered by 90-3. As such, a clear understanding of the arrangement is needed.
4) A new last paragraph was added to explain the application of Annexes relative to other code material.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #605)

1- 92 - (90-4): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the first paragraph of Section 90-4 to read as follows:
"This code is intended to be suitable for mandatory application by governmental bodies that exercise legal jurisdiction over electrical installations, including signaling and communications systems, and for use by insurance inspectors. The authority having jurisdiction for enforcement of the Code will have the responsibility for making interpretations of the rules, for deciding on the approval of equipment and materials, and for granting the special permission contemplated in a number of rules."
SUBSTANTIATION: The Task Group on Communications Systems' discussions have identified that confusion may exist because there are users of the Code who do not identify signaling and communications conductors and equipment as part of the electrical installation. Specifically, the Task Group has determined that some communications systems installations may not be subject to inspection because of this confusion. This proposal clarifies that signaling and communications conductors and equipment are included in the scope of enforcement as stated in Section 90-4. In addition, the Task Group recommends that this proposal be forwarded to CMP 16 for information and review.
Task Group Recommendation: The Task Group has addressed the specific issues raised by Comments 1-153, 1-154, and 1-155 (held in 1999 Code cycle). Based on the above findings and Task Group proposals for the 2002 Code cycle, the Task Group recommends that Comments 1-153, 1-154, and 1-155 be rejected.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4152)

1- 93 - (90-4): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
By special permission, the authority having jurisdiction may waive specific requirements in this Code or permit alternate methods where it is assured that equivalent objectives can be achieved by establishing and maintaining effective safety.
SUBSTANTIATION: Throughout the NEC, when we want to allow the AHJ to be able to vary a specific rule, we ask for the special permission process in instances of particular gravity. That doesn't subtract from the authority of the AHJ, but it does assure accountability through the written record. It continues to boggle my mind, that here where the AHJ has the authority to invent new performance-based code provisions based on equivalence, no equivalent accountability exists. If there is any single act by an AHJ throughout the spectrum of code enforcement that should demand this accountability, surely it is in this paragraph of this section.
PANEL ACTION: Accept.

PANEL STATEMENT: For clarification purposes, this change affects paragraph No. 2 as shown by only the underlined words. The remainder of Section 90-4 is unchanged
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2757)

1- 94 - (90-4-Authority Having Jurisdiction (New)): Accept in Principle
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add the formal definition of "Authority Having Jurisdiction" found in the NFPA Fire Codes. See A-2.1 in NFPA 1, for example.
SUBSTANTIATION: The addition of this definition in this section provides valuable information that should be included in the 2002 NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that the action on Proposal 1-103 meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3289)

1- 95 - (90-7, FPN No. 3): Accept
SUBMITTER: James T. Pauley, Square D Co.
RECOMMENDATION: Add the follow as a new FPN No. 3
FPN No. 3: Annex A contains an informative list of product safety standards for electrical equipment.
SUBSTANTIATION: This is a companion proposal to the proposal to add a new Annex A for a list of product safety standards used for listing of products. The objective of the FPN is to simply call the users attention to the informative list contained in Annex A. Annex A was chosen because the existing Annex A will be removed by virtue of the new style manual requirements relative to extract identification.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
PRICHARD: The Panel Action to accept this proposal to include a FPN referencing Annex A was made without benefit of seeing or reviewing Annex A. See my vote on Proposal 1-315.

(Log #443)

1- 96 - (90-9): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Replace Section 90-9 with the following:
90-9. Units of Measurement.
(a) Measurement System of Preference. For the purpose of this Code, metric units of measurement are in accordance with the modernized metric system known as the International System of Units (SI).
(b) Dual System of Units. The SI units shall appear first, and the inch-pound units shall immediately follow in parenthesis. The conversions from the inch-pound units to SI units shall be based on hard conversion except as provided in (c).
(c) Permitted Uses of Soft Conversion. The following cases shall not be required to use hard conversion and shall be permitted to use soft conversion.
(1) Trade Sizes. Where the actual measured size of a product is not the same as the nominal size, trade size designators shall be used rather than dimensions. Trade practices shall be followed in all cases.
(2) Extracted Material. Where material is extracted from another standard, the context of the original material shall not be compromised or violated. Any editing of the extracted text shall be confined to making the style consistent with that of the NEC.
(3) Industry Practice. Where industry practice is to express units in inch-pound units, the inclusion of SI units shall not be required.
(4) Safety. Where hard conversion to SI would impact safety.
(d) Compliance. The conversion from inch-pound units to SI units shall be permitted to be an approximate conversion. Compliance with the numbers shown in either the SI system or the inch-pound system shall constitute compliance with this Code.
FPN No. 1: "Hard" conversion is considered a change in dimensions or properties of an item into new sizes that might or might not be interchangeable with the sizes used in the original measurement. "Soft" conversion is considered a direct mathematical conversion and involves a change in the description of an existing measurement but not in the actual dimension.
FPN No. 2: SI conversions are based on IEEE/ASTM SI 10-1997, Standard for the Use of the International System of Units (SI): The Modern Metric System.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4. with respect to the placement of units and values of measurement. See supporting information titled "Metrication information for CMP Members".
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
Modify 90-9(c)(4) of this proposal to read as follows:
(4) Safety. Where hard conversion to SI would <u>have a negative</u> impact <u>on</u> safety.
PANEL STATEMENT: This was revised editorially to be more specific.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1839)

1- 97 - (90-9): Accept in Principle in Part
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise the second paragraph of 90-9 to read:
The SI units shall appear first and the inch-pound units shall immediately following in parenthesis. In tables, there shall be separate columns for the SI units and the inch-pound units.
SUBSTANTIATION: As the code is converted to SI units as the primary units, the code will be more user friendly if the SI units and the inch-pound units are in separate columns in Tables. It will also make it easier for countries outside the U.S. to adopt the code by simply omitting the inch-pound columns when their country practice is SI units.
The SI proposal for 90-9 submitted by the TCC does not address tables.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the first sentence of recommended action in principle.
Reject the remainder of the proposal.
PANEL STATEMENT: The panel rejects the remainder of the proposal because editorial guidance does not belong in the NEC. See Proposal 1-96.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

ARTICLE 100 — DEFINITIONS

(Log #2933)

1- 98 - (100): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for information.
SUBMITTER: Bernard J. Mezger, American Lighting Association
RECOMMENDATION: Incorporate "luminaire" into the 2002 NEC:

(a) To incorporate the use of the inclusive wording "luminaire" throughout the Code wherever the ambiguous wording "fixture" or "lighting fixture" is used an the intent and meaning is a complete lighting unit consisting of a fixture and the lamp(s), called a "luminaire".

(b) Add the definition of "luminaire" to Article 100-1 as follows:

Luminaire. A complete lighting unit consisting of a lamp, or lamps, and a ballast (when applicable), together with the parts designed to distribute the light, to position the lamp(s), and connect the lamp(s) to the power supply.

(c) Delete the FPN from Article 410-1 (and identical definition).

SUBSTANTIATION: Clarify the true meaning and intent of the item described as a "fixture", or a "lighting fixture", by providing the proper wording for a complete lighting unit. A luminaire consists of a fixture plus lamp(s). The definition and use proposed is consistent with that published and used by IESNA and NEMA.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes its action on Proposals 1-1 and 1-165 meet the intent of the Submitter. Refer to CMP-18 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3930)

1- 99 - (100-Ambient Temperature (New)): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Add new definition as follows:

Ambient Temperature. The temperature of the surrounding medium, usually used to refer to the temperature of the air in which a structure is situated or a device operates.

SUBSTANTIATION: There are 48 hits throughout the NEC referencing the term ambient temperature, without technical reference to this term. It is my understanding that terms used in more than one article may be defined in Article 100 per the Style Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes the term "ambient temperature" is in common use throughout the electrical industry, its meaning is well understood and a definition is not needed in Article 100 for proper application of Code requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #422)

1- 100 - (100-Ampacity): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise as follows:

The current in amperes that a conductor can carry continuously under the conditions of use, as specified in this Code. ~~without exceeding its temperature rating.~~

SUBSTANTIATION: Editorial. Bare conductors have no temperature rating. Where bare conductors are permitted, their ampacity is prescribed by Section 310-15(b)(3), Table 310-21, and UL listing for service cable which considers the ampacity of the bare conductor the same as the insulated conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not necessarily agree with the submitter's substantiation. There is no evidence that the present definition is being misunderstood.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1986)

1- 101 - (100-Ampacity): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Revise "ampacity" definition as follows:

Ampacity. Allowable current-carrying capacity of electrical conductors expressed in amperes.

Ampacity (scientific): The current in amperes that a conductor can carry continuously under conditions of use without exceeding its temperature rating.

SUBSTANTIATION: This proposal was rejected for the 1999 NEC because scientific ampacities were not so designated in the text. A number of correlating proposals are offered herewith to introduce scientific ampacities where appropriate.

Sections in the NEC like 310-10 have specific warnings against exceeding the temperature ratings of insulated conductors. Overheated conductors can be dangerous. Scientific ampacities establish the continuous current limits that such conductors can handle without overheating. The proposed definition (which is actually the existing definition retitled) is very precise in addressing that concept. That very precision makes it unacceptable for establishing conductor ampacities except in closely defined circumstances. It completely ignores other important criteria used to establish conductor ampacities in a more general sense. See the FPN discussion in 310-15(b). Important ampacity tables as, for example, 310-16 through 310-20, 400-5(A), and 402-5 have ampacities derived using several factors and, therefore do not meet the specificity demanded by the scientific definition. A table like 310-21 cannot comply because the scientific ampacity is specific to insulated conductors. Table 610-14(a) gives ampacities for short-time or intermittent currents, obviously outside the scope of continuous current demanded by the scientific definition.

The proposed new, more general, definition covers all present usage of the terms ampacity and ampacities. (Note that scientific ampacities are a defined sub-group within the category). The submitter attempted to find and study all the numerous references to ampacity in the Code, and offers changes only in cases which he considered appropriate. Individual Panels may wish to study their references to determine whether further correlation would be appropriate.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "scientific ampacity" does not appear in the NEC. Also, the term is unnecessary for the proper application of the NEC. The present definiton of ampacity works very well.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #650)

1- 102 - (100-Attachment (Plug Cap) (Plug)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

A device that, by insertion in a receptacle or cord connector, establishes connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle or cord connector.

SUBSTANTIATION: Cord connectors accept attachment plugs. A cord connector does not appear to be a receptacle (as defined) even though considered as a receptacle outlet by Section 210-50(a) under certain conditions. All cord connectors are not installed as pendants. See Article 305, Sections 422-16(b)(3), 422-32(a) for example.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text does not enhance the definition from a practical view. The definition of receptacle from Article 100 does include cord connectors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2104)

1- 103 - (100-Authority Having Jurisdiction): Accept

Note: The Technical Correlating Committee directs that in the FPN change "because" to "since". This is to provide consistency with the Regulations Governing Committee Projects. This action will be considered as a public comment.

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Add the following definition and FPN to Article 100:

Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner because jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

SUBSTANTIATION: Sections 1-1, 1-2, and 4-1 of the NFPA Regulations Governing NFPA Committee Projects (Nov. 18, 1998) Manual of Style provides that the NFPA Rules and Regulations Covering Committee Projects shall contain a uniform definition of "authority having jurisdiction." Section 3-3.6.1 of the NFPA Regulations Governing NFPA Committee Projects states:

"3-3.6.1 Definitions. Where the following terms, commonly found in the Association Technical Committee Documents, are used or defined in the body of the text, they shall be consistent with the intent of these meanings. "Definitions" shall not be altered unless approved by the Council. Such altered definition shall be clear and unambiguous in the context in which it is used."

The NFPA Regulations go on to provide the following definition:

Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner because jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction."

This definition of "authority having jurisdiction" is currently in over 200 other NFPA Codes as well as being included in the NEC Handbook.

Addition of this definition would alleviate the potential concern that the NEC exclusion of this "standard" definition implies that the NEC's intended definition is somehow different than the NFPA standard definition.

PANEL ACTION: Accept.

Editorially change "NOTE" to "FPN."

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2153)

1- 104 - (100-Automatic): Accept

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

Self-acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current ~~strength,~~ pressure, temperature, or mechanical means.

SUBSTANTIATION: Delete the word "strength." The term current is well understood and used throughout the Code. See Article 100 definition for Interrupting Rating, and Overload, for example. The NEC Style Manual 3.2.4 states, "Standard terms have been established through accepted use or by definition and are to be used in preference to similar terms that do not have such recognition." The term current strength is not in common usage and this is the only usage of current strength in the code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1872)

1- 105 - (100-Bathroom): Reject

SUBMITTER: Ric Thomson, Candler Hospital, Engr Dept.

RECOMMENDATION: Define what an "area" is when used in definition of a "bathroom." How big is an "area"? Sq-footage, etc. Define "area" or redefine "bathroom."

SUBSTANTIATION: When the state fire marshal inspects our hospital, he always says something about our patient rooms in general care areas, where we have a basin, and there is a switch/receptacle combination next to it. In the patient room, there is another room which contains a tub and toilet. The fire marshall says we should have a GFI receptacle by the basin, I question this because of present definition of a "bathroom", but what is an "area" our basin is outside of the room with the tub and toilet our facility is twenty years old. To me this is a very confusing issue, one of the most confusing in the NEC.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not contain recommended text as required by Section 4-3.3(c) of the Regulations Governing Committee Projects.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #332)

1- 106 - (100-Bathtub and Shower Zone (New)): Reject

SUBMITTER: Richard L. Miell, Otero County, CO

RECOMMENDATION: Bathtub and Shower Zone. The area measured 3 ft (914mm) horizontally and 8 ft (2.44m) vertically from the top of the bathtub rim or shower stall threshold. This zone is all encompassing, and includes the zone directly over the tub or shower stall.

SUBSTANTIATION: Over the years we have seen additional rules for this area around and above tubs and shower stalls. This change will place the definition of this area into Article 100, where it belongs. We will now have an area defined, to which the Article 380 and Article 410 can address their requirements, rather than have the same area defined differently in each article.

PANEL ACTION: Reject.

PANEL STATEMENT: The term "Bathtub and Shower Zone" is not used in the Code. The panel does not necessariy agree with the submitter's substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #4282)

1- 107 - (100-Bonding Jumper, Main): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for comment.

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Revise text as follows:

Bonding Jumper, Main. The connection between the grounded circuit conductor and the equipment grounding conductor. ~~at the service.~~

SUBSTANTIATION: The changes to the definition of "Service" that started with the 1987 NEC have impacted how installations for feeders to separate buildings and separately derived system are completed. Under the old definition in a very broad sense, the feeder to a new building became a "service" and a separately derived system created a new "service." To overcome the restrictions placed with the present definition, new terms have been utilized when in fact what is being installed is a main bonding jumper. The bonding jumper for a second building is sized and installed the same as if it were a main bonding jumper at a service. The bonding jumper for a

separately derived system is sized and installed at the source or at the first disconnect the same as a main bonding jumper is at a service. There is no technical reason to name the conductor that connects the grounded circuit conductor to the equipment grounding conductors and possibly the grounding electrode conductor at a service any differently than the conductor that connects the grounded circuit conductor to the equipment grounding conductor and grounding electrode conductor at a separately derived system or separate building. Making this change will enhance usability and reduce confusion by redundant use of terms that in essence mean the same thing.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "Bonding Jumper, Main" is correctly separated from the term "bonding jumper" to ensure the specific identification of the connection between grounded feeder and branch grounding conductors and the grounded service conductor at the service. The panel refers this action to CMP-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #666)

1- 108 - (100-Branch Circuit): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise definition of Branch Circuit to read as follows:
Branch Circuit. The circuit conductors between the final branch circuit overcurrent protection device protecting the circuit and the outlet(s).
SUBSTANTIATION: Editorial. The final overcurrent device may be a supplementary device. Supplementary type overcurrent devices may or may not be approved for branch circuit protection since there is no definition. The intent appears to apply to the required branch circuit OCD. The definiton of feeder makes this distinction.
PANEL ACTION: Reject.
PANEL STATEMENT: Supplementary overcurrent devices do not normally protect the circuit in its entirety. The emphasis in the present definition is understood to include the entire conductors of the circuit. Section 240-10 prohibits supplementary overcurrent protection as a substitute for branch circuit protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #651)

1- 109 - (100-Branch Circuit, General Purpose): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
A branch circuit that supplies ~~a number of~~ two or more receptacles or outlets for lighting and appliances.
SUBSTANTIATION: Editorial. The phrase "number of outlets" is presumed to mean more than one, although one is a number. Present wording does not cover a circuit with one outlet box containing more than one receptacle, or one outlet box containing one or more receptacles and from which a permanent connection is made, since there is still only one outlet.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #256)

1- 110 - (100-Branch Circuit, Multiwire (New)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Revise the definition of "Branch Circuit, Multiwire" to read as follows:
Branch Circuit, Multiwire. A branch circuit which consists of two or more phase conductors that have a potential difference between them, and a conductor that has an equal potential difference between it and each of the phase conductors of the circuit and is connected to the common/return conductor of the system.
SUBSTANTIATION: Multi-wire branch circuits are used in systems which are not intentionally grounded. Refer to Sections 250-1(1), 250-1(6), 250-21, 250-22, 250-24(d), 250-30(b) and 250-32(c) for circuits or systems which are not required or not permitted to be grounded. The present definition applies only to intentionally grounded systems and incorrectly refers to a neutral conductor. See proposed definition of "Neutral".
PANEL ACTION: Reject.
PANEL STATEMENT: The term "Multiwire Branch Circuit" is not applicable to the referenced Code sections, which refer to systems that are permitted to be ungrounded. These sections do not use the term "Multiwire Branch Circuit". The term is only applicable to the circuit as presently defined.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2151)

1- 111 - (100-Branch Circuit, Multiwire): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise the definition of Branch Circuit, Multiwire as follows:
"...conductors that have a voltage ~~potential difference~~ between them,... a grounded conductor that has equal voltage ~~potential difference~~ between it...".
SUBSTANTIATION: The term "potential difference" should be avoided if possible per the NEC Style Manual.
"The term voltage is well understood and shall be used in preference to other terms such as potential." [NEC Style Manual 3.2.5.5 Voltage]. Voltage is defined in Article 100 as a "...difference of potential...".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #663)

1- 112 - (100-Circuit Breaker, Interruptor Switch): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise definition of Circuit Breaker to read as follows:
Circuit Breaker. A switching device capable of ~~making, carrying, and breaking~~ safely closing a circuit, conducting and interrupting, currents under normal circuit conditions, and also ~~making, carrying for a specified time, and breaking currents~~ capable of safely performing these functions under specified abnormal conditions, such as those of short circuit.
Revise definition of Interruptor Switch to read as follows:
Interruptor Switch. A switch capable of safely closing a circuit, conducting, ~~making, carrying,~~ and interrupting specified currents.
SUBSTANTIATION: Editorial. A circuit breaker may be capable of closing on carrying, and interrupting currents even though not rated to do so safely. Switching devices are not capable of literally "making" current.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes the proposal addresses the definition of circuit breaker in Part B of Article 100 listed under "Switching Devices". The proposal does not add clarity and proposes a requirement in the definition. The term "making" current is in common use in describing the functions of circuit breakers over 600 volts.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4313)

1- 113 - (100-Circuit Integrity Cable (New)): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 15 and 16 for comment.
SUBMITTER: Edward Walton, Marlborough, CT
RECOMMENDATION: Add the following definition:
Circuit Integrity Cable. A cables ability to continue to function after exposure to specific fire conditions for a specified period of time.
SUBSTANTIATION: The term circuit integrity is used throughout Article 760 and is a requirement called out in Article 700 [700-9(d)(1)(f)]. As used, circuit integrity does not define a particular

cable but is a characteristic that could apply to any cable and therefore its definition should be consistent throughout the Code. The definition will distinguish circuit integrity cables from fire retardant or fire resistant cables that have no circuit integrity.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is unsure that the term "circuit integrity" has a common meaning as used in both Sections 700-9(d)(1)(f) and 760-2. Refer this proposal to both CMP-15 and CMP-16.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2561)

1- 114 - (100-Circuit Integrity (CI) Cable): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for comment.
SUBMITTER: Wayne D. Moore, Hughes Assoc., Inc./Rep. Rockbestos-Surprenant Cable Corp.
RECOMMENDATION: Move current definition for "Fire Alarm Circuit Integrity (CI) Cable" found in Article 760-2 and revise definition to read:
Circuitry Integrity (CI) Cable: Cable used to ensure continued operation of critical circuits during a specified time under fire conditions.
SUBSTANTIATION: The term "Circuit Integrity" is used in two sections 760-2 and 700-9(d)1.(f). It seems to make more sense to define the term in Article 100 so that the user of the code would understand the term's use in both locations.
PANEL ACTION: Reject.
PANEL STATEMENT: The two present NEC references listed in the substantiation are not the same. One section's cable type is required to be both listed and be functional for a specific time period while the other section's cable type has no such requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3932)

1- 115 - (100-Commercial (New)): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Add new definition as follows:
Commercial. A qualifying term referring to premises that under normal business employ a permanent or semi-permanent staff for the activity of exchanging ideas, opinions, or retailing a product or group of products or the transportation of such products or a like.
SUBSTANTIATION: There are over 45 hits in the 1999 Code referencing the term commercial. In many instances the application of specific wiring methods and various items of utilization equipment may be installed in either retail, residential, or manufacturing locations. It is imperative that the Code Making Panel clarify these occupancies to enable the authority that has jurisdiction to evaluate each installation in a consistent manner. Beyond retailing locations the term commercial may be applied to such locations as banks and schools.
PANEL ACTION: Reject.
PANEL STATEMENT: 1. Many Code references are to commercial equipment, not commercial buildings. Commercial-grade equipment is defined by the product standards, for example, compare the Standard for Motor-Operated Commercial Food Preparing Machines, UL 763, to the Standard for Motor-Operated Household Food Preparing Machines, ANSI/UL 982.
2. In reality, commercial is better defined by what it is not (residential, industrial) than by what it is.
3. This is not a common definition used to identify an occupancy.
4. The proposed text would equally apply to industrial occupancies as well as a home office.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #257)

1- 116 - (100-Common/Return Conductor (New)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Add the following new definition to read:
Common/Return Conductor. The conductor in a multi-wire circuit or system which is used to carry the unbalanced load of the phase conductors in that circuit or system. In a grounded circuit or system, this is the conductor which is intentionally grounded.
SUBSTANTIATION: This conductor is mistakenly referred to as the neutral conductor whether the loads on the phase conductors are balanced or not. This conductor is in a neutral state or condition only when the phase conductors of that circuit or system are balanced. In this condition, this conductor does not conduct, it is neutral. This conductor is also referred to as the grounded conductor. It is the intentionally grounded conductor in those circuits or systems which are intentionally grounded. Refer to Sections 250-1(1), 250-1(6), 250-21, 250-22, 250-24(d), 250-30(b) and 250-32(c) for circuits or systems which are not required or not permitted to be grounded. Therefore, to refer to the common/return conductor as the grounded conductor would only be correct if the circuit or system were intentionally grounded. This definition is needed to properly designate respective components of a circuit.
PANEL ACTION: Reject.
PANEL STATEMENT: The term Common/Return Conductor" is not used in the Code and therefore does not require a definition. See panel action on Proposal 1-110.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #632)

1- 117 - (100-Concealed): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Change definition of Concealed as follows:
Concealed. ~~Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.~~ Not visible to public view. Covered or kept from sight.
SUBSTANTIATION: The present definition treats concealed as being inaccessible. Using Webster's Dictionary, wiring in the canopy of a lighting fixture is concealed (not visible to public view) but it is accessible by lowering the canopy. The wiring is not visible or exposed but it is accessible. What do we mean when in Section 410-8(a)(5) we say "concealed behind building walls, structural ceilings, suspended ceilings, dropped ceilings or floors?" Certainly, they are concealed but in suspended ceilings or dropped ceilings they are also accessible. There is no reason for definitions in the NEC to differ from those which can be found in Webster's dictionary. I submit that if it is concealed, you cannot see it but it may be accessible and if it's exposed you certainly can see it, unless you somehow cover it to conceal it. See my proposal to change definition of "exposed" (as applied to wiring methods).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the existing definition is more usable. Changing this definition could result in unintended consequences to other NEC articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #652)

1- 118 - (100-Conductor: Covered): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
~~A~~ An uninsulated conductor ~~encased~~ within a ~~material~~ cable jacket or armor ~~of composition or thickness that is not recognized by this Code as insulation.~~
SUBSTANTIATION: "Encased" infers individually embedded and surrounded. This type of conductor is not indicated in Code tables (except Table 310-21) and Code users have no information relative to ampacity, dimensions, temperature ratings, raceway fill, etc. This type conductor is apparently not a listed product. This creates a problem with Sections 110-2, 110-3, 110-11, 240-3, etc.
I believe covered conductor originally applied to one dubbed "weatherproof," encased in asphaltic-impregnated material widely used in the past for aerial outdoor spans. It appears to be rarely

used today and may be unavailable. "Covered" conductors appear to more appropriately be applied to (bare) conductors contained in cables such as Type SE, NM, UF, etc.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed definition is too restrictive as to what is considered a "covered conductor". Conductors not considered by the NEC as insulated exist in many forms and are in common use in the industry.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1542)

1- 119 - (100-Conductor (shielded)): Reject
SUBMITTER: Thomas J. Conlan, Conlan's "The Electrician Inc."
RECOMMENDATION: Conductor us addressed to
1. Bare
2. Covered
3. Insulated
Add:
4. Shielded. A shield conductor is a conductor that contains a metal shielding around insulated conductors that limits the amount of electromotive induction caused from adjacent influences of flux.
SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not contain substantiation as required by Section 4-3.3(d) of the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #653)

1- 120 - (100-Continuous Load): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
A load, or portion of a load, other than motors, ~~where the maximum~~ for which current is expected to continue for three hours or more.
SUBSTANTIATION: The panel statement for Comment 1-174 in the 1998 ROC indicated motor loads continuing for three hours or more are not excluded from the definition and that a load is not continuous unless the maximum current continues for three hours or more. This is a correct interpretation of the literal wording and the reason for this proposal. The definition is suitable only for nonmotor loads where the maximum load is all continuous. The panel concept does not harmonize with Article 430 rules which only apply a multiplier to the largest motor supplied by a set of conductors, not each motor. Motors may be designated continuous duty which is not the same as continuous, in code context.
Consider the following examples:
No. 1. Feeder (or service) conductors supply a total multiple motor load of 356 amperes and a lighting load of 35 amperes, all load for eight hours continuous; the largest motor is rated 65 amperes FLA. Panel statement and the definition indicate the load is continuous since the maximum current continues for three hours or more. Section 215-2(a) requires conductors with a minimum ampacity of 400 amperes times 125 percent, or 500 amperes. However, Section 220-4(a) indicates only the largest motor requires the 125 percent multiplier, which requires minimum conductor ampacity of 365 amperes, plus 25 percent of 65 amperes, plus 125 percent of 35 amperes, or 425 amperes. Does the definition and Section 215-2(a) or Section 220-4(a) have precedence?
No. 2. A set of conductors supplies a total maximum load of 18 amperes for lighting operating for three hours or more and 2 amperes of other load operating for less than three hours. This combined load doesn't meet the definition of continuous load since the maximum load is not for three hours or more. The conductor ampacity can be 20 amperes. If the conductors supplied only the lighting load it meets the definition of continuous, and minimum conductor ampacity is required to be 18 times 125 percent, or 22.5 amperes. This doesn't make sense.
While there may be few reported problems with the definition, I believe this is because it is not interpreted literally, but in accordance with the proposed revision and as indicated in Section 220-4(a). General practice I have observed is to increase the volt-amperes of any portion of the load continuing for three hours or more by 25 percent to arrive at minimum ratings for conductors, panelboards, and services. Example No. D3 in Appendix D appears to follow this procedure, which is also indicated in Section 430-24.
PANEL ACTION: Reject.
PANEL STATEMENT: The present definition is correct, clear, and is to be applied literally. The Submitter appears to be confusing total circuit loading with the maximum current of a single load to which the definition is to be applied.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2529)

1- 121 - (100-Control Drawing): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for information.
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Control Drawing.
1) A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus that details the allowed interconnections between the intrinsically safe and associated apparatus, or
2) Control Drawing. A drawing or other document provided by the manufacturer of the nonincendive field wiring apparatus or associated nonincendive field wiring apparatus that details the allowed interconnections between the nonincendive field wiring apparatus and associated nonincendive field wiring apparatus.
SUBSTANTIATION: To allow the user to interconnect nonincendive field wiring apparatus, and associated nonincendive filed wiring apparatus a Control Drawing will be necessary. The definition already exists in 504-2, but this was written specifically for intrinsically safe apparatus.
PANEL ACTION: Reject.
PANEL STATEMENT: The term is used only in Article 504 where it is presently defined and does not warrant definition in Article 100. Forward to CMP-14 for action on the proposed new definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2919)

1- 122 - (100-Coordintion (Selective) (New)): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for comment.
SUBMITTER: Joseph A. Tedesco, Boston, MA
RECOMMENDATION: Add the following definition:
Coordination (Selective). Proper localization of a fault condition to restrict outages to the equipment affected, accomplished by the choice of selective fault-protective devices.
SUBSTANTIATION: Coordination, Selective Coordination and Coordinated are found in 240-12, 230-95, 620-62, 685-2, and 700-25. This definition should replace the one found in 240-12 because the word (phrase) is used in at least five places in the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this to CMP-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
MINICK: All references in the substantiation, including the several referenced Fine Print Notes, all refer to coordinated overcurrent protection as addressed in Section 240-12, Electrical System Coordination. As Section 240-12 provides the conditions on which a system of coordination shall be based, the logical conclusion is that Section 240-12 is presently the best suited NEC location for the definition of coordination as this definition relates to the orderly shutdown of electrical systems and should remain as a technical definition under the purview of Code-Making Panel 10.

(Log #654)

1- 123 - (100-Cord Connector (Body) (Separable Connector) (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add a definition for Cord Connector (Body) (Separable Connector) to read as follows:
Cord Connector (Body) (Separable Connector) A female contact device intended to be wired on the load end of a flexible cord for use as an extension from an outlet to provide a detachable electrical connection to an attachment plug or male flanged inlet.
SUBSTANTIATION: Cord connectors, separable connectors, are indicated in more than one article, e.g., Sections 200-10(b); 210-7; 210-50(a), 250-124(a); 410-29; 410-30(b)(c)(3); 410-56(g)(i); 410-58; 422-16(a)(3); 422-32; 511-6(c); 511-9(c); 513-5(d); 513-12(b); 520-53(k); 525-13(d); 525-15(d); 530-22; 551-46(a)(1), etc. Cord connector, connector, and separable connector as used in this code appear to refer to a common similar type female temporary connection device, although the different designations may infer otherwise. For Code purposes a definition would be useful as it is for receptacles and attachment plus, even though it is generally understood what those devices are.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes this definition is more appropriate for the product standards. This substantiation does not identify any problem of misinterpretation in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #320)

1- 124 - (100-Damp Location): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 6 and 18 for comment.
SUBMITTER: James F. Pierce, Intertek Testing Services NA Inc.
RECOMMENDATION: Delete and add as follows:
Location:
Damp Location: (Remove existing wording and replace with):
Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture.
SUBSTANTIATION: A simplified definition is needed that doesn't rely on a list of examples. Architectural designs vary significantly; therefore, designation of a specific area as a damp location is best left to the authority having jurisdiction who would base the decision of the definition and not a list of examples.
PANEL ACTION: Accept in Principle.
Revise the proposed definition to read as follows:
Damp Location: (Remove existing wording and replace with):
Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture. Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses.
PANEL STATEMENT: The panel concludes that the list of examples is useful. The list is beneficial to installers and inspectors in complying with the code rules. The panel refers this action to CMP-6 and CMP-18.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
MINICK: The revised definition of "damp location" uses the exact same words (weather, saturation, other liquids) as the definition of "wet location", but in an opposite way. Therefore, the definition of "damp location" is an inverse definition to the term "wet location" and is redundant. The term "moderate", while not identified by the NEC Style Manual as a vague word, is in fact a vague term that could hold different degrees of meaning depending on the individual defining the term. By the new wording (weather), it could be construed that this definition would only apply to outdoor locations. This revision does not add clarity to the present definition.

(Log #1041)

1- 125 - (100-Dedicated Circuit (New)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Add a new definition to read:
Dedicated Circuit. A circuit with an overcurrent device and a return conductor which are designated for exclusive use of that circuit.
SUBSTANTIATION: To be dedicated all parts of the circuit must be dedicated or exclusive to that circuit. If the return conductor if shared by another circuit it also means the phase conductor is shared any time both circuits are energized. If the return conductor were to become open the "dedicated" circuit would be completely dependent on circumstances affecting the other circuit. A dedicated circuit should not be a part of a multiwire circuit. See my proposal for new definition of "Separate Circuit."
PANEL ACTION: Reject.
PANEL STATEMENT: The term "dedicated circuit" is not used in the Code and therefore does not warrant a definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #655)

1- 126 - (100-Disconnecting Means): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise Disconnecting Means (Disconnect) A device or group of devices consisting of a switch(es), circuit breaker(s) or other switching devices or other means permitted in this Code (by which) (whereby) the device load side ungrounded conductor(s), and where permitted or required, the grounded conductor(s) ~~of a circuit~~ can be disconnected from the device supply side conductors. ~~their source of supply~~.
SUBSTANTIATION: Editorial. the present unmodified "other means" is so broad it includes terminals, splicing devices, etc. Many sections referring to disconnecting means contain specifics, such as switch, circuit breaker, horsepower, simultaneous operation, locking provisions, etc. which in effect determine the type disconnecting means. Some sections permit or require grounded conductor. SWITCHING (disconnection) under specified conditions. A device which disconnects only ungrounded conductors of a circuit that contains a grounded conductor does not literally comply with the definition since the grounded conductor is a circuit conductor connected to the source of supply. This is not a conflict where the sections specify disconnection of ungrounded conductors, but sections which do not specify that, suggest the grounded conductors per definition, are also to be disconnected. Numerous sections specify disconnecting means without a reference to type, horsepower, simultaneous opening, etc., whereby a terminal connection or splicing device would literally comply with "other means" of the definition. Code users should not have to infer intent. Limiting "other means" to those permitted in the Code would clarify the term.
A disconnect does not literally comply with the definition if it disconnects only load side conductors and supply side conductors are not disconnected from the source of supply.
Where two switches (disconnecting means) supply one set of fuses as covered in the exception for Section 490-27(b)(7), opening one switch only disconnects the load side conductors from the supply side conductors to that switch and not necessarily from the source of power provided by the other switch.
Sections where other than switches or circuit breakers are permitted:
230-75
305-4(e)
422-31
422-32
424-20
426-51
430-109(f)
440-13
440-63
668-13(b)
669-8(b)
690-13 FPN
Sections with no specifics:
240-40
422-33(a)(b)
424-19(a)(c)(1)(2)
424-65
426-50

430-74(a)
445-10
660-5
680-12
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements for disconnecting means are specified in the relevant Code sections and the proposed definition does not add clarity or facilitate its application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1779)

1- 127 - (100-Dust-ignitionproof): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for information.
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Relocate the definition of Dust-ignitionproof and the related FPN from Section 502-1 to Article 100, and delete the text that applies the definition only to Article 502.
SUBSTANTIATION: The term "Dust-ignitionproof " is used in both Articles 500 and 502. For the purposes of Article 500 the term is undefined because the definition in Article 502 applies only to Article 502. In addition, according to Section 500-4(b) FPN, "Dust-ignitionproof equipment is defined in Article 100. PANEL ACTION: Reject.
PANEL STATEMENT: This term currently exists only in the 500 series Classified Location NEC Articles and more specifically in Articles 500 and 502. The panel refers this proposal to Code-Making panel 14. The panel noted in Section 500-4(b), FPN there was a possible erratum in referencing the definition to Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2415)

1- 128 - (100-Dustproof): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 19 for consideration in Article 547.
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Delete the definition of the term "Dustproof."
SUBSTANTIATION: The term "dustproof" could be found in only one other place in the Code - Section 547-5(a), which improperly requires enclosures to be "dustproof." This term is not used in the UL electrical equipment directory in reference to enclosures or boxes, nor in the NEMA enclosure type designations. Submitter has submitted a proposal for Article 547 that will, if accepted, obviate the need for this term.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
COX: Recommend adding a statement in the Panel Action that refers the action on this proposal to CMP-19 for information.

(Log #2414)

1- 129 - (100-Dusttight): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise the definition of the term "Dusttight" as shown below:
"Dusttight. Constructed so that dust will not enter the enclosing case under specified test conditions and listed for Class II locations."
SUBSTANTIATION: The present definition states that dusttight enclosures are "constructed so that dust will not enter the enclosing case under specified test conditions" (emphasis added). This requires evaluation according to a published standard, strongly implying listing by a recoginzed testing laboratory. If that is the intent, it should be clearly stated. The specifier, installer, or AHJ can not practically determine whether the testing requirement has been met without listing.
PANEL ACTION: Reject.
PANEL STATEMENT: Class II is not the only application for dust-tight enclosures. In fact dust-tight is NEMA Type 13 not NEMA Type 9. Furthermore, prevention of the entrance of dust is only part of the Class II enclosure rating process. Also, the proposed definition contains a requirement which is prohibited by Section 2.2.2 of the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1543)

1- 130 - (100-Dwelling): Accept
Note: The Technical Correlating Committee directs that the panel reconsider their action based on the fact that the Style Manual directs that definitions be listed in alphabetical order. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Thomas J. Conlan, Conlan's "The Electrician Inc."
RECOMMENDATION: Revise as follows:
Dwelling
Dwelling Unit.....defined
One-Family Dwelling.....defined
Two-Family Dwelling.....defined
Multifamily Dwelling.....defined
SUBSTANTIATION: Rearrange to the proper order of precedence.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #5)

1- 131 - (100-Electric-Discharge Lighting): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for information.
NOTE: The following proposal consists of Comment 1-176 on Proposal 1-75 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-75 was:
Add a new definition as follows:
Electric-Discharge Lighting: Systems of illumination utilizing fluorescent lamps, high intensity discharge (HID) lamps, or neon tubing.
SUBMITTER: Thomas E. Trainor, City of San Diego, CA
RECOMMENDATION: Proposal No. 1-75 was referred to CMP 18 for comment by the Technical Correlating Committee at the request of CMP 1.
SUBSTANTIATION: The Chairman of CMP 18 established a Task Group to represent the Panel in reviewing this proposal. The Task Group consisted of Stephen Kieffer, Jim Pierce and Tim Wall, with myself as Chair.
The Task Group recommends that the proposal to add the defintion of Electric-Discharge Lighting to Article 100 be accepted.
The recommendation of the Task Group is based on the following:
1) "Electric-Discharge Lighting" is a technical term used in more than one Article of the NEC. (Specifically Articles 100, 210, 225, 300, 310, 380, 400, 410, 450, 530, and 600.)
2) The proposed defintion is consistent with the way the term is used in all of these articles.
3) Locating the definition of "Electric-Discharge Lighting" in Article 100 will help to clarify related terminology such as "Electric-Discharge Lighting Fixture", "Electric-Discharge Lighting System", "Electric-Discharge Lighting Equipment" and "Electric-Discharge Lamp" which are all used in other Articles of the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not believe that a definition for electric-discharge lighting is necessary in Article 100. Also, see action on proposal 1-132. By action of reject on this Proposal, the panel also rejects Proposal 1-75 of the 1999 NEC and the associated Comment 1-176 of the 1999 NEC. Refer this to CMP-18.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #349)

1- 132 - (100-Electric-discharge Lighting): Accept

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for information.

SUBMITTER: John D. Minick, Grand Prairie, TX

RECOMMENDATION: Reject NFPA 70 - A98 ROP Proposal 1-75 (Log #3718) and uphold the original CMP 1 action of "reject", and reject NFPA 70 A98 ROC Comment 1-176 (Log #309) which was held for the 2002 NEC revision cycle.

SUBSTANTIATION: TCC Chairman Harold Ware appointed John Minick, NEC CMP 1 Chairman, to chair a Task Group of NEC CMP1 and 18 members, plus any other persons as needed to recommend specific actions relating to NFPA 70 - A98 ROP Proposal 1-75 and NFPA 70 - A98 ROC Comment 1-176 concerning a proposed definition of "Electric-Discharge Lighting" that was submitted for the 1999 NEC. CMP 1 members John Troglia and Brooke Stauffer along with CMP 18 members Ken Kempel and Bernard Mezger were appointed by Task Group Chairman Minick to form the Task Group. Also, the NEMA Lighting Fixtures Section and the NEMA Lamp Section were consulted for suggestions and recommendations on this subject matter. Basically, the members of the Task Group unanimously recommend that no definition for Electrical-Discharge Lighting be included in NEC Article 100 for the reasons as stated below.

The inclusion of a definition for the term "electrical discharge lighting", outside that already included in National Electrical Code Article 600, would seem to be a controversial solution looking for a problem. To date, and also within Proposal 1-75 for revision of the 1999 National Electrical Code, no real problem has ever been identified that would demand such a singular or unique definition in National Electrical Code Article 100. On the other hand, there are indications that would support the exclusion of a singular definition of electrical discharge lighting in Article 100. By CMP 1's panel statement on Proposal 1-75, "the definition submitted appears to serve systems serving electric signs and outline lighting" and also states that "there is no substantiation that the proposed definition would be acceptable for lighting fixtures covered in Article 410". It was pointed out by one Task Group member that there is no National Electrical Code generic definition of "lamps" or "lighting" or "illumination" as these terms would apply to a lighting product with only general references being defined as a part of their relationship to either application or installation of lighting. Examples of such definitions are "lighting outlet" and "outline lighting". The fact that a single definition of electric discharge lighting may not always fit all lighting categories in all applications was questioned by several of the Task Group members. As an example, is "neon lighting" a true lighting source as compared to true HID type lighting, or is it merely a decorative amenity that does in fact produce light? Another Task Group member raised the question of including "cold cathode" lighting if "neon" type lighting was included. In essence, such a singular definition of electric discharge lighting may indeed raise more questions that it may solve as such a definition may not always fit all situations in all occasions.

PANEL ACTION: Accept.

PANEL STATEMENT: Refer this to CMP-18 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2482)

1- 133 - (100-Electrical Inspector (New)): Reject

SUBMITTER: Ronald M. DeGesero, Bldg Dept., City of Coral Springs, FL

RECOMMENDATION: The National Electrical Code needs to have a definition of an electrical inspector. What do the inspectors do?

SUBSTANTIATION: We act as inspectors, architects, engineers, designers; yet when we do our job we are hampered by political or personal interference by well meaning contractors, individual homeowners or anyone wishing to build, change, or add to existing structures.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not contain recommended text as required by Section 4-3.3(c) of the Regulations Governing Committee Projects.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #656)

1- 134 - (100-Enclosed): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise definition of Enclosed to read as follows:

Surrounded by a case, housing, fence, or walls that prevent persons from accidentally contacting energized parts, or contained in a raceway, cable jacket or armor, or other equipment approved for enclosing conductors.

SUBSTANTIATION: Many code sections use phrases such as "enclosed in a raceway", "enclosed within the same raceway", "enclosed in a metallic sheath", and similar phrases. Many code users may conclude that "case" and "housing" do not include raceways or cable armor since the definition of enclosure relates case or housing to apparatus.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not add clarity to the definition and contains a variation of the word being defined.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #657)

1- 135 - (100-Enclosure): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise definition of enclosure to read as follows:

The case or housing of apparatus, raceways, cable jacket or armor, or other equipment approved for enclosing conductors, or the fence or walls... (remainder unchanged)

SUBSTANTIATION: Editorial. Many code sections equate raceways, cable armor conduit bodies, boxes, etc. with enclosures, while other sections indicate they are not enclosures. The proposal would include auxiliary gutters, conduit bodies, boxes, cablebus framework, etc., which are not cases or housing for apparatus.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not add clarity to the definition and contains a variation of the word being defined.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2154)

1- 136 - (100-Energized): Accept

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise the definition of Energized as follows:

Electrically connected to a source of voltage ~~potential difference~~.

SUBSTANTIATION: The term "potential difference" should be avoided if possible per the NEC Style Manual.

"The term voltage is well understood and shall be used in preference to other terms such as potential," [NEC Style Manual 3.2.5.5 Voltage]. Voltage is defined in Article 100 as a "...difference of potential...".

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #389)

1- 137 - (100-Entry Foyer (New)): Reject

SUBMITTER: Mitchell R. Iles, City of Rogers Insp. Division, AR

RECOMMENDATION: Add a definition for entry-foyer.

SUBSTANTIATION: In my opinion an entry should include the same requirements as any other room or make a size for that requirement.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not contain recommended text as required by Section 4-3.3(c) of the

Regulations Governing Committee Projects. In addition, the term is not used in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #631)

1- 138 - (100-Exposed (as Applied to Wiring Methods)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Change definition of Exposed (As applied to wiring methods) as follows:
Exposed (As applied to wiring methods). On or attached to the surface or ~~behind panels designed to allow access.~~ Visible to view without removal of panels or obstructions.
SUBSTANTIATION: The present definition treats exposed as being the same as accessible. Prior to the 1999 NEC it referenced See "Accessible: (As applied to wiring methods)" as part of the definition. This part of the definition was deleted in the 1999 NEC and neither the ROP or the ROC appears to include reasoning for this. Using Webster's Dictionary which tells us that "to expose" is to uncover or bring into view means, that while it is not uncovered or not in view, it is not exposed. The problem with using the present definition is that it renders part of the Code such as the exception to Section 250-50 as useless or in fact dangerous with regard to the purpose of Section 250-50. As an example, if this exception had read in part "the entire length of the interior metal water pipe that is being used for the conductor is accessible" rather than saying exposed, would it serve the purpose it was intended for? Why do we say in Section 318-6(h) that cable tray shall be "exposed and accessible" when under the present definitions they are one and the same. Prior to 1971, the NEC definition of exposed was "not concealed" but since the definition of concealed paralleled "inaccessible", the definition of exposed was changed to parallel "accessible". We have two pair of words, each pair having opposite meanings. Something is either "exposed" or "concealed" and something is either "accessible" or "inaccessible'". I believe it's time to correct our definitions. See my proposal to change definition of concealed.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing definition is expressly limited to wiring methods. Changing this definition could result in unintended consequences to other NEC articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4379)

1- 139 - (100-Fastened in Place (New)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add the following definition:
Fastened In Place (as applied to utilization equipment). Equipment that is held in position by fasteners, piping, hose connections, or other means.
SUBSTANTIATION: Utilization equipment, such as waste disposals, swimming pool pumps, etc., that is held in place by piping or hose connections without the use of specific additional fasteners is being interpreted as not being fastened in place. Permissible loads and computation of loads on circuits and receptacle outlet locations are being compromised. This term is used in more than one article, therefore belongs in Article 100.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes the submitter's intent is satisfied by the existing NEC requirements in Section 110-13(a) and supported by most product standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2323)

1- 140 - (100-Feeder, Motor): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 11 for information.
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new definition to read as follows:
Feeder, Motor. Any feeder, including those that serve panelboards, switch boards, and motor control centers, that carries current to supply a motor.
SUBSTANTIATION: There is confusion as to what exactly a motor feeder is, and corresponding difficulty in apply the relative code sections.
Many believe that once a motor branch circuit or feeder is terminated at a panel, switchboard or motor control center, it no longer is treated as a motor feeder for the purposes of sizing and protection. There are some circumstances that this may present problems, such as sizing the overcurrent device in such a manner as to permit a motor to start.
This definition would go a long way to clearing up the difficulty in the use of articles 430-62 and 63 as well as making the code more user friendly.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed definition is considered unnecessary and does not add clarity to the use of the term. Refer to CMP-11 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2929)

1- 141 - (100-Garage): Accept in Principle
SUBMITTER: Robert R. Sallaz, City of Munroe Falls, OH
RECOMMENDATION: Revise the definition to read as follows:
Garage. A building or portion of a building in which one or more self-propelled vehicles ~~carrying volatile flammable liquid for fuel or power~~ are kept for use, sale, storage, rental, repair, exhibition or demonstrating purposes. ~~and all that portion of a building that is on or below the floor or floors in which such vehicles are kept and that is not separated therefrom by suitable cutoffs.~~ For commercial garages see Section 511-1.
SUBSTANTIATION: The current 66 word sentence defining "garage" is too lengthy, unclear, and does not apply to the term as used in Section 625-29 for electrical vehicles. By making the current FPN the second sentence it will follow the Style Manual.
PANEL ACTION: Accept in Principle.
Revise the definition to read as follows:
"Garage. A building or portion of a building in which one or more self-propelled vehicles can be kept for use, sale, storage, rental, repair, exhibition or demonstration purposes.
FPN: For commercial garages, repair and storage, see Article 511."
PANEL STATEMENT: The panel agrees with the submitter, but prefers the reference to Article 511 as a FPN.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3061)

1- 142 - (100-Ground-Fault Circuit Interrupter): Accept in Principle in Part
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Change the definition to define Class A protection.
Ground-Fault Circuit Interrupter. A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds ~~some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit~~ the values established for a Class A device. Class A, when applied to a Ground-Fault Circuit Interrupter, is a device that:
(a) will interrupt the circuit to the load when the interrupter ground fault current is 6 mA or more in a time not greater than given by the equation:

$$T = (20/I)^{1.43}$$

where:
T = time in seconds, and
I = ground-fault current in rms milliamperes for fault currents between 6 mA and the maximum voltage divided by 500 ohms.

(b) and will not interrupt the circuit to the load when the ground fault current is 4 mA or less (when the ambient air temperature is

less than -5°C or more than 40°C, the minimum trip current may be 3.5 mA instead of 4 mA).

(c) and is capable of keeping within the requirements in (a) should the identified circuit conductor (neutral) become inadvertently grounded between the interrupter and the load.

The prime function of a Class A GFCI, therefore, is to provide protection against hazardous electric shocks from leakage currents flowing to ground from defective circuits or equipment. It does not provide protection against shock should a person make contact with two of the circuit conductors on the load side of the GFCI.

SUBSTANTIATION: Requirements in the Code are for Class A protection. The current definition is unclear with respect to what constitutes "protection of personnel" or what the "established period of time" is. By specifically calling out the requirement for a Class A device, the ambiguities are eliminated.

PANEL ACTION: Accept in Principle in Part.

Revise the definition to read as follows:

"Ground-Fault Circuit Interrupter. A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds the values established for a Class A device.

FPN: Class A ground-fault circuit interrupters trip when the current to ground has a value in the range of 4 to 6 mA. For further information, see Standard for Ground-Fault Circuit Interrupters, UL 943."

PANEL STATEMENT: The panel concludes that this revision meets the submitter's intent without including a requirement in the definition.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1544)

1- 143 - (100-Grounded Condcutor, FPN (New)): Reject

SUBMITTER: Thomas J. Conlan, Conlan's "The Electrician Inc."

RECOMMENDATION: Revise definition to read as follows:

Grounded Conductor:

A system or circuit conductor that is intentionally grounded.

Add a fine print note:

FPN: Basically a grounded conductor is a conductor designed to carry current, for example in a 2 conductor power cord that contains a grounded conductor (polarized/identified) as addressed in Article 200 and 400 and a hot conductor basically addressed in Article 240. Also electrical training to the theory of Kirchoffs law dictates that whatever current goes into a circuit must come out, which relates to if 1 amp goes in the hot conductor, 1 amp leaves through the grounded conductor so the grounded conductor is a current carrying conductor.

SUBSTANTIATION: The definition is very confusing to most electrical people and no solid definition has really been established as to the training and design of the conductor.

It would solve a lot of problems to insert a fine print note and what the conductor was designed to do.

Food for thought - the grounding conductor is designed to carry fault current.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed Fine Print Note is not entirely correct. The Fine Print Note does not add clarity to the definition of grounded conductor. The substantiation does not identify any specific problems that would be solved by the addition of the proposed Fine Print Note.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3873)

1- 144 - (100-Grounding Electrode (New)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.

SUBMITTER: J. Philip Simmons, Olympia, WA

RECOMMENDATION: Add the following definition:

Grounding Electrode. A conducting element used to connect electrical systems or electrical equipment to earth.

SUBSTANTIATION: This term needs to be defined in Article 100 as it is used in several articles in the NEC. Articles where this term is used include 250, 280, 501, 502, 503, 504, 545, 547, 551, 553, 640, 675, 690, 800, 810, 820, and 830.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation does not identify a problem requiring an additional definition. The panel refers this proposal to CMP-5 for action.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #658)

1- 145 - (100-Grounding Electrode Conductor): Accept in Principle

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise definition of Grounding Electrode Conductor to read as follows:

The conductor used to connect the grounding electrode to the equipment grounding conductor, to the grounded conductor, or to both, ~~of the circuit~~ at the service ~~equipment, or~~ at ~~the source of~~ a separately derived system or other derived system.

SUBSTANTIATION: The definition does not literally apply to a (grounding electrode) conductor attached to a service at a location other than service equipment as permitted by Section 250-24(a)(1)(d), nor to a conductor attached at a point remote from the source of a separately derived system as permitted by Section 250-30(a)(1)(2), nor to a grounding conductor for sources which are not services or separately derived systems.

Outside secondary conductors from a separately derived system per Section 240-21(b)(4) could have a grounding connection at the disc/overcurrent device which may be far from the source.

An alternate power source generator used with a solid neutral connection to a transformer secondary results in neither source meeting the definition of separately derived. (See my proposal for Section 250-51).

Transformers supplying secondary ties per Section 450-6 also do not appear to meet the definition of separately derived systems and the definition doesn't cover the grounding conductor for such systems.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel believes that the action on proposal 1-146 meets the intention of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3346)

1- 146 - (100-Grounding Electrode Conductor): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for comment.

SUBMITTER: Paul Dobrowsky, Holley, NY

RECOMMENDATION: Revise as follows:

Grounding Electrode Conductor. The conductor used to connect the equipment grounding conductor, the grounded conductor, or both ~~grounding electrode(s) equipment grounding conductor, to the grounded conductor, or to both, of the circuit~~ at the service equipment, at each building or structure where supplied from a common service, or at the source of a separately derived system.

SUBSTANTIATION: The language needs to be the same for services, separately derived systems, and where multiple buildings or structures exist. The conductor being connected to an electrode should be consistently defined whether it is at the service or at a building supplied by a feeder. The term grounding electrode conductor should be used consistently where circuits or systems are connected to a grounding electrode.

A proposal has been submitted to modify Section 250-32(f) to be consistent with the proposed change here.

PANEL ACTION: Accept in Principle.

Revise proposed text as follows: "Grounding Electrode Conductor. The conductor used to connect the grounding electrode to the equipment grounding conductor, to the grounded conductor, or to both, at the service equipment, at each building or structure where supplied from a common service, or at the source of a separately derived system."

PANEL STATEMENT: The definition needs to indicate that the grounding electrode conductor is connected to the grounding electrode. Refer to CMP-5 for comment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3781)

1- 147 - (100-Grounding System): Reject
SUBMITTER: Behzad Eghtesady, City of Los Angeles, CA
RECOMMENDATION: Grounding System. It consists of all interconnected grounding connections in a specific power system that is isolated from adjacent grounding system. The isolation is provided by transformer primary and secondary windings that are coupled only by magnetic means. Such system boundaries are defined by the lack of a physical connection that is either metallic or through a significantly high impedance.
SUBSTANTIATION: Currently there are no definition for what is a system ground. The current Webster or any other technical dictionary does not contain any such definitions.
Providing this definition will clarify the intend of the code that:
1. There be more than one system ground within a given installation.
2. Clarify the difference between equipment ground and system ground.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed definition contains the term being defined and contains a requirement that is prohibited by Section 2.2.2 of the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3787)

1- 148 - (100-Habitable Room (Space) (New)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for action in Article 210.
SUBMITTER: John I. Williamson, Minnesota Board of Electricity
RECOMMENDATION: Create a new definition for Habitable Room (Space) that could be applicable throughout the code including, but not limited to, Section 210-8(a)(2)
Habitable Room (Space). A habitable room (space) is space in a structure for living, sleeping, eating or cooking. Bathrooms, toilet compartments, closets, hallways, storage or utility space, and similar areas are not considered habitable space.
SUBSTANTIATION: Substantiation - There currently is no definition in the code for "habitable room" (space). The typical dictionary definition for "habitable" is too ambiguous to be relied on for code application. This proposed definition appears to be correlated with the use of the word "habitable" in the following sections including, but not limited to: Section 210-8, Section 210-52, and Section 210-70. Although building codes will usually contain a definition for habitable room, the electrical code is enforced in many jurisdictions that do not adopt a basic building code. The electrical code is often relied upon as a stand-alone document and must include definitions for specific non-electrical terms.
PANEL ACTION: Reject.
PANEL STATEMENT: The National Electrical Code does not generally classify occupancies or spaces within buildings. This type of classification is best left to the building code provisions of which the term "habitable room" is one of the spaces defined in the 2000 International Building Code and is almost identical to the proposed definition. Forward to CMP-2 for action on proposed new definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #444)

1- 149 - (100-In Sight From): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In the definition of "In Sight From", replace "50 ft (15.24 m)" with "15 m (50 ft)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show the SI units as the preferred and inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #659)

1- 150 - (100-In Sight From (Within Sight From, Within Sight)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise definition of In Sight From (Within Sight From, Within Sight) to read as follows:
Where this Code specifies that one equipment shall be "in sight from", "within sight from", or "within sight", etc. of another equipment, the specified equipment <u>shall be immediately adjacent to the other, or where normally illuminated so as</u> to be visible <u>from the other equipment, shall</u> ~~and~~ not be more than 50 ft (15.24 m) distant from the other <u>equipment.</u>
SUBSTANTIATION: Proposal specifically invokes an illumination requirement (natural or artificial) which is only inferred by the word "visible". Equipment which complies when there is illumination won't comply when lighting is off in a building or where outside during darkness and no specifically required illumination is provided.
"Normally illuminated" provides for natural or artificial type when the location is occupied by a person(s).
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed definition does not add clarity to the present definition. The term "adjacent" is vague and unenforcable according to the Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1400)

1- 151 - (100-In Sight From (Within Sight From, Within Sight)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise definition of "In Sight From (Within Sight From, Within Sight)" to read as follows:
Where this Code specifies that one equipment shall be "in sight from", within sight from", or "within sight", etc., of another equipment, the specified equipment is to be ~~visible~~ <u>in direct line of sight from,</u> and not more than 50 ft. (15.24m) distant from the other.
SUBSTANTIATION: Editorial. Dictionary definition of "visible" is "capable of being seen", "perceptable of vision", "in full view or readily seen". A disconnecting means located 50 ft from a motor controller and complying with the rule while there is adequate artificial or natural illumination may not be visible from the controller when there is no artificial or natural illumination at the disconnecting means. For example, in a plant during night time shudown where local illumination is provided at the controller and motor location for maintenance or repair but with no illumination at the remote disconnecting means. Where a motor controller at an oil well pump or similar outdoor installation is 50 ft. from a service disconnect serving as the disconnecting means for the motor and controller and no artificial illumination is provided at the disconnect, it may not be visible during night time or dense fog. A disconnecting means for air conditioning equipment installed outdoors and 50 ft. distant may not be visible under the same conditions.
Section 110-26(d) only requires illumination for certain equipment, and then only where installed indoors.
"Direct line of sight" sould provide for visibility under "normal" conditions but does not impose the condition to always be visible. A strict interpretation of the rule would require artificial illumination at the disconnecting means, and prohibit installations where dense fog may occur.
Additionally, the absence of the word "from" after "visible" is literally unclear whether the equipment is to be merely visible, or visible from the other equipment, which is the intent but not plainly stated. Ambiguity does not serve the Code well.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not support the recommended change. The panel concludes that the present language in the definition adequately addresses situations where one piece of equipment is not in sight of another without regard to the time of day.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3931)

1- 152 - (100-Industrial (New)): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Add new definition as follows:
Industrial. A qualifying term referring to premises that under normal business employ a permanent or semi-permanent staff for the purpose of activity is to manufacture and distribution a product or group of products.
SUBSTANTIATION: There are over 70 hits in the 1999 Code referencing the term industrial. In many instances the application of specific wiring methods and various items of utilization equipment may be installed in either retail, residential, or manufacturing locations. It is imperative that the Code Making Panel clarify these occupancies to enable the authority that has jurisdiction to evaluate each installation in a consistent manner.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "industrial" is in common use, is well understood, and does not need a definition in Article 100. The proposed definition might well encompass a commercial operation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2322)

1- 153 - (100-Industrial Occupancy (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new definition to read as follows:
Industrial Occupancy. For the purposes of the NEC, To be an Industrial occupancy, all of the following conditions must be met.
(1) Conditions of maintenance and engineering supervision ensure that only qualified persons will monitor and service the system.
(2) The premises wiring system has 2500 kVA or greater of load used in industrial process(es), manufacturing activities, or both, as calculated in accordance with Article 220.
(3) The premises has at least one service that is more than 150 volts to ground and more than 300 volts phase-to-phase.
SUBSTANTIATION: There is no definition of just what an industrial occupancy is, even though it shows up in the NEC over 70 times.
This definition would give individuals utilizing the code clear guidelines as to just what an industrial occupancy is, in addition to making the code more user friendly. It has been argued that industrial occupancies include facilities such as data processing, large multi-building commercial facilities and can be utilized for facilities such as high schools.
There are possible problems that may arise if this is approved. Sections 240-21(c)(3) and 250-21 may be clouded by this submission, but on a whole these are minor and the local authority having jurisdiction may grant leeway on these two sections.
Note that this definition parallels Section 240-91.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed definition contains a requirement which is prohibited by Section 2.2.2 of the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3642)

1- 154 - (100-Interrupting Rating): Reject
SUBMITTER: Jim Brozer, Acton, MA
RECOMMENDATION: Add the following as a second Fine Print Note to the definition of Interrupting Rating:
"Multi-pole overcurrent devices have both a multi-pole interrupting rating and a single-pole interrupting rating at any one particular voltage."
SUBSTANTIATION: This addition is needed because most users do not understand that 2 and 3 pole overcurrent devices have two (2) interrupting ratings. This needs to be pointed out so that the users can properly apply these products. I have provided a copy of Table 7.1.7.2 from UL 489 that lists the single-pole interrupting ratings under the bold "Individual" columns.
Single-pole interrupting ratings become especially critical on corner grounded delta systems, resistance grounded systems, center point grounded delta systems, and ungrounded systems, all systems where one or two faults can cause full voltage to appear across one pole, thus necessitating compliance with single-pole interrupting ratings.
For example, using the table 7.1.7.2 from UL 489, all 60 amp, 480 volts, 3-pole circuit breakers have an 8,600 ampere single-pole interrupting rating. The table is used for the minimum interrupting ratings tests. There is no similar table for the higher interrupting ratings tests. Therefore, you could have a 0-800 amp, 480 volt molded case circuit breaker, with a marked interrupting rating of 100,000 amperes, that was only tested at 8,660 amperes with 480 volts across one pole. This is a serious issue that can be addressed by bringing it to the attention of users so that they can apply these devices within their ratings.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Specific test conditions do not affect the definition of "Interrupting Rating".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3622)

1- 155 - (100-Intrinsically Safe Systems (New)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Add definition of "Intrincically Safe Systems"
Intrinsically Safe Systems. See Article 504.
SUBSTANTIATION: A listing of this major item of the code in Article 100 is essential.
PANEL ACTION: Reject.
PANEL STATEMENT: All references to the term "Intrinsically safe systems" in the Code refer specifically to Article 504 and the definition contained therein. The proposal does not suggest inclusion of the definition in Article 100, but merely refers to the present definition in Article 504.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #347)

1- 156 - (100-Kitchen (New)): Reject
SUBMITTER: Mike Melaney, Moraine Park Technical College
RECOMMENDATION: Add a definition for kitchen to read as follows:
Kitchen. A separate room with permanent means for cooking and food preparation and one or more of the following; 1 sink, dishwasher, trash compactor, refrigerator.
SUBSTANTIATION: 1) Section 210-52(b)(3) requires no small appliance branch circuit shall serve more than 1 kitchen, but there is no definition of a kitchen.
2) In hotel rooms, a dorm refrigerator with a microwave on top could be considered a kitchen which makes the room a dwelling unit requiring more circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "kitchen" is in common use, is well understood, and does not need a definition in Article 100 for proper application of the Code rules.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3789)

1- 157 - (100-Kitchen (New)): Reject
SUBMITTER: John I. Williamson, Minnesota Board of Electricity
RECOMMENDATION: Create a new definition for Kitchen that could be applicable throughout the code.
Kitchen. An area generally designated for storage, preparation, cooking, and serving of food. Cleaning and washing of food equipment and utensils also is conducted in this area.
SUBSTANTIATION: Substantiation - There currently is no definition in the code for "kitchen". The typical dictionary definition for "kitchen" is too ambiguous to be relied on for code application. This proposed definition appears to be correlated with the use of the word "kitchen" throughout the code. Very often the electrical code is relied upon as a stand-alone document in non-building code areas and must include definitions for specific non-electrical terms. Section 210-52(b)(3) states that no small-appliance branch circuit shall serve more than one "kitchen". This new definition will enable authorities having jurisdiction to better differentiate between kitchens and the increasingly common large wet bar areas that may have the "appearance" of being a kitchen.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "kitchen" is in common use, is well understood, and does not need a definition in Article 100 for proper application of the Code rules.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3414)

1- 158 - (100-Labeled): Reject
SUBMITTER: Nicholas T. Abbatiello, Spencerport, NY
RECOMMENDATION: Revise the definition of "Labeled" to read:
"...that maintains periodic inspection of production of labeled equipment and materials or who field evaluates unique equipment and machinery, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner."
SUBSTANTIATION: Many agencies now have "Field Evaluation" programs in which an experienced "Field Engineer" performs an evaluation of the equipment at the manufacturer's site. If the equipment, which is usually utilization type equipment such as industrial machinery, is acceptable, a "Field Evaluation Label" is applied. This machinery is or equipment is a one-of-a-kind and will not be subject to periodic inspections. As the definition of "Labeled" is now written, the "Field Evaluation Label" is technically not acceptable as periodic inspection of production of the labeled equipment is not performed.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel realizes that labeling of field evaluated equipment does not involve periodic inspections, however the panel concludes that the existing definition of Labeled is broad enough that field evaluation is included. It is not necessary to specifically name field evaluation in the definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2208)

1- 159 - (100-Labeled, Listed): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction (approved) and concerned with product evaluation,...
Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction (approved) and concerned with evaluation of products or services,...
SUBSTANTIATION: "Approved" is defined in Article 100 of the NEC as "acceptable to the authority having jurisdiction." By adding this word here parenthetically within these definitions, it gives increased awareness and exposure to the reader of the code emphasizing the meaning of the word "approved" as used in the code.
PANEL ACTION: Reject.
PANEL STATEMENT: The parenthetical use of the word approved adds no additional meaning or clarity to the definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2380)

1- 160 - (100-Liquid, Combustible (New), Liquid, Flammable (New)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Add the following definitions:
Liquid, Combustible: A liquid designated as Class II, III, IIIA, or IIIB, having a flash point at or above 100°F (37.8°C).
Liquid, Flammable: A liquid designated as Class IA, IB, or IC, having a flash point below 100°F (37.8°C) and having a vapor pressure not exceeding 40 psia at 100°F (37.8°C).
Revise the term below as shown, to group the entries alphabetically:
~~Volatile flammable liquid~~ Liquid, volatile flammable.
SUBSTANTIATION: Definitions of these terms would be helpful to Code users, who often seem to be unsure whether the requirements for Class I locations apply to liquids such as jet fuel, diesel fuel, or paint thinner. The definitions proposed are based on those in NFPA 497.
PANEL ACTION: Reject.
PANEL STATEMENT: The controlling document for these definitions is NFPA 30, not NFPA 497. Although technically correct, these definitions are not complete and those requiring a complete defintion should be directed to NFPA 30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4153)

1- 161 - (100-Listed): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or services meets ~~identified~~ appropriate designated standards or has been tested and found suitable for a specified purpose.
SUBSTANTIATION: This was Comment 1-42B in the prior cycle. It restores the wording of the 1996 NEC, which should never have been changed. This wording was put there by one of the greatest UL participants in the NEC process throughout its history. The point remains valid, that listing was meaningless without listing in conformity to the appropriate standard, which needed to be designated by that agency. Now that NFPA has gotten the message and revised Section 3-3.6.1 of the Regulations accordingly, the NEC should follow suit.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the recommended language which is consistent with the definition of listed in the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3135)

1- 162 - (100-Live Parts): Accept in Principle
SUBMITTER: Joseph J. Andrews, Electrical Safety Resources, Inc.
RECOMMENDATION: Revise the definition of "Live Parts" to read:
Live Parts. Electric conductors, buses, terminals or components that are a shock hazard when uninsulated or exposed.
SUBSTANTIATION: The current definition of live parts is very confusing. It reads, "Electric conductors, buses, terminals, or components that are uninsulated or exposed and a shock hazard exists." There are no punctuation marks among the words "uninsulated or exposed and a shock hazard exists." One does not know whether the word "exposed" goes with "uninsulated" or if it goes with "and a shock hazard exists."

Under NFPA 70E, Proposal 70E-48 (which tried to change the definition, but was rejected), the following Committee Statement was made: "The concept of live parts requires two conditions to be present before a part is considered live. Condition no. 1 is uninsulated or exposed. The second condition is where a shock hazard exists." This statement indicates that there should at least be a comma after the word "exposed."

However, even with the addition of a comma, there is still confusion with interpretation of the existing words. This confusion leads to the question, "Are uninsulated bus bars, in an enclosure with its door closed, considered live parts?" Traditionally, the answer would have been "yes." But now, some people are saying "no," with the explanation that uninsulated energized bus bars in an enclosure are not a shock hazard since they are protected from contact by the enclosure. This logic implies that the parts change state from "live" to "not live" depending upon the opening and closing of a door. There is also question about whether or not overhead lines are to be considered "live" since they are usually unreachable by other than qualified persons, and therefore not a normal shock hazard.

At the NFPA 70E meeting on comments in June, 1999, there was a lot of discussion and disagreement about this definition, indicating that there is a need for clarification. The Committee decided not to change the definition because it is now in the NEC, and that the same definition should apply to all NFPA 70 series documents, with the NEC being the lead document (Committee Statement on Comment 70E-10). Based on that statement, change has to be made in the NEC first. The definition now existing in the NEC was proposed and accepted for the 1996 NEC, and was derived from the definition placed in the 1995 edition of NFPA 70E. That definition, in turn, originated in the NEC Manual of Style.

The proposed definition maintains the two conditions stated by the NFPA 70E Committee, while rearranging the words to improve understanding.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 1-163.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #4425)

1- 163 - (100-Live Parts): Accept in Principle

SUBMITTER: Paul Dobrowsky, Holley, NY

RECOMMENDATION: Revise text as follows:

Live Parts. Electric conductors, buses, terminals, or components that are uninsulated or exposed ~~and a shock hazard exists~~.

SUBSTANTIATION: Based on the existing definition, live components placed in an enclosure are no longer considered live parts because a shock hazard does not exist (to the general public). Live parts are typically required to be guarded by enclosure or elevation. Once that is accomplished are they then not considered live parts? An individual in close proximity to live parts that are elevated may be exposed to a hazard. The definition of the components should not change depending on whether they are guarded or not.

PANEL ACTION: Accept in Principle.

Revise proposal as follows: Live Parts. Electric conductors, buses, terminals or components that present a shock hazard while energized.

PANEL STATEMENT: The listed items should be considered "live parts" if they present a shock hazard to anyone regardless of whether they are insulated, uninsulated, enclosed or exposed. This definition meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 1 Macias

EXPLANATION OF NEGATIVE:

MINICK: The new definition is inconsistent with the way the term is now used in the National Electrical Code. The definition as proposed does not add clarification and in fact may be less clear.

(Log #3399)

1- 164 - (100-Location-Dry Location): Reject

SUBMITTER: Brian Spindle, S&A Electric

RECOMMENDATION: Add new text to the definition to read as follows:

"The inside of a raintight raceway which is installed above grade and arranged to drain shall be considered a dry location."

SUBSTANTIATION: 1. Clarification of this point is needed in the body of NEC.

2. Wire need not be dereated in locations which truly are dry.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed definition contains a requirement which is prohibited by Section 2.2.2 of the NEC Style Manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1157)

1- 165 - (100-Luminaire): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for information.

SUBMITTER: William Buckson, Hubbell Lighting Inc.

RECOMMENDATION: Remove the FPN under 410-1 and add the term Luminaire to Chapter 1, Article 100 Definitions, as follows:

Luminaire. A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply.

(See the companion proposal for replacing the terms "lighting fixture, lighting fixtures" and "fixture, Fixtures" with "luminaire, luminaires").

SUBSTANTIATION: 1. Lighting standards that have or are being developed, revised and adopted by the U.S., Canada, and Mexico are utilizing the IES term Luminaire in lieu of the term fixture. This includes the new UL/CSA BI-NATIONAL <u>luminaire</u> standard, which will ultimately replace the UL 1570, 1571, and 1572 standards. (These are the very standards used to evaluate the lighting products required to be Listed and Approved, according to the NEC and verified by the Authorities Having Jurisdiction).

2. The Canadian Electrical Code has used the luminaire term for the last ten years.

3. The Tri-NATIONAL lighting standard currently being developed will be designated as a <u>luminaire</u> standard.

4. The National Electrical Manufacturers Association has recently retitled its "Lighting Fixture Section, to <u>Luminaire</u> Section".

5. The U.S. National Committee's Technical Advisory Group to the IEC is working on exporting U.S. lighting perspectives into <u>luminaire</u> (IEC) standards.

6. There are initiatives underway by both NEMA and the NFPA to promote and solidify the use of the NEC from a global perspective. The NEC and its IEC counterpart, IEC 60364, have recently undergone an equivalency review conducted by UL, NFPA, IAEC, NIST, and NEMA as part of this global strategy.

7. If the NEC is ever to be considered as an International Standard, it must utilize the proper terminology.

8. The FPN under 410-1 denotes that luminaire is an international term. International does not mean European only, international, includes the U.S.

9. The term fixture, is archaic and a misnomer. The term fixture has many meanings and connotations. A fixture could refer to a building part, any type or number of gas, plumbing, machine, electric or appliance components, a familiar element or feature or even an individual that has been in a position for a long time. The term luminaire however, by its very formulation, communicates its meaning in a more clear and succinct manner, reducing the possibility of misunderstanding or misapplication of the term.

PANEL ACTION: Accept in Principle.

Revise the definition to read as follows:.

"Luminaire. A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and ballast (where applicable), and to connect the lamps to the power supply."

PANEL STATEMENT: The panel believes the definition should include reference to ballasts. Refer to CMP-18 for action and removal of the FPN as proposed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #49)

20- 3 - (100-Maximum Water Level (New)): Accept in Principle
NOTE: The following proposal consists of Comment 20-2 on Proposal 1-109 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-109 was:
Add a new definition to read as follows:
Maximum Water Level: The short term flood level upper most rim of a pool, spa, fountain, hydromassage tub and similar installation.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 20 for action in Article 680. This action will be considered by the Panel as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept in Principle.
Provide a new definition to be added to 680-2 to read: "Maximum Water Level. The highest level that water can reach before it spills out."
PANEL STATEMENT: This revised definition clarifies the intent of the submitter. See also Proposal 20-30a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Ryan

(Log #3133)

1- 166 - (100-Metal-Enclosed Power Switchgear (New)): Accept
Note: The Technical Correlating Committee directs the panel to review the use of the word "may" in accordance with 3.1 of the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Christopher Henry, Fluor Daniel
RECOMMENDATION: Add the following definition:
Metal-Enclosed Power Switchgear. A switchgear assembly completely enclosed on all sides and top with sheet metal (except for ventilating openings and inspection windows) containing primary power circuit switching or interrupting devices, or both, with buses and connections. The assembly may include control and auxiliary devices. Access to the interior of the enclosure is provided by doors or removable covers, or both.
SUBSTANTIATION: This definition is taken from IEEE Standard C37.20.2-1993, Section 2.1.9.2. While it is understood that metal-clad and arc-resistant types of switchgear are all metal-enclosed power switchgear, industry commonly uses "metal-enclosed," "metal-clad," and "arc-resistant" as three separate and distinct types of switchgear. The addition of the above definition clarifies what I believe to be the intent of the Code: to include metal-clad and arc-resistant switchgear as types of metal-enclosed switchgear.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #350)

1- 167 - (100-Multi-building Campus-Style Complex (New)): Reject
SUBMITTER: Kenneth W. Birringer, University of Michigan/Rep. Univ. of Michigan Facilities Planning and Design
RECOMMENDATION: Add a definition for multi-building campus-style complex to read as follows:
Multi-building campus-style complex. A group of buildings or a single property and under single management in which a common system of conductors and equipment for the delivery of energy to these buildings is under the same management.
SUBSTANTIATION: A. With the exception of a few sections, the NEC is based on a model of a single utility service supplying a single premises. This proposed change combined with two others provides a means by which the Authority Having Jurisdiction can apply the NEC with consistency to nonutility, inter-building power distribution systems at multi-building campus-style complexes including universities and industrial complexes.
B. In addition, this proposed change provides a definition for the term "multi-building campus-style complex" which was introduced but not defined in Article 695 of the 1996 NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The term is used only in Article 695 and does not warrant a definition in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
ANTHONY: This comment is provided on behalf of the higher education industry in general and for an esteemed colleague in particular. The Panel's substantiation is consistent with past practice in other, similar proposals requesting definitions. I agree with the prevailing sentiment that some judicious compromise on the matter of which definitions should be included in the code must be struck to keep the NEC useable. Admittedly, some definitions that presently appear in this section may not meet the same criterion and probably ought to be removed. If 30-odd revisions to the NEC hasn't yet yielded a definition of "neutral"; the definition of a "multi-building campus-style complex" is not likely to come any time soon. The submitter's point about the need to see in the NEC more articulation of the specific requirements for campus-style facilities is not without merit, however; even if the term remains undefined.

(Log #254)

1- 168 - (100-Neutral (New)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Add the following new definition to read:
Neutral. The state or condition of the common/return conductor, in a multi-wire circuit or system, when the loads on the phase conductors in that circuit or system are balanced.
SUBSTANTIATION: The term "neutral" is loosely and mistakenly used and accepted by the entire electrical industry. Neutral is not the name of a conductor. It is the state of a conductor, the state in which there is no current flow in a common/return conductor. Thus, the common/return conductor of a multi-wire circuit is in a neutral state when the loads on the phase conductors are balanced. But the return conductor of a two-wire circuit can never be in a neutral state because it is always carrying the return current of the phase conductor. Webster says that "neutral" is belonging to a neutral state, having no electrical charge or not aligned with any side. This proposed terminology would be more useful than current code language because it is technically more accurate and it distinguishes the "neutral state" of a conductor whether it is in a circuit where this conductor is intentionally grounded or is used in an ungrounded system.
This proposal relates to two other proposals for definitions namely: Return conductor and Common Return Conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: A neutral conductor remains a neutral conductor whether the load is balanced or not. The substantiation does not demonstrate a need for a definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2758)

1- 169 - (100-Neutral (New)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add definition as follows:
Neutral. A grounded conductor having the same voltage to each ungrounded conductor of the same 3-wire, or 4-wire circuit.
SUBSTANTIATION: Here is a start, although I realize not all neutrals are grounded. The term should be defined in the NEC. CMP 5 will review this same proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: A neutral conductor is not always a grounded conductor and a grounded conductor is not always a neutral conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3004)

1- 170 - (100-Neutral (New)): Reject
SUBMITTER: Rea Hamilton, Abbott Labs
RECOMMENDATION: Add definition for neutral to read as follows:
Neutral. A system or circuit conductor that is intentionally grounded.
SUBSTANTIATION: The common terminology for a grounded conductor is the word neutral and should be added to the code definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: A neutral conductor is not always a grounded conductor and a grounded conductor is not always a neutral conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2833)

1- 171 - (100-Neutral, Neutral Conductor (New)): Reject
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Add a new definition to read as follows:
Neutral, Neutral Conductor. Point or circuit conductor path by which unbalanced currents reenter the source.
SUBSTANTIATION: Attempting to define a neutral that can be accommodated by the NEC has been known to make strong men fall to their knees and women and children weep. Used extensively throughout the electrical industry, it falls into the category of "I know what it is when I see it even if I can not define it". Section 220-22 requires one to calculate it and Article 310 requires one to investigate it as to whether it provides additional heat stress to conductors in a common raceway or cable, yet when queried, it is identified rather lamely as "The middle wire."
It is part of a circuit path but does not have to be grounded in order to perform as intended.
Therefore, it is not correctly identified as the "grounded conductor" [even though it must be grounded, such as in NEC Section 250-20(b)(1) and (2)]. Some grounded conductors may in fact be a deliberately grounded phase conductor of a corner-grounded three-phase three-wire "delta" connected source and are definitely not a "neutral" as those who have touched them accidentally know.
These issues were consulted while developing the proposed words:
310-15(b)4a: Normally balanced currents from one or two or more phases to a conductor common to the single phase or the poly-phases.
310-15(b)4b: Two phases and a common for a "Wye" system that has current in the common conductor approximately equal to the current in the phase or phases supplying line-to-neutral loads.
310-15(b)4c: Three phases from "Wye" systems that has a conductor common to the three phases and the supplied loads cause frequencies to be higher than the source power line 60 Hz even though the load currents may be equal in the phases.
Also:
"Wye" connected capacitor banks where one bank fails.
Faults that return to the source by any path.
Allows for fault currents to return to the source via the neutral path (IEC refers to this as the PEN).
Balancing currents circulating within the source are not neutral currents under this proposal.
Allow for multi-grounded system neutral currents to return to the source.
PANEL ACTION: Reject.
PANEL STATEMENT: This definition does not take into account harmonic currents. The substantiation does not indicate a need for this definition nor does it point out a problem.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2321)

1- 172 - (100-On Site Generator): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new definition to read as follows:
On Site Generator. An on site generator is one that is meant to be the primary source of supply to any service.
SUBSTANTIATION: There is no definition of what an on site generator is, even though it is used in several places in the code including Fire Pumps in NEC 695.
PANEL ACTION: Reject.
PANEL STATEMENT: An on-site generator need not be the primary source of power. Supply to a service is only through connection to the serving utility.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #339)

1- 173 - (100-On-Site Power Production Facility (New) and Standby Power Production Facility (New)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for consideration. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Richard Schneider, Lancaster, SC
RECOMMENDATION: Add the following definitions to 695-2:
On-Site Power Production Facility. (ref. 695-3(a)(2)) A facility producing electric power "on-site" intended to serve as the normal supply of electric power. It differs from standby power production facility in that it is expected to be normally, constantly energized.
Standby Power Production Facility (ref. 695-3(b)) A facility producing electric power "on-site" intended to serve as the alternate supply of electric power. It differs from on-site power production facility in that it is not expected to be normally, constantly energized.
SUBSTANTIATION: Present 695-3(a)(2) uses the term "on-site power production facility" which is undefined in NFPA 70 and NFPA 20 and are applying fire pump controllers erroneously. Authorities having jurisdiction have no present guidance.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "On-site Power Production Facility" only appears in Section 695-3(a)(2) and the term "Standby Power Production Facility" is not contained within the National Electrical Code, therefore, neither term is presently used in two or more Articles. The panel refers this proposal to Code-Making Panel 15 for action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #660)

1- 174 - (100-Oven, Wall-mounted): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 2, 19, and 20 for comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete definition or alternatively, revise:
A separate oven for cooking purposes, ~~and~~ consisting of one or more electric heating elements, internal wiring, and built-in or separately mounted controls, designed and intended for installation in or on a wall or in a cabinet.
SUBSTANTIATION: Present definition is unneeded as the term defines itself, as do other appliances such as electric range, clothes dryer, water heater, etc., which are commonly defined terms. It does not specify whether heating elements are electric (assumed) or gas (not excluded) and doesn't distinguish an oven part of a range.
PANEL ACTION: Accept in Part.
Delete definition of Oven, Wall-Mounted in Article 100.
PANEL STATEMENT: This definition was deleted as this term is commonly understood by both industry and non-industry and does not require a specific definition to be understood in applying NEC requirements. Refer this proposal to CMP-2, CMP-19, and CMP-20.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #661)

1- 175 - (100-Panelboard): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise definition of Panelboard to read as follows:
A single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent devices and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box ~~placed in or against a wall or partition~~ and accessible only from the front.
SUBSTANTIATION: Editorial. The definition infers in or against a wall is the only acceptable mounting for a panelboard. Many are suitably installed on posts or poles, or angle iron or strut assemblies and some are suitable for floor mounting. The UL "white book" does not indicate such restrictions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
DINI: I agree with Mr. Minick's Comment on Negative Vote. The present definition provides guidance to differentiate product application and safety rules between "panelboards" that are generally mounted to a vertical support and "switchboards" that are generally freestanding and mounted to the floor. The "placed in or against a wall or partition" gives the user of the NEC clear permission to place the panelboard enclosure "within any wall" or "against a partition" in a building or in a switchboard application.
MINICK: The present definition provides guidance to differentiate product application and safety rules between "Panelboards" that are generally mounted to a vertical support and "Switchboards" that are generally free standing and mounted to the floor. Panelboards may also be mounted within a switchboard section but the entire list of product application was not intended to be placed in the text. The "placed in or against a wall or partition" gives the user of the NEC clear permission to place the panelboard enclosure "within a wall" or "against a partition" in a building or in a switchboard application.

(Log #4154)

1- 176 - (100-Premises Wiring): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Premises Wiring (System). That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all of their associated hardware, fittings, and wiring devices, both permanently and temporarily installed, that extends from the service point ~~of utility conductors~~ or source of power such as a battery, a solar photovoltaic system, or a generator, transformer, or converter windings, to the outlet(s). Such wiring does not include wiring internal to appliances, fixtures, motors, controllers, motor control centers, and similar equipment.
SUBSTANTIATION: This is a companion proposal to one submitted as part of a comprehensive overhaul of Section 90-2 for the purposes of eliminating conflicts with the NESC. That proposal recognizes an unavoidable political reality, namely, that there are some major industrial players who are using the NESC for their medium voltage campus outdoor distributions, and that they will continue to do so for the foreseeable future. This modification, along with another one covering the definition of service point, establishes the appropriate demarcation, where the two codes interface.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts this recommendation based on the fact that the term "of utility conductors" is redundant.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #318)

1- 177 - (100-Qualified Person): Reject
SUBMITTER: Mark Reese, Nineveh, IN
RECOMMENDATION: Revise definition of Qualified Person to read as follows:
~~One familiar.~~ One who has been formally trained in a nationally recognized program that includes information and hands on experience with the construction and operation of the equipment involved.
SUBSTANTIATION: Ignorance of the basic principals of electrical theory, and the lack of hands on training, can be deadly for the person performing the work. It can also be dangerous for the person performing maintenance.
PANEL ACTION: Reject.
PANEL STATEMENT: Being formally trained in a nationally recognized program is not the only way for as person to become a qualified person. Lack of formalized training also does not mean that a person is ignorant of the basic principals of electric theory.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3800)

1- 178 - (100-Qualified Person): Accept in Principle in Part
SUBMITTER: Jack H. Zewe, Electrical Consultants, Inc.
RECOMMENDATION: Revise Article 100- Definition for a Qualified Person:
Old text: Qualified Person: One familiar with the construction and operation of the equipment and the hazards involved.
Revised test: One who has skills and knowledge of the construction and operation of the equipment and has received specific safety training on the hazards involved.
From OSHA 29 CFR: 1910.332(b)(3)
(3) Additional requirements for qualified persons. Qualified persons (i.e. those permitted to work on or near exposed energized parts) shall, at a minimum, be trained in and familiar with the following:
OSHA 29 CFR 1910.332(b)(3)(I)
(I) The skills and techniques necessary to distinguish exposed live parts from other parts of
electric equipment.
OSHA 29 CFR 1910.332(b)(3)(ii)
(ii) The skills and techniques necessary to determine the nominal voltage of exposed live parts,
and
OSHA 29 CFR 1910.332(b)(3)(iii)
(iii) The safe approach clearance distances specified by OSHA 29 CFR 1910.333 and the
corresponding voltages to which the qualified person will be exposed.
Note 1: For the purposes of OSHA 29 CFR 1910.331 through 1910.335, a person must have
the safety training required in order to be considered a qualified person.
Note 2: Qualified persons whose work on energized equipment involves either direct contact or
contact by means of tools or materials must also have the training needed to meet 1910.333(C)(2)
SUBSTANTIATION: Align the NFPA definition with the requirements of OSHA Electrical Safe Work Practices requirements. The present definition is weak and does not provide guidance on "who" is authorized to work on electrical equipment that may be energized. The OSHA Electrical Safe
Work Practices Training requirements are very specific on "who" and "what" a person must be able to do (SKILLS)to be considered QUALIFIED.
PANEL ACTION: Accept in Principle in Part.
Revise the definition of Qualified Person to read as follows:
"Qualified Person. One who has skills and knowledge related to the construction and operation of the equipment and has received safety training on the hazards involved."
PANEL STATEMENT: It is not necessary to repeat OSHA requirements in the NEC. The panel concludes that safety training is important.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #662)

1- 179 - (100-Raceway): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for information.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise definition of Raceway to read as follows:

Raceway. ~~An enclosed~~ A channel of metal or nonmetallic material designed expressly for holding wires, cables, or busbars, with additional functions as permitted in this code. Raceways include, but are not limited to, rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible conduit, electrical nonmetallic tubing, electrical metallic tubing, underfloor raceways, cellular concrete floor raceways, cellular metal floor raceways, surface raceways, wireways, cablebus, and busways.

SUBSTANTIATION: Editorial. Some raceways are not totally enclosed ("surrounded by") such as lighting busway, trolley busway, and strut-type raceway (Article 363).

Cablebus certainly appears to meet the definition of raceway. A similar Proposal 1-82 in the A92 TCR was accepted; action on Proposal 1-88 in the A95 ROP removed it from the definition. Substantiation for Proposal 1-88 was based on raceways being required to be continuous which would not permit a discontinuity where conductors pass through walls (open conductors) or where they terminate in switchgear to transformer rooms without framework connection to the equipment (transition to open wiring).

However, such transitions are inferred for raceways by Section 300-16 and can be considered a junction point or splicing point as covered in Section 300-18 which doesn't require raceways to be continuous for the entire length of the circuit.

If cablebus is not a raceway there is no provision similar to Section 300-16 for transitions to open wiring.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel concludes that enclosed is important. Removing the term "enclosed" from the definition could include other wiring methods and materials not considered raceways. Including Cablebus would not be consistant with the definition in Article 365. Refer to CMP-8 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1830)

1- 180 - (100-Raceway): Reject

SUBMITTER: Peter Fernandez, Peco Energy

RECOMMENDATION: Add:

"metal poles supporting lighting fixtures."

SUBSTANTIATION: See Article 410, Part D, Section 410-15(b) which indicates that a raceway is "a metal pole used to support lighting fixtures."

PANEL ACTION: Reject.

PANEL STATEMENT: Metal poles supporting lighting fixtures are permitted to be raceways only if the conditions specified in 410-15(b) are met. Otherwise they are not raceways and cannot be included in the definition.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3332)

1- 181 - (100-Remote-Control Circuit): Accept

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBMITTER: Paul Dobrowsky, Holley, NY

RECOMMENDATION: Delete the word "remote" from the definition heading. The heading should be Control Circuit.

SUBSTANTIATION: The word remote is vague and adds no value. How far away is considered remote? If the control circuit and "controlled equipment" is in the same enclosure is it still considered remote?

A similar proposal has been submitted for Article 725.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 2

NOT RETURNED: 1 Macias

EXPLANATION OF NEGATIVE:

DINI: This proposal should be rejected. Code-Making Panel 16, which considered a companion proposal (16-30) to remove the word "remote" from article 725 rejected this idea. They considered the term "remote" to be necessary, the appropriate word, and understood by all.

MINICK: The existing definition is correct. The term "remote" distinguishes control located outside the equipment enclosure from that located inside the enclosure. It should also be noted that Panel 16 rejected companion proposal 16-30 to remove the word "remote" from Article 725.

(Log #255)

1- 182 - (100-Return conductor (New)): Reject

SUBMITTER: Charles M. Trout, Maron Electric Co.

RECOMMENDATION: Add the following new definition to read:

Return Conductor. The conductor in a single two wire circuit or system which is used to carry the load of the phase conductor in that circuit or system back to the source. In a grounded circuit or system, this is the conductor which is intentionally grounded.

SUBSTANTIATION: Too often this conductor is mistakenly referred to as the neutral conductor. It is not a conductor which can be in a neutral state or condition. This conductor is also referred to as the grounded conductor. It is the intentionally grounded conductor in those circuits or systems which are intentionally grounded. Refer to Sections 250-1(1), 250-1(6), 250-21, 250-22, 250-24(d), 250-30(b) and 250-32(c) for circuits or systems which are not required or not permitted to be grounded. Therefore, to refer to the return conductor as the grounded conductor would only be correct if the system or circuit were intentionally grounded. This definition is needed to properly designate respective components of a circuit.

PANEL ACTION: Reject.

PANEL STATEMENT: The term "Return Conductor" is not used in the Code in the sense proposed and therefore does not require a definition. See Panel action on proposal 1-110.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1040)

1- 183 - (100-Separate Circuit (New)): Reject

SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.

RECOMMENDATION: Add a new definition to read:

Separate Circuit. A circuit that has a defined load on the overcurrent device but which permits the return or grounded conductor to be shared with another circuit.

SUBSTANTIATION: The terms "separate circuit" and "dedicated circuit" are used in the National Electrical Code without any difference in meaning between the two terms. I believe definitions should be made to differentiate between these two terms. A circuit can be separate from other circuits in that its overcurrent protective device is designed to protect a defined load. Its return or grounded conductor may be shared with another circuit, if desired, without affecting the purpose of the circuit and its overcurrent protection. See my proposal for new definition for "Dedicated Circuit".

PANEL ACTION: Reject.

PANEL STATEMENT: The term "separate conductor" is not used in the Code in the sense proposed and therefore the proposed definition does not agree with the present use of the term. See panel action and statement on Proposal 1-125.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3123)

1- 184 - (100-Service Equipment): Reject
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: Change:
Article 100 Definitions.
Service Equipment. The necessary disconnecting and overcurrent equipment, usually consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the load end of service conductors to a building or other structure, or an otherwise designated area, and intended to constitute the main control and cutoff of the supply from the service point.
SUBSTANTIATION: This change is necessary to clarify the intent for the main service equipment function. As an example, some transfer switches are manufactured, listed and labeled "suitable for use as service equipment" and contain only a disconnecting device along with necessary grounding provisions for service equipment. Although the listing agency qualifies the equipment in this manner, they do indicate the installation shall meet national and local requirements. The practice typically recognized as the local requirement is that service equipment needs to be comprised of a switch and fuse or circuit breaker to meet the necessary disconnecting and overcurrent function at the load end of service conductors. The service equipment could contain these devices in one enclosure or within grouped enclosures. In outdoor high voltage stations, the devices are grouped within the same switchyard.
This change will mitigate conflicts of installation arrangements with the requirements of authorities having jurisdiction of the electric supply and the National Electrical Code. See supporting 1999 NEC Article 230, Part F, and Section 230-91.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not add anything to the definition of service equipment, but appears to have an objective of placing a requirement for installation of overcurrent devices in the definition. The requirements for service equipment are necessarily included in Article 230.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4155)

1- 185 - (100-Service Point): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Service Point. The point of connection between the ~~facilities of the serving utility and the~~ premises wiring and the facilities of the serving utility, or the facilities of a serving entity recognized by the jurisdiction as having substantially equivalent organizational permanence, engineering supervision, and workforce training.
SUBSTANTIATION: This is a companion proposal to one submitted as part of a comprehensive overhaul of Section 90-2 for the purposes of eliminating conflicts with the NESC. That proposal recognizes an unavoidable political reality, namely, that there are some major industrial players who are using the NESC for their medium voltage campus outdoor distributions, and that they will continue to do so for the foreseeable future. This modification, along with another one covering the definition of premises wiring, establishes the appropriate demarcation, where the two codes interface. Please refer to the proposal on Section 90-2 for more substantiation.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposals 1-10 and 1-11. The existing definition of service point is more appropriate and complements the definition of service. No technical substantiation was submitted that would support the recognition of non-utility entities in installing electrical conductors and equipment without benefit of the requirements of the National Electrical Code. The code panel disagrees that this proposal would eliminate conflicts, if any exist, between the NEC and NESC concerning the definition of service point.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
TROGLIA: This is a companion proposal to Proposal 1-11 (Log #4151) that contains the rationale for use of the service point as the demarcation between supply systems and premises wiring and reconciles the scopes of the NEC and NESC. See my comment on vote on Proposals 1-10 (Log #52) and 1-11 (Log #4151).
COMMENT ON AFFIRMATIVE:
ANTHONY: There is integrity of purpose in this and other related proposals on subjects related to service point. The submitter should be applauded for keeping the debate on the subject lively and healthy.

(Log #1164)

1- 186 - (100-Service-Entrance Conductors, Overhead System): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
"The service conductors between the terminals of the service equipment and a point usually outside of the building, clear of building walls, where usually joined by tap or splice to the service drop."
Or alternatively add:
FPN: There may be no tap or splice where jacketed multiconductor service cable is employed for the service drop and service-entrance conductors.
SUBSTANTIATION: Edit. Where a jacketed multiconductor service cable is employed as a service drop and continues unbroken as service-entrance conductors there is no tap or splice at the transition. I believe this type installation is done in some parts of the country, and recognized by the exception for Section 230-54(e).
PANEL ACTION: Reject.
PANEL STATEMENT: The existing definition has not resulted in any reported misunderstanding. The word "usually" does not add clarity to the present wording. The proposed Fine Print Note is unclear. No technical substantiation was submitted to support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2320)

1- 187 - (100-Standby Source of Supply (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new definition to read as follows:
Standby Source of Supply. A standby source of supply may be any source of supply that is meant to be available should the primary supply system become unavailable.
SUBSTANTIATION: There is some question within the electrical community of what a standby system is. Many feel that if for example, a generator feeds an emergency system, the generator becomes an emergency generator and may not feed any other loads. Others feel that only the system, I.E. emergency, legally required, optional etc, is to be classed as such and the generator in this example, is merely a standby generator.
The purpose of this proposal is to clarify that any redundant source of supply is in fact a standby source of supply.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "standby source of supply" is not used in the Code and therefore does not warrant a definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
ANTHONY: I will only add to the Panel's substantiation by referring the submitter to Chapter 7 and to the Fine Print Notes that contain other references. While "standby source of supply" does not appear, the words "standby source" appear 3 times and "standby" appears some 32 times.

(Log #1935)

1- 188 - (100-Structure): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section IAEI
RECOMMENDATION: Provide the following definition in Article 100: Structure. That which is built or constructed.
SUBSTANTIATION: The above term is used in more than 100 places in the NEC. These places are in more than 15 different articles under the responsibility of several different code panels. Having heard several different opinions from several different code panel members through the years, it seems obvious that to provide uniform interpretation of this term, a definition should be provided.

This is the definition in the proposed 2000 International Building Code which will likely be used by many building inspection departments across the country. This definition would allow the architect and electrical engineer, the general contractor and the electrical contractor and the building inspector and electrical inspector to all use the same definition.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2901)

1- 189 - (100-Structure (New)): Accept in Principle
SUBMITTER: James H. Maxfield, Dover, NH
RECOMMENDATION: Add a new definition to read as follows:
Structure. That which is constructed or built or erected or a portion thereof.
SUBSTANTIATION: The word structure is used throughout the NEC in several locations but is not defined. The definition is intentionally broad so as to include within the NEC everything that is built whether it is constructed solely from electrical components or not. For example, the addition of the definition would clarify the fact that the NEC considers a meter pedestal a structure.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel prefers the definition found in Proposal 1-188. See Proposal 1-188.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4472)

1- 190 - (100-Structure): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Provide the following definition in Article 100 to read:
Structure. That which is built or constructed.
SUBSTANTIATION: The above term is used in more than 100 places in the NEC. These places are in more than 15 different Articles under the responsibility of several different Code Panels. Having heard several different opinions from several different code panel members through the years, it seems obvious that to provide uniform interpretation of this term, a definition should be provided. This definition would allow the architect and electrical engineer, the general contractor and the electrical contractor and the building inspector and electrical inspector to all use the same definition.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that the intent of the submitter is met by the action on Proposal 1-188.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2499)

1- 191 - (100-Subpanel (New)): Reject
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
RECOMMENDATION: Add a definition of "Subpanel" as a panelboard located in the same building as the service equipment that supplies it.
SUBSTANTIATION: The use of the term subpanel seems to be on the increase in many code articles and seminars and while the NEC does not use this word we would then all know what the word meant when it was used.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "subpanel" is not used in the Code and therefore does not warrant a definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2152)

1- 192 - (100-Switching Devices, Circuit Breaker): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise the definition of Switching Devices, Circuit Breaker, as follows:
A switching device capable of making, carrying, and interrupting ~~breaking~~ currents under normal circuit conditions..., and interrupting ~~breaking~~ currents under specified abnormal circuit conditions,...
SUBSTANTIATION: The phrase "breaking currents" should be replaced with the phrase "interrupting currents" for consistency. CMP 1 has previously accepted a similar proposal. See A98-ROP 1-98a (Log #CP108).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
MINICK: The term "breaking" is correct in context of this specific definition and is consistent with current product standards.

(Log #4036)

1- 193 - (100-Telecommunications): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information.
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add:
Telecommunications. Any transmission, emission, and reception of signs, signals, writings, images, and sounds, that is, information of any nature by cable, radio, optical, or other electromagnetic systems.
Adoption of this proposal and associated proposals will effect various Panels and the Correlating Committee. Sections that are effected include:
Communication to telecommunications: 520-5. (a) Exception; 830-10. (d)
Communications to telecommunications: 90-2. (b) 3; 90-2. (b) 4; 90-2 (b) 5; 90-3.; 210-25.; 225-2.; 225-14 (d) 1; 225-14 (d) 2; 225-14 (d) 3; 225-14 (d) 4; 250-4; 250-92. (b) FPN No. 2; 318-3. (a); 328-17.; 328-36.; 336-30 (a) (3); 400-4. (Table 400-4, including note 5 and 11); 501-14.; 501-14 (a); 501-14 (b); 502-14; 502-14 FPN; 502-14 (a); 502-14 (b); 517-30. (c) (3) Exception 2; 517-32. (d); 517-32. (f); 517-40. (a) Exception c.; 517-42 (d); 517-42 (g); 517 F.; 517-80.; 517-80. FPN; 518-4 (a) Exception b.; 530-11. Exception; 604-1.: 604-6 (a) 2. Exception No. 2; 620-36.; 625-17; 640-21 (b); 640-21 (c); 640-42. (b); 640-42. (c); 645-5 (d); 645-5 (e); 645-6 FPN; 700-1 FPN No. 3; 701-2. FPN; 702-2. FPN; 725-54 (a); 725-54 (a) (1); 725-54 (a) (1) Exception 1; 725-54 (a) (1) Exception 2; 725-54 (a) (1) Exception 2 a.; 725-54 (a) (1) Exception 3; 725-54 (a) (1) Exception 4 a.; 725-54 (a) (3); 725-54 (a) (3) Exception 1; 725-54 (a) (3) Exception 2; 725-54 (b) (4); 725-54 (b) (4) Exception; 725-54 (b) (5) c.; 725-54 (b) (5) e.; 725-61 (e) Exception No. 5; 760-54 (a); 760-54 (a) (1); 760-54 (a) (1) Exception No. 1; 760-54 (a) (1) Exception No. 2; 760-54 (a) (1) Exception No. 2 a.; 760-54 (a) (1) Exception No. 3; 760-45 (a) (3); 760-45 (a) (3) Exception No. 1; 760-45 (a) (3) Exception No. 2; 760-54 (b); 760-54 (b) (1); 760-54 (b) (3); 760-61 (d) FPN; 770-4.; 770-52 (a); 770-52 (b) 3.; 770-52 (b) 5.;780-6 (a); 780-6 (b); Article 800 Title; 800-1 FPN No. 3; 800-3; 800-3 FPN; 800-4 FPN; 800-6; 800-7; 800-10; 800-10 (a); 800-10 (a) 1; 800-10 (a) 2; 800-10 (a) 3; 800-10 (a) 4; 800-10 (b); 800-10 (b) Exception No. 2; 800-11; 800-11 (a); 800-11 (c); 800-11 (c) Exception; 800-11 (c) Exception FPN; 800-12 (a); 800-12 (b); 800-12 (c); 800-13; 800-30 (a) FPN No. 1; 800-30 (b) FPN; 800-31 FPN; 800-32; 800-32 FPN No. 1; 800-33; 800-40 (d); E. Title; 800-48; 800-48 Exception; 800-49; 800-50; 800-50 Exception 4; 800-50 Table; 800-50 FPN No. 1; 800-51; 800-51 (a); 800-51 (b); 800-51 (c); 800-51 (d); 800-51 (e); 800-51 (f); 800-51 (h); 800-51 (i); 800-51 (j); 800-51 (k); 800-51 (l); 800-52; 800-52 (a) (1) a.; 800-52 (a) (1) a. 5.; 800-52 (a) (1) b.; 800-52 (a) (1) b. Exception; 800-52 (a) (1) c.; 800-52 (a) (1) c. 1.; 800-52 (a) (1) c. 1. Exception 1; 800-52 (a) (1) c. 1. Exception 2; 800-52 (a) (2); 800-52 (a) (2) Exception No. 1; 800-52 (a) (2) Exception No. 2; 800-52 (d); 800-52 (e); 800-52 (e) Exception; 800-53; 800-53 (a); 800-53 (a) Exception; 800-53 (b); 800-53 (c); 800-53 (d); 800-53 (d) Exception No. 1; 800-53 (d) Exception No. 2; 800-53 (d) Exception No. 3; 800-53 (d) Exception No. 4; 800-53 (d) Exception No. 5; 800-53 (e); 800-53 (f); 800-53 Table; 820-3 (e); 820-3 (f); 820-10 (d) Exception No.2; 820-10 (f) (2); 820-52 (a) (1) a. 3. 820-52 (a) (1) a. 5.; 820-52 (a) (1) b.; 820-52 (a) (1) b. Exception No. 1; 820-52 (a) (2); 820-52 (a) (2) Exception

No.1; 820-52 (a) (2) Exception No. 2; 830 Title; 830-1; 830-1 FPN No. 2; 830-2 Fault Protection Device; 830-2 Network-Powered Broadband Communications Circuit; 830-2 Network-Powered Broadband Communications Circuit FPN; 830-3 (d) 1.; 830-4; 830-4 Table; 830-5; 830-5 Exception 1; 830-5 Exception 2; 830-5 (a); 830-5 (a) (1); 830-5 (a) (2); 830-7; 830-8; 830-9; 830-9 (a); 830-9 (b) 830-9 (b) Exception; 830-10; 830-10 (a); 830-10 (b); 830-10 (c); 830-10 (d) FPN; 830-10 (e); 830-10 (f); 830-10 (f) Exception No.2; 830-10 (g); 830-10 (h); 830-10 (h) Exception; 830-10 (i); 830-10 (i) (1); 830-10 (i) (2); 830-10 (i) (3); 830-10 (i) (4); 830-10 (i) (4) Exception; 830-11 (a); 830-11 (b); 830-11 (b) Exception No. 1; 830-11 (b) Exception 2; 830-11 (c) Exception; 830-11 Table; 830-11 Table Note 5; 830-30 (a); 830-30 (a) Exception FPN No.1; 830-30 (a) Exception FPN No.2; 830-30 (b) 1.; 830-30 (b) 3. FPN; 830-33; 830-33 FPN; 830-40; 830-40 (a) (3); 830-40 (d); 830-42 (a); 830-42 (b); 830 E. Title.; 830-54; 830-55; 830-58; 830-58 (a) (1) a.; 830-58 (a) (1) b.; 830-58 (a) (1) b. 3.; 830-58 (a) (1) c.; 830-58 (a) (1) c. 3.; 830-58 (a) (1) d.; 830-58 (a) (1) d. Exception No. 1; 830-58 (a) (1) d. Exception No. 2; 830-58 (a) (2); 830-58 (a) (2) Exception No. 1; 830-58 (a) (2) Exception No. 2; 830-58 (d); 830-58 Table FPN.

Telephone to Telecommunications: 517-33 (a) 7.; 800-1 the second "telephone" to become "telecommunications"; 800-50 Exception No. 3 FPN No. 1.

Within figures: 760-61; 800-53; 820-53.

SUBSTANTIATION: Telecommunications is a term that is adopted by ANSI in their related standards to identify those transmissions in the proposed definition. Inclusion of this definition will harmonize this Code with other ANSI approved industry standards. This harmonization will provide a common understanding of the relationship between this safety code and performance standards.
PANEL ACTION: Reject.
PANEL STATEMENT: It is premature to make this universal change. The new NFPA Technical Committee on Telecommunication has not adopted a definition of this term. Refer to CMP-16.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2759)

1- 194 - (100-Temporary Wiring (New)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information.

SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add definition as follows:

Temporary Wiring. Approved wiring for power and lighting during a period of construction, remodeling, maintenance, repair, or demolition, and decorative lighting, carnival power and lighting or similar purposes.

SUBSTANTIATION: Extracted text from NFPA 1, 1997, edition, Fire Prevention Code. CMP 3 will review this same proposal. This term should be defined.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed definition includes wiring and equipment that may be part of the permanent electrical installation. Refer to CMP-3 for action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2103)

1- 195 - (100-Unclassified Locations (New)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for information

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add a new definition to read:

Unclassified Locations. Locations which are neither Class I, Division 1; Class I, Division 2, Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2, or any combination thereof.

SUBSTANTIATION: The term "Classified" refers to the type of material/hazard potential involved, i.e., Class I, Division 1, Class II, Division 2, etc. Terms such as nonhazardous and unclassified are used in both the NEC, the Uniform Building Code (UBC) and other NFPA documents. The term nonhazardous infers that the area has "no" hazards while the term "unclassified" more clearly correlates with the condition of being reviewed but found not to need classification. This action provides needed correlation with other NFPA documents, such as NFPA 497. Additionally the term "nonhazardous" is used 7 times within various parts of the NEC and in at lest one place in the NEC the meaning of nonhazardous applies to voltages and not classification. A companion proposal has been made to change the term "nonhazardous" to "unclassified" as appropriate elsewhere in the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: CMP-1 agrees there may be a problem, however, CMP-1 does not believe the definition belongs in Article 100 as the term "unclassified" only relates to Chapter 5. Article 100 does not presently contain the definition of "classified". Refer to CMP-14.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
PRICHARD: A definition for "unclassified locations" is needed. CMP-14 has included this definition in Article 500.

(Log #445)

1- 196 - (100-Volatile Flammable Liquid): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the definition of "Volatile Flammable Liquid" to read:

"A flammable liquid having a flash point below 38°C (100°F), or a flammable liquid whose temperature is above its flash point, or a Class II combustible liquid having a vapor pressure not exceeding 276 kPa (40 psia) (~~276 kPa~~) at 38°C (100°F) whose temperature is above its flash point."

SUBSTANTIATION: The change is to facilitate practical application of the numeric value in SI units. This proposed revision is intended to comply with NFPA 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #362)

1- 197 - (100-Wet Bar (New)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for information.

SUBMITTER: Bob K. Middleton, State of Idaho Div. of Building Safety
RECOMMENDATION: Add a definition for wet bar to read as follows:

Wet bar. A bar for mixing drinks (as in a home) that contains a sink with running water.

SUBSTANTIATION: The code needs to define what a wet bar is. As some authorities having jurisdiction are saying that a counter in a utility room is a wet bar - the receptacle has to be ground fault protected. This was not the intent of the panel.
PANEL ACTION: Reject.
PANEL STATEMENT: The term is used only in Article 210 and does not warrant a definition in Article 100. Refer to CMP-2 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4466)

1- 198 - (100-Wet Bar (New)): Reject

SUBMITTER: David Skeen, Nugent Electric
RECOMMENDATION: To add the definition of a wet bar.
SUBSTANTIATION: None given.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not contain recommended text as required by Section 4-3.3(c) of the Regulations Governing Committee Projects. The proposal does not

contain substantiation as required by Section 4-3.3(d) of the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #321)

1- 199 - (100-Wet Location): Reject
SUBMITTER: James F. Pierce, Intertek Testing Services NA Inc.
RECOMMENDATION: Revise as follows:
Location:
Wet Location: Installations underground or in concrete slabs or masonry in direct contact with the earth, and locations subject to saturation with water or other liquids. ~~such as vehicle washing areas, and locations exposed to weather and unprotected.~~
SUBSTANTIATION: A simplified definition is needed that doesn't rely on a list of examples. Architectural designs vary significantly; therefore, designation of a specific area as a wet location is best left to the authority having jurisdiction who would base the decision on the definition and not a list of examples.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed definition does not improve on the present definition. The panel disagrees that a variable example list of wet locations is not desirable. The present list provides a range of examples to which authorities can compare similar locations that are being considered during inspection procedures.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2209)

1- 200 - (100-1, 100-2 Definitions, 100-10, 100-11): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
100-1. Scope. This article contains only those definitions essential to the proper application of this code...
A. General
100-2. Definitions. Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish,...
B. Over 600 Volts Nominal.
100-10 Application of Definitions. Whereas the preceding definitions are intended to apply wherever the terms are used throughout this code,...
100-11 Definitions. Electronically Actuated Fuse. An overcurrent protective device that generally consists of a control module that provides current sensing...
SUBSTANTIATION: This is the only article within the NEC that is not divided into sections. The NEC Style Manual 2.1.3 states, "Articles are divided into sections and sometimes into parts." By adding these section division and titles, Article 100 will be consistent with every other article in the code.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel intends to follow the NEC style manual as directed by the Technical Correlating Committee.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

Note: The sequence no. 1-201 was not used.

ARTICLE 110 — REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

(Log #446)

1- 202 - (110): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 110-26(a), Exception No. 1, replace "30 in. (762 mm)" with "750 mm (30 in.)".
2. In Section 110-26(a)(2), replace "30 in. (762 mm)" with "750 mm (30 in.)".
3. In Section 110-26(a)(3), replace "6 in. (153 mm)" with "150 mm (6 in.)".
4. In Section 110-26(c) 2nd paragraph, replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
5. In Section 110-26(c) 2nd paragraph, replace "24 in. (610 mm)" with "600 mm (24 in.)".
6. In Section 110-26(c) 2nd paragraph, replace "6 1/2 ft (1.98 m)" with "2.0 m (6 1/2 ft)".
7. In Section 110-26(e) in 2 locations, replace "6 1/2 ft (1.98 m)" with "2.0 m (6 1/2 ft)".
8. In Section 110-26(f)(1)(a), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
9. In Section 110-27(a)(4), replace "8 ft (2.44 m)" with "2.5 m (8 ft)".
10. In Section 110-31 2nd paragraph, replace "7 ft (2.13 m)" with "2.1 m (7 ft)".
11. In Section 110-31 2nd paragraph, replace "6 ft (1.80 m)" with "1.8 m (6 ft)".
12. In Section 110-31 2nd paragraph, replace "1-ft (305 mm)" with "300 mm (1 ft)".
13. In Section 110-31(c), replace "8 ft (2.44 m)" with "2.5 m (8 ft)".
14. In Section 110-32, replace "6 1/2 ft (1.98 m)" with "2.0 m (6 1/2 ft)".
15. In Section 110-32, replace "3 ft (914 mm)" with "900 mm (3 ft)".
16. In Section 110-33(a), replace "24 in. (610 mm)" with "600 mm (24 in.)".
17. In Section 110-33(a), replace "6 1/2 ft (1.98 m)" with "2.0 m (6 1/2 ft)".
18. In Section 110-33(a)(1), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
19. In Section 110-34(a), Exception, replace "30 in. (762 mm)" with "750 mm (30 in.)".
20. In Section 110-54(a), replace "1000 ft (305 m)" with "300 m (1000 ft)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
Revise Item No. 1 and 5 to reflect a soft conversion. The new conversions are as follows:
Item No. 1 is revised from 750 mm to 762 mm.
Item No. 5 is revised from 600 mm to 610 mm.
PANEL STATEMENT: The panel chose a soft metric conversion because the panel considered these critical to safe work clearances.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4457)

1- 203 - (110): Reject
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
RECOMMENDATION: Add the following text:
"...and like locations including the underside of equipment where exposed to moisture."
SUBSTANTIATION: The use of indoor-type connectors on underside of outdoor equipment such as meterbases, AC compressors, and disconnects is common practice. This appears to violate Section 100-3(b), and 90-4 is commonly construed as requiring written authorization. Nevertheless, given that manufacturers do provide for drainage by the way their cabinets' sheet metal does not quite meet at the bottom, the justification for this practice appears to rest on the "like locations" category in this section. However, the other examples are structural. Possible Code change aside, a committee statement on this matter in the ROP would be useful.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal appears to address Article 100 definition of Damp Location. The substantiation suggests an enforcement problem and not a problem with the definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #CP101)

1- 203a - (110-1): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee directs that Code-Making Panel 1 correlate this Proposal with the information in the Technical Correlating Committee Note on Proposal 1-308. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 1
RECOMMENDATION: Add the following to Article 110.
"110-1 Scope: This article covers general requirements for the examination and approval, installation and use, access to and spaces about electrical conductors and equipment."
SUBSTANTIATION: CMP-1 complies with the direction of the TCC and Section 2.2.1 of the Style Manual to add a scope statement to Article 110.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
COX: Recommend adding the following sentence to the Panel Action.
"The Panel recognizes that the Technical Correlating Committee has responsibility over the Scope of Articles and submits this proposal for consideration and recommends approval of the proposed language."

(Log #4314)

1- 204 - (110-3): Reject
SUBMITTER: Scott T. MacDonald, Collyn Ferris, Aquadoor Inc.
RECOMMENDATION: Add the following text:
The location, application, and life expectancy of the safety grounding systems and the determination as to their suitability.
SUBSTANTIATION: a. In real life, the location of bonding clips, grounding clips, and their wires, is often left to the equipment installer. They sometimes cut corners by not removing the paint below a bonding clip or choosing a place that is easy to ground but may not be the best spot due to motion, paint, corrosion, part to part resistance, etc., etc. The bonding/grounding location should be predetermined, if possible, by electrical engineering experts.
b. Application refers to, is this the proper wire, clip, screw, and metal?
c. Life expectancy means, how long will the part last, and should it last as long as the product?
d. The example I can give in my field, pool covers, is many pool cover companies were using aluminum bonding clips that were factory installed over paint. In this situation aluminum bonding clips are not to code and the life expectancy of the clip is very low. This should have been reviewed by the listing company and stopped/corrected before listing.
PANEL ACTION: Reject.
PANEL STATEMENT: The list in Section 110-3 is not intended to be all-inclusive, but examples of evaluation considerations. The concerns of the submitter appear to be covered in the existing list.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2106)

1- 205 - (110-3(a)(1), FPN): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise the second sentence of the fine print note to read:
"Suitability of equipment may be evidenced by listing, labeling, or for specialized or custom designed equipment, by manufacturer's certification, when manufacturer's test data or engineering evaluation are supplied by the owners or installers."
SUBSTANTIATION: Many times during examination of equipment, the manufacturer's test data and engineering evaluations are not in evidence. There have been cases where complete electrical rework has been required instead of evaluating the data and evaluations.
By adding this clarifying sentence to the FPN, the Authority Having Jurisdiction should have a better understanding and consider alternate suitability justifications.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wording does not improve the application of provisions in this Section. The example of listing and labeling merely identifies a source of information upon which the Authority Having Jurisdiction can rely for support of approval of equipment but it does not limit it to that source. Listing and labeling are based on the compliance with recognized product safety standard. The proposed new wording is likely to cause confusion because it can be interpreted to have various meanings. The Authority Having Jurisdiction has the responsibility under the existing Code wording to approve equipment, and as such, has the authority to review applicable data regarding one-of-a kind or custom designed equipment and decide upon approval.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
PRICHARD: The proposal would add a FPN, not a mandatory rule. This could lead some Authorities Having Jurisdiction to at least consider alternate suitability justifications. Many times, the owner or installer can provide manufacturer's test data or engineering evaluations to the Authority Having Jurisdiction.

(Log #1809)

1- 205a - (110-3(b), FPN (New)): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Add a fine print note to read as follows:
FPN: Installation instructions may be provided on a certificate supplied with the apparatus.
SUBSTANTIATION: The IEC 60079 Series of standards, on which the ANSI/ISA S12 series of standards, and ANSI/UL2279 are both based, require a certificate number as part of the apparatus marking. ISA and UL have both taken this requirement out of their versions of the Zone standards. Manufacturers are increasingly asking for certificates as evidence to users that the product is Listed. If the format of the certificate number is consistent between the NRTLs then the users and the AHJs will be able to find the information needed quickly, especially on items such as Ex components. See also proposal on 505(10)(b).
PANEL ACTION: Reject.
PANEL STATEMENT: The existing wording in this section does not prohibit supplying installation instructions on a certificate supplied with equipment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1137)

1- 206 - (110-3(c) (New)): Reject
SUBMITTER: Bob K. Middleton, Rep. State of Idaho
RECOMMENDATION: Add a new Section 110-3(c) to read:
"The receptacles required by this Code shall have the proper voltage and the other equipment required by this Code shall function upon completion of the project."
SUBSTANTIATION: The intent of the Code is that everything shall work when the job is complete, but I can find nothing in the Code that states this.
PANEL ACTION: Reject.
PANEL STATEMENT: The Submitter is referred to Section 90-1(b). Compliance with the provisions of the Code will result in an installation that is essentially free from hazard. Adequacy or performance of the resulting installation is not necessarily contemplated by the Code provisions and is not within the purview of the AHJ.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias
COMMENT ON AFFIRMATIVE:
ANTHONY: This seems to be a perfectly reasonable expectation; that receptacles should be capable of supplying potential to utilization equipment at the completion of a project. One can visualize, however, situations in which operational or contractual situations result in de-engerized receptacles, if only temporarily. If, however, receptacles do not work because of an error in the construction, it should be a signal that a dangerous condition may exist-something completely within the purview of the Authority Having Jurisdiction. The issues are related and the submitter has raised an important point even though not exclusively a "code point".

(Log #2760)

1- 207 - (110-3(c)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add new text:
Permanent wiring abandoned in place shall be tagged or otherwise identified at its termination and junction points as "Abandoned in Place" or removed from all accessible areas and insulated from contact with other live electrical wiring or devices.
SUBSTANTIATION: Electrical fire safety section 3-2.4 in NFPA 1 Fire Prevention Code should be added to NEC 2002.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any substantiation to address such a broad requirement. The establishment and enforcement procedures concerning maintenance requirements and identification of electrical equipment not in use is better left to other codes and documents such as NFPA 1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
ANTHONY: This seems to me to be a modest proposal. It does not require removal of old cable which, while recommended, is not always practical. It simply asks for them to be tagged from this point forward. Furthermore, it is theoretically possible - though, admittedly unlikely - that voltages can be induced in abandoned cables in proximity to energized cables. A combustible material in contact with a live end could pose a fire hazard.

(Log #3895)

1- 208 - (110-4): Reject
SUBMITTER: Joseph Misrahi, PBS&J
RECOMMENDATION: Delete: "The voltage rating of the equipment shall not be less than the nominal voltage of a circuit to which it is connected."
SUBSTANTIATION: In general, motor voltage ratings are less than nominal voltages shown in Article 100.
PANEL ACTION: Reject.
PANEL STATEMENT: The voltage rating of motors falls within the ranges associated with nominal voltages in Voltage Ratings for Electric Power Systems and Equipment (60 Hz), ANSI C84.1. The nominal voltages referenced in Article 100 are examples only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2886)

1- 209 - (110-7): Reject
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Add a new paragraph to the end of section to read as follows:
All equipment rated at 1,000 amperes or more shall be tested in conformance with UL Standard 869, or 891 for insulation breakdown prior to its being energized. This test shall be performed by an independent testing facility or agency approved by the Authority Having Jurisdiction.
SUBSTANTIATION: This section only refers to wiring being free from short circuits or grounds. However, all equipment should be tested for insulation integrity after installation and prior to its being energized. Experience has shown that things occasionally happen to electrical switchboards, panel boards, motor control centers and other similar large pieces of equipment when it leaves the manufacturing facility, until the time it is off loaded at the job site and finally installed. Insulating bushings have cracked, hardware has loosened, insulation integrity can be compromised and not all occurrences have been visible to visual observation or have been detected by the use of a DC meg-ohm meter.
However, an AC high potential test such as the requirements of UL 869, or 891, can pick up these ground faults or shorts. Additionally, much of this large equipment is assembled in the field, leaving chances for tools being left in the equipment, or shavings of metal from phase to ground or any hardware or tools being left in the equipment, and never found until after the equipment is energized. Equipment smaller than 1000 amperes usually does not require field assembly and is more easily transported to its final installation destination. This test required by this proposal are nondestructive and have exposed many problems prior to energization. This has been a requirement in the Phoenix metro area for over 6 years.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation was submitted to warrant a requirement to field test all equipment rated at 1,000 amps or more as outlined in the proposal. Section 110-12 presently addresses the concerns of the submitter. It is not the purpose of the National Electrical Code to establish and limit which product-testing standards may be used. In this case, standards other than those outlined in the proposal may be more appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3641)

1- 210 - (110-9): Reject
SUBMITTER: Jim Brozer, Acton, MA
RECOMMENDATION: Add a new third paragraph to Section 110-9 to read as follows:
"Multi-pole circuit breakers shall have a single-pole interrupting rating sufficient for the nominal circuit voltage and current that is available at the line terminals of the circuit breaker when utilized on corner grounded systems, resistance grounded systems, ungrounded systems and center point grounded delta systems."
SUBSTANTIATION: This new third paragraph is needed to make it clear that multi-pole overcurrent devices, when applied on certain systems, must have an adequate single-pole interrupting rating in order to assure that the circuit will be opened safely.
Single-pole interrupting ratings become critical when full voltage can appear across only one pole. Take for example a resistance grounded system. This type of system is popular with industrials because the first fault to ground is of such a low value that the phase overcurrent devices do not open. The plant continues to run. Maintenance crews plan the shutdown to fix the fault. No unplanned downtime. Unfortunately, some facilities are understaffed, and the original fault to ground may remain for many days or even weeks. When this occurs, it becomes very possible for a second phase to go to ground, thus creating a phase-to-phase fault. This can put full voltage across only one pole of the overcurrent device. It is for a case like this that the single-pole interrupting rating must be adequate. Table 7.1.7.2 of UL 489 provides the only guidance in this area. Single-pole ratings are provided under the "Individual" columns. These are the only short-circuit tests in UL

480 that test for full voltage across one pole. Take for example, a 3-pole, 100 amp, 480 volt molded case circuit breaker. It may have a marked 3-pole interrupting rating of 42,000 amperes but its single-pole rating is only 8,660 amps. This is the one that is circled in the tabled. That's a big difference, big enough to cause a safety concern. This issue can be safely resolved by simply making people aware of the situation, by modifying Section 110-9, so that they can safely apply the devices within their tested limits.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The product standard does not assign a single pole rating to a multipole circuit breaker. The table referenced, 7.1.7.2 of UL489, tabulates the minimum test current values for one of several test sequences of the program, based on the current rating of the circuit breaker. This table is not intended for the maximum short circuit rating of the circuit breaker. The submitter's substantiation describes an installation that does not comply with the requirements of 110-9.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #4007)

1- 211 - (110-9): Reject

SUBMITTER: Robert B. Alexander, Fluor Daniel

RECOMMENDATION: Add text after the first sentence to read:

The available short-circuit current shall be permitted to exceed the interrupting rating of the equipment for not more than two seconds during an automatically controlled, closed transition, power transfer.

SUBSTANTIATION: References:

Proposal 1-174 NFPA 70-A98 ROP.

Proposal 1-175 NFPA 70-A98 ROP.

Comment 1-215 NFPA 70-A98 ROC.

Comment 1-216 NFPA 70-A98 ROC.

Comment 1-217 NFPA 70-A98 ROC.

A reading of the above proposals and comments has left several users in confusion as to the intent of the Panel. Since I was an original submitter, I have been questioned several times as to the Panel's intent. Currently I recommend rating the equipment based on calculated contributions from both sources. I do not believe it is technically necessary, but I do not believe that the current wording can be interpreted otherwise.

I am personally opposed to any manual system of closed transfer; the potential to leave equipment in a dangerous condition is too great.

I take some encouragement that the Panel obviously reread my Proposal 1-175 when rejecting Comment 1-215. The Panel statement simply challenged the two-second interval, but otherwise seemed to accept it. I will attempt to justify it now. The systems that would most commonly use the proposed wording are normally-opened, automatic, secondary selective, distribution equipment. The actual interval of parallel operation during an automatically controlled transition is typically, on the order of 8-16 cycles. This is obviously considerably less than the two seconds suggested. However, the submitter is aware of a few automatic transfer switches that use molded case circuit breakers as the switching devices. The mechanical linkages that control the transfer have enough "slop" that the actual time of the closed transition is a bit less than two seconds.

As pointed out in the original proposal, the transfer itself will not precipitate a downstream fault where the danger is downstream devices being over stressed. The devices used for switching cannot actually see contributions from both sources, whereas downstream devices potentially could. The probability of the concurrent failure required to actually create a dangerous condition is infinitesimal.

Finally, as pointed out in several of the proposals and comments, these are commonly applied configurations in industrial facilities, especially continuous process ones, with a long history of success.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Complex systems design criteria such as closed transition are inappropriate for specific inclusion in the NEC. Existing sections, such as 90-4 may be an appropriate avenue to deal with such issues.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 1 Macias

EXPLANATION OF NEGATIVE:

FLOYD: Proposal 1-211 (Log #4007) brings attention to a design and application issue that is not adequately addressed by product standards and the NEC. Some manufacturers have addressed this performance rating in their product literature, while others have not. From a user's perspective, this proposal will help assure a safe application and installation as noted in the proposal substantiation.

(Log #664)

1- 212 - (110-10): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise penultimate sentence:

This fault shall be assumed to be either between two or more of the circuit conductors or between any <u>ungrounded</u> circuit conductor and ~~the~~ <u>a</u> grounding conductor(s) ~~or enclosing metal raceway.~~

SUBSTANTIATION: Editorial. A grounded circuit conductor is not normally considered for ground faults. "An enclosing metal raceway" is somewhat superfluous, as if it is grounded it will be a grounding conductor, and if ungrounded it is not pertinent to the section.

PANEL ACTION: Reject.

PANEL STATEMENT: The grounded conductor is a current carrying conductor. Deleting the reference to metal raceways may lead to a misintrepretation of this section.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2324)

1- 213 - (110-10): Reject

SUBMITTER: Mark Ptashkin, City of Phoenix, AZ

RECOMMENDATION: Add the following underlined text to the section.

110-10. Circuit Impedance and Other Characteristics. The overcurrent protective devices, <u>conductors,</u> the total impedance, the component short-circuit current ratings, and other characteristics of the circuit to be protected shall be selected and coordinated to permit the circuit-protective devices used to clear a fault to do so without extensive damage to the electrical components of the circuit. This fault shall be assumed to be either between two or more of the circuit conductors, or between any circuit conductor and the grounding conductor or enclosing metal raceway. Listed products applied in accordance with their listing shall be considered to meet the requirements of this section.

SUBSTANTIATION: Due to the absence of the word, the conductors are often overlooked, or passed over when short circuit ratings are addressed for other portions of the circuit. In many cases, the conductors may actually be the weak link in the system, and it should be clearly shown that they must be addressed.

The addition of the word conductors in this paragraph will clearly show that they are to be considered when applying this section as well as making the code more user friendly.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing requirement provides that faults be cleared without extensive damage to the electrical components of the circuit. Conductors are an electrical component of the circuit.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1187)

1- 214 - (110-11): Reject

SUBMITTER: John A. Souza, M&M South Baldwin Electric Co.

RECOMMENDATION: Add new text:

"All surface and flush mounted non watertight switch boards, panelboards, and distribution boards shall be installed no less than 3 ft from any sink where hot water and/or potentially corrosive cleaning agents are to be used."

SUBSTANTIATION: The problem I wish to resolve is the hazardous conditions caused by rust and oxidation promoting materials that may come into contact with panel covers, dead fronts,

bussbars, overcurrent protection terminations, etc. This contact may occur due to steam from hot water or from splashing as chemical agents are poured down drain.
PANEL ACTION: Reject.
PANEL STATEMENT: Compliance with the present requirements of 110-11 would resolve the problem addressed in the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3938)

1- 215 - (110-12(a)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 9 for comment.
SUBMITTER: William F. Laidler, Town of Hanover, MA
RECOMMENDATION: Revise text as follows:
(a) Unused Openings. Unused openings in ~~boxes~~ enclosures, raceways, auxiliary gutters, cabinets, equipment cases, or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment. Where metal plugs or plates are used with nonmetallic cabinets or cutout boxes, they shall be recessed at least 1/4 in. (6.35 mm) from the outer surface.
SUBSTANTIATION: Section 373-4 addresses the procedures for closing unused openings in enclosures only, I have submitted a proposal to strike that entire section and address those requirements in one place. In the interest of creating a more usable and readable code the repetition of information throughout the document should be minimized. The word enclosure in this paragraph is all inclusive and addresses various wiring methods and articles within the code.
PANEL ACTION: Reject.
PANEL STATEMENT: As defined, the term "enclosure" has a broad meaning. The panel concurs that the present wording better conveys the intent of the requirements as it already meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3893)

1- 216 - (110-12(b)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 9 for information.
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Delete this section and move the requirements to Section 370-52.
SUBSTANTIATION: The most significant requirements for subsurface enclosures (manholes) are located in Article 370. Locating this section in Part D of Article 370 should improve the user friendliness of the Code.
A companion proposal has been made for Section 370-52.
PANEL ACTION: Reject.
PANEL STATEMENT: The material referenced includes access to electrical equipment. The panel concludes that the present location of this subject matter best serves the NEC user by remaining in Article 110.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3673)

1- 217 - (110-12(c)): Reject
SUBMITTER: George Ferguson, Eastern Michigan Univ.
RECOMMENDATION: Add text as follows:
110-12(c) Integrity of Electrical Equipment and Connections. External moving and internal parts of electrical equipment, ...or deteriorated by corrosion, chemical action, or overheating. This includes devices, cover plates, hinges, and hardware for enclosure doors. This rule shall apply to those performing or causing the performance the damage or painting of the equipment.
SUBSTANTIATION: There is a great deal of damage and expense occurring because of layers of paint applied to devices, covers, hinges, locks, and other moving parts of electrical equipment. There has been a lot of disagreement between the building owners, electrical inspectors, and electrical contractors of the cost and conditions to remedy this condition. The added wording will help to access responsibility to those responsible and perhaps reduce the problem in the future.
PANEL ACTION: Reject.
PANEL STATEMENT: The problem described in the substantiation is adequately addressed in the second sentence of 110-12(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2048)

1- 218 - (110-12(e) (New)): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a new section to read as follows:
(e) Terminations. Terminations for all electrical connections to devices and equipment shall be torqued as required by the manufacture of such electrical device or equipment.
SUBSTANTIATION: Terminations are not being installed as required by the manufacture and only LISTED electrical devices and equipment require the torquing of terminations of current carrying conductors be shown on the enclosure of electrical equipment.
Adding this section will require all equipment be supplied with the torquing requirements.
PANEL ACTION: Accept in Principle.
Add a new section to read as follows:
"(d) Terminations. Terminations for electrical connections to devices and equipment shall be torqued as required by the manufacturer of the electrical device or equipment."
PANEL STATEMENT: The panel does not necessarily agree with the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
MINICK: Section 110-3(b) currently instructs users to follow all manufacturer instructions included in the listing and labeling of listed and labeled equipment. The intent of the submitter is presently addressed in Section 110-14 and the Fine Print Note. This additional wording is redundant.

(Log #2049)

1- 219 - (110-12(f) (New)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a new section to read as follows:
(f) Seismic Zones. Electrical equipment located in Seismic Zones 2,3, and 4, shall be supported to resist the forces that can be imposed. Supporting requirements shall be designed by a structural engineer and detail drawings shall be available to the authority having jurisdiction.
SUBSTANTIATION: Electrical equipment is presently being installed in areas of seismic zones 2,3, and 4 without this requirement in the codes.
The NEC should require this. The building codes do not adequately cover systems such as electrical.
Electrical systems are the main backbone of any building to allow the people to have time to exit the structure.
Presently installed electrical systems disregard the seismic loads imposed on the electrical installation.
History has shown the number of failures and this section will correct this oversight.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a design issue and is best left to the building structural requirements as imposed through the building codes or other appropriate standards. No technical substantiation was submitted to support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1458)

1- 220 - (110-13): Reject
SUBMITTER: Joseph E. McCann, City of Coral Springs, FL
RECOMMENDATION: Add new text to read as follows:
Electrical equipment mounted overhead (such as transformers suspended on all thread) should be fastened by approved means other than lead shields or anchors.
SUBSTANTIATION: The use of lead shields overhead to mount heavy electrical equipment should be eliminated due to the low melting point of lead 650°. Equipment could fall on to a firefighter while fighting fires.
PANEL ACTION: Reject.
PANEL STATEMENT: Substantiation is insufficient to prohibit the general use of the referenced devices for all overhead electrical installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1678)

1- 221 - (110-13(a)): Reject
SUBMITTER: Terry L. Carlson, Nebraska State Electrical Board
RECOMMENDATION: Add new sentence after first sentence in current text to read as follows:
(a) Electrical equipment likely to require maintenance or servicing shall be mounted at such height and location as to allow safe working access for those persons servicing the equipment.
SUBSTANTIATION: Inspectors find equipment enclosures, fuse disconnects, and circuit breaker enclosures mounted so low to the floor or finished grade that they must get down on their knees or lower in order to inspect them. Anyone who tries to service the equipment after the installation also must lay down in many cases to work on the equipment. This proposal will require the installation to allow safe working access.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 110-26 requires sufficient space and access for safe operation and maintenance of the equipment. A code rule such as this would be too restrictive for such items as switchgear, motor control centers, unit substations, etc.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1048)

1- 222 - (110-14): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 110-14 as follows:
110-14(a) - change "No. 10" to "10 AWG".
110-14(c)(1) - change "Nos. 14 through 1 conductors" to "14 through 1 AWG conductors".
110-14(c)(2) - change "No. 1" to "1 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel has no knowledge of the specific agreement that "AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2505)

1- 223 - (110-14): Reject
SUBMITTER: Gary R. DeLay, Franktown, CO
RECOMMENDATION: Add Table 1.3 Tightening Torques for Screws in Pound-Inches, found in NEC 1999 Handbook under Section 110-14, to the NEC 1999 Code Book. Add table immediately after Section 110-14 or add to the table section of the code book.
SUBSTANTIATION: That information is not readily available on the job site. We have the code book but not the handbook.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC Handbook commentary states, "[this table] ... should be used for guidance only where no tightening information on the specific wire connector is available. It should not be used to replace manufacturer's instructions, which should always be followed." See panel action and statement on Proposal 1-218
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2425)

1- 224 - (110-14(a)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Add a new last sentence to read:
"There shall only be one terminal on a stud post."
SUBSTANTIATION: Instead of using 2, 3, and 4 lug terminals on a single stud post, electricians are using a combination of terminals which result in poor connections, improper surface contact.
PANEL ACTION: Reject.
PANEL STATEMENT: This requirement is too restrictive and may prohibit existing listed products. Many single lug products are presently listed for grouping on a single stud where described in the manufacturers instructions. The present Code requirements prohibit multiple lugs for terminations unless specifically identified for such use.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4156)

1- 225 - (110-14(a)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
(a) Terminals. Connection of conductors to terminal parts shall ensure a thoroughly good connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for No. 10 or smaller solid conductors. Where stranded conductors are terminated on and not looped through such terminals, the terminals shall be identified for such use, or the strands at the terminals shall be made solid.
Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.
SUBSTANTIATION: Surprisingly, it isn't a violation of any listing requirement to used side-wired devices with stranded wire. Normally such devices are used without problems for residential applications with solid wire, but nothing restricts them to such applications. Present product standards don't adequately address the near impossibility of back-wrapping 19-stranded conductors under a screw head, especially on lower quality devices. Take receptacles, for example. At present UL 498 appears to have no testing protocol to adequately assure the containment of stranded wires on binding screw lugs. Paragraph 12.5 simply parrots the present NEC rule under discussion here. Conductors looping through devices are okay because insulation on both sides of the skinned section of wire contains the strands. If necessary, a little work with a soldering tool quickly makes a solid conductor out of a stranded one.
The Panel action in the previous cycle rejecting this language is out of touch with the everyday experience of journeyman electricians. A number of highly qualified individuals have discussed the problem with the standard privately, pointing to the issue of stranding characteristics. They were referring to the fact that the standard was drawn at a time when the stranded conductors typically used with these devices, if stranded wire were ever actually used, would be 7-strand instead of today's 19-strand conductors, which makes the problem even worse today.
The proposal is a properly worded, common sense approach to a real enforcement headache. It will not impose any significant costs on the industry, due to the use of the word "identified." That is intentionally different from "listing;" it allows general recognition in

manufacturer's catalogs which is generally already indicated as a marketing advantage. Over time, UL can phase in a minor revision to the standard with minimal disruption. The wording has been working well in Massachusetts, where it has been in force as code for several cycles.

Finally, to respond to NEMA Comment 1-237, on which the Panel based its final rejection in the 1999 cycle, the NEC contains many product design requirements. There's a good reason for this. The NFPA process is an open, consensus based one, and the UL process is not; UL always agrees that its process is, most emphatically, not a consensus one. Therefore many times the NEC has been used to force a change in a product standard. No apologies offered on that score.

The other issue raised in the NEMA comment had to do with solder and cold flow. This strains the boundaries of common sense. The idea that a stranded conductor with its strands tinned could make a less reliable connection than the same conductor with those same strands free to move around under a screw, however well they may have been twisted, is frankly unbelievable. Should credible substantiation emerge on this point, then the Panel could simply remove the allowance for solder. More to the point, however, is that upon the adoption of this proposal, UL will revise the product standard to provide meaningful termination requirements for these conductors.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal addresses product design requirements and is not appropriate for an installation Code. Provisions that allow field alteration of a listed or unlisted manufactured wiring product with unknown non-standardized materials is not appropriate. The substantiation does not include specific identification of field problems.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1497)

1- 226 - (110-14(c)): Reject

SUBMITTER: Bill Whitlow, Lockwood Greene

RECOMMENDATION: Revise text as follows:

(c) Temperature Limitations. The temperature rating associated with the ampacity of a conductor shall be selected and coordinated so as not to exceed the lowest temperature rating of any connected termination, conductor, or device. ~~Conductors with temperature ratings higher than specified for terminations shall be permitted to be used for ampacity adjustment, correction, or both.~~ Ampacity adjustment and correction shall not be applied in determining conductor ampacity for complying with the termination temperature rating.

FPN: The operating temperature of a conductor in conduit or cable may exceed the temperature rating of the termination to which the same conductor is connected.

SUBSTANTIATION: The second sentence, "Conductors...shall be...used for...adjustment..." is grammatically incorrect and is confusing. The added text more clearly expresses the intent that the ampacity for terminations is to be calculated separately and independent from the ampacity for wire in conduit.

PANEL ACTION: Reject.

PANEL STATEMENT: The Submitter is incorrect in his belief that "ampacity adjustment and correction" shall not be applied in determining conductor ampacity for complying with the termination temperature rating.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3285)

1- 227 - (110-14(c)): Accept

SUBMITTER: James T. Pauley, Square D Co.

RECOMMENDATION: Revise NEC 110-14(c) with the additions (underlined) and deletions (strike through) as shown. The entire text of 110-14(c) is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

(c) Temperature Limitations. The temperature rating associated with the ampacity of a conductor shall be selected and coordinated so as not to exceed the lowest temperature rating of any connected termination, conductor, or device. Conductors with temperature ratings higher than specified for terminations shall be permitted to be used for ampacity adjustment, correction, or both.

(1) Equipment Provisions. The determination of termination provisions of equipment shall be based on (a) or (b). Unless the equipment is listed and marked otherwise, conductor ampacities used in determining equipment termination provisions shall be based on Table 310-16 as appropriately modified by 310-15(b)(1) through (7).

~~(1)~~ (a) Termination provisions of equipment for circuits rated 100 amperes or less, or marked for Nos. 14 through 1 conductors, shall be used only for one of the following.

~~a.~~(1) Conductors rated 60°C (140°F), or

~~b.~~(2) Conductors with higher temperature ratings, provided the ampacity of such conductors is determined based on the 60°C (140°F) ampacity of the conductor size used, or

~~c.~~(3) Conductors with higher temperature ratings if the equipment is listed and identified for use with such conductors, or

~~d.~~(4) For motors marked with design letters B, C, D, or E, conductors having an insulation rating of 75°C (167°F) or higher shall be permitted to be used provided the ampacity of such conductors does not exceed the 75°C (167°F) ampacity.

~~(2)~~ (b) Termination provisions of equipment for circuits rated over 100 amperes, or marked for conductors larger than No. 1, shall be used only for

~~a.~~(1) Conductors rated 75°C (167°F), or

~~b.~~(2) Conductors with higher temperature ratings provided the ampacity of such conductors does not exceed the 75°C (167°F) ampacity of the conductor size used, or up to their ampacity if the equipment is listed and identified for use with such conductors.

(2) Separate Connector Provisions. ~~(3)~~ Separately installed pressure connectors shall be used with conductors at the ampacities not exceeding the ampacity at the listed and identified temperature rating of the connector.

FPN: With respect to Sections 110-14(c)(1), and (2), ~~and (3),~~ equipment markings or listing information may additionally restrict the sizing and temperature ratings of connected conductors.

SUBSTANTIATION: The objective of this proposal is to clear up confusion relative to what ampacities are used to determine the proper conductor size at equipment terminations. When 600V and less equipment is evaluated relative to the appropriate temperature characteristics of the terminations, conductors sized based on Table 310-16 are used. The UL General Information Directory (pages 1 and 2) clearly indicates that the 60C and 75C provisions for equipment have been determined using conductors from Table 310-16. However, if an installer or designer is not aware of the UL guide card information, they may attempt to select conductors based on the Tables other than 310-16. This is especially true if a wiring method is used that allows the use of ampacities such as those in 310-17. This can result in overheated terminations at the equipment. Clearly, the ampacities shown in other tables (such as 310-17) could be used for various conditions that the wiring method is subject to (ambient, ampacity correction, etc.), but the conductor size at the termination must be based on ampacities from Table 310-16.

This proposal does not have any new impact on the equipment or the wiring methods; it simply adds a rule from the listing information into the Code because it is an installation and equipment selection issue.

In addition the proposal provides for a slight renumbering to easily accommodate the reference to the Table and adds titles to the Level 2 subdivision as required by the NEC Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2245)

1- 228 - (110-14(c)(1)): Accept in Principle

SUBMITTER: Steven R. Musial, II, Pittsburgh, PA

RECOMMENDATION: Revise text as follows:

110-14(c)(1) "Termination provisions of equipment for circuits rated 100 amperes or less (after the application of all derating factors), or marked...".

SUBSTANTIATION: It is easy to select the wrong temperature column in Table 310-16 if derating factors are not applied, such as, 1.25 for continuous loads, 0.8 for 4, 5, or 6 current carrying conductors in a conduit or derating for higher than 30°C ambient temperatures.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel believes that the action on Proposal 1-227 meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #665)

1- 229 - (110-14(c)(1)(b); (2)(b); (3)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(1)(b) Conductors with higher temperature ratings, provided the ampacity of such conductors is determined based on the 60°C (140°F) ampacity of the conductor ~~size used~~ for a conductor length not less than 6 ft (1.83 m) from the equipment termination provisions, or
(2)(b) Conductors with higher temperature ratings provided the ampacities of such conductors does not exceed the 75°C (167°F) ampacity of the conductor size used, for a conductor length not less than 6 ft (1.83 m) from the equipment terminations, or up to their ampacity if the equipment is listed and identified for use with such conductors.
(3) Separately installed pressure connectors shall be ~~used with conductors at the ampacities not exceeding the ampacity at the listed and identified temperature rating of the connector~~ listed for use with the number, size, and material of the conductor used and in accordance with their temperature and voltage rating.
FPN: No change.
SUBSTANTIATION: The provisions of this section appear to require the entire length of conductor comply with the ampacity/temperature requirements, whereby higher ampacity/temperature rated conductors cannot be utilized except for correction/adjustment factors. This in effect, does not allow for higher rated ampacities to be used for any part of the circuit far removed from equipment terminations. Prior to inclusion of these requirements in the Code to comply with listing requirements (Section 110-3(b)) some jurisdictions would permit a splice at some distance from the equipment terminations to conductors sized for higher ampacities at their rated temperature, which can result in a smaller size conductor for portions of a circuit. This is economically advantageous and does not negate the reasons for the requirements if the splicing devices are suitably rated.
The proposed 6 ft is arbitrary; if the panel believes the basic premise of the proposal has merit that figure could be adjusted.
Sections 310-15(b)(2) Exception No. 4 and 310-60(b)(1) Exception provide for different ampacity ratings for portions of circuits.
The proposal for (3) is intended for clarity and inclusion of other factors.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #531)

1- 230 - (110-14(c)(1)d): Reject
SUBMITTER: Charles B. Schram, Wilmette, IL
RECOMMENDATION: Revise Section 110-14(c)(1)d by adding "(1)" after the word "provided" in the third line, and by adding the following at the end of the sentence:
"and (2) the terminations for such conductors at the controller meet the provisions of Section 110-14(c)(1)(c)."
SUBSTANTIATION: The substantiation for Comment No. 1-248 in the 1998 NEC ROC referred to "the vast majority of motor control devices" as being suitable for connection of conductors selected on the basis of either 60 Deg. C or 75 Deg. C ampacities. However, this does not include all such devices. There is nothing to prevent listing of motor control devices that do not meet the condition of Section 110-14(c)(1)(c), other than revising the several product safety standards for such devices to force compliance at some time in the future. The proposal is intended only to close the "loophole" provided by the present wording of Section 110-14(c)(1)(d), without necessitating revisions of several product safety standards.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed language is redundant to 110-14(c)(1)(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3845)

1- 231 - (110-14(c)(1)(d)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 11 for information.
SUBMITTER: Terry O'Reilly, Riviera Electric
RECOMMENDATION: Revise text to read as follows:
(d) For motors marked with design letter B, C, D, or E, conductors having an insulation rating of 75°C (167°F) or higher shall be permitted to be used provided the ampacity of such conductors does not exceed the 75°C (167°F) ampacity.
SUBSTANTIATION: For clarity of application this paragraph should also be in Part B of Article 430 or at least to refer you back to Article 110-14(c)(1)(d).
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is virtually identical to the present text of 110-14(c)(1)(d). The substantiation indicates the text should also be included in Article 430 Part B. Refer to CMP-11 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2246)

1- 232 - (110-14(c)(2)): Accept in Principle
SUBMITTER: Steven R. Musial, II, Pittsburgh, PA
RECOMMENDATION: Revise text as follows:
110-14(c)(2) "Termination provisions of equipment for circuits rated over 100 amperes or less (after the application of all derating factors), or marked...".
SUBSTANTIATION: It is easy to select the wrong temperature column in Table 310-16 if derating factors are not applied, such as, 1.25 for continuous loads, 0.8 for 4, 5, or 6 current carrying conductors in a conduit or derating for higher than 30°C ambient temperatures.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that the action on Proposal 1-227 meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1499)

1- 233 - (110-15 (New)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 2, 4, and 9 for comment.
SUBMITTER: Larry D. Wendt, State of Idaho/Rep. I.A.E.I.
RECOMMENDATION: Add the following text:
110-15. High-Leg Marking. On a 4-wire, delta-connected system where the midpoint of one phase winding is grounded to supply lighting and similar loads, the conductor or busbar having the higher phase voltage to ground shall be durably and permanently marked by an outer finish that is orange in color, or by other effective means. Such identification shall be placed at each point on the system where a connection is made if the grounded conductor is also present. On switchboards or panelboards, the "B" phase shall be that phase having the higher voltage to ground. See Section 384-3(f) for phase arrangement of busbars. Other busbar arrangements shall be permitted for additions to existing installations and shall be marked.
Exception: Equipment within the same single section or multisection switchboard or panelboard as the meter on 3-phase, 4-wire, delta-connected systems shall be permitted to have the same configuration as the metering equipment.
SUBSTANTIATION: High-leg marking is a requirement that should be in Section 110 where it would apply to all types of installations instead of to services, feeders, and switchboards and panelboards. The new Section 110-15 will meet the intent of the Code and also simplify it. Please coordinate with the proposals on Sections 210-4(d), 215-8, 230-56, 384-3(e), and 384-3(f).
PANEL ACTION: Accept in Part.

Accept the first two sentences of the proposal to read as follows:
"110-15. High-Leg Marking. On a 4-wire, delta-connected system where the midpoint of one phase winding is grounded to supply lighting and similar loads, the conductor or busbar having the higher phase voltage to ground shall be durably and permanently marked by an outer finish that is orange in color, or by other effective means. Such identification shall be placed at each point on the system where a connection is made if the grounded conductor is also present."
Reject the balance of the proposal.
PANEL STATEMENT: That part of the proposal after sentence two, including the exception is rejected because it does not address high-leg marking, relates only to switchboard and panelboard configuration, and should continue to be addressed in 384-3(f). Refer to CMP-2, CMP-4, and CMP-9 for comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1743)

1- 234 - (110-15 (New)): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: New text.
110-15 Razor Sharp Edges. Electrical equipment shall be designed installed and maintained that users, installers and maintenance personnel will not be likely to come into contact with razor sharp edges.
SUBSTANTIATION: Some equipment is manufactured or modified in the field that the installer or users of the equipment come into contact with razor sharp edges. Often cutting there fingers or hands. Some examples are punched or cut enclosures and knockouts that leave a razor sharp edge near the front of the enclosure that one has to reach over or by to work on or in the equipment. Please see similar proposal to 373-10 (d).
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not address an electrical hazard and is not consistent with the stated purpose of the Code in Section 90-1(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2563)

1- 235 - (110-15 (New)): Accept in Principle
NOTE: The Technical Correlating Committee directs the panel to change "residential" to "dwelling" to comply with current word usage. In addition, the Technical Correlating Committee directs the panel to use the proper metrication in the text. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Ray A. Jones, Electrical Safety Consulting Services, Inc. (ESCS, Inc.)
RECOMMENDATION: Add the following new section:
110-15. Flash Protection. For other than residential occupancies, switchboards, panelboards, loadcenters and motor control centers shall be marked in the field to indicate the incident energy in calories per square centimeter for a worker at a distance of 18 in.
SUBSTANTIATION: Significant number of electricians are being seriously burned and often killed from an accidental electrical flash while working equipment "hot." Most of these serious accidents can be eliminated or significantly reduced if the electricians wear the proper type of protective clothing. If switchboards, panelboards, loadcenters, and motor control centers were individually marked with the incident energy, the personnel would easily know what type of protective clothing to wear, because its rating is based upon the available incident energy in calories per square centimeter. These calculations can easily be made by an engineer or a knowledgeable contractor by using a formula which was presented in an IEEE paper by R.L. Doughty, T.E. Neal, and H.L. Floyd II, "Predicting Incident Energy to Better Manage the Electric Arc Hazard on 600 V Power Distribution Systems", Record of Conference Papers IEEE IAS 45th Annual Petroleum and Chemical Industry Conference, September 28-30, 1998. This formula also appears in the 2000 edition of NFPA 70E, Electrical Safety Requirements for Employee Workplaces. The formula is $E_{MB} = 1038.7 D_B^{1.4738} t_A [0.0093F^2 - 0.3453F + 5.9675]$
Where E_{MB} = incident energy from a box in cal/cm^2
D_E = Distance from arc in inches. Assume 18 inches for this calculation.
t_A = Arc duration in seconds
F = Bolted fault short circuit current
These requirements do not include residential occupancies because the available short circuit current is generally low enough so as not to be of a major concern.
PANEL ACTION: Accept in Principle.
Add the following new section:
"110-16. Flash Protection. Switchboards, panelboards, and motor control centers installed in other than residential occupancies shall be marked in the field to indicate the incident energy in calories per square centimeter for a worker at a distance of 18 in.
FPN: See NFPA 70E-2000, Electrical Safety Requirements for Employee Workplaces for calculation methods and charts related to incident energy."
PANEL STATEMENT: The term "loadcenter" was removed since it it did not appear in Article 384. The FPN was added to give further direction to the user. The panel concludes the revised proposal meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 1 Macias
EXPLANATION OF NEGATIVE:
MINICK: The requirement is not enforceable and will not improve electrical safety. The three published methods of calculating incident energy result in considerably different values. This would create a dilemma for the authority having jurisdiction in trying to enforce some specific value. In addition, the FPN refers to NFPA 70E-2000 for calculation methods. NFPA 70E-2000 only contains one reference on how to perform the calculation of incident energy and this is a non-enforceable (informative) annex. The NFPA 70E committee specifically placed this material in an informative annex because of the variation in calculation methods. Furthermore, the incident energy value has little meaning to the electrical worker.
Process industries, such as pharmaceuticals, typically must work on "hot" equipment. This is recognized as a serious problem, but the proposed solution does not provide a suitable answer. The NFPA 70E committee is addressing this problem and it would be better to wait for the experts in this area to devise a solution that can be added to NFPA 70E, rather than the more general NEC.
COMMENT ON AFFIRMATIVE:
ANTHONY: Acceptance of this proposal is a bold stroke on behalf of electrician safety. It could be a very costly addition to the NEC, however, if it raises engineering costs for building owners. Applying this proposal could be as simple as computing short circuit at the service entrance and using it as the maximum fault current at all panels throughout the building. On this basis, protective gear for electricians could be selected.
Applying this proposal could also get much more complicated if investigations into comparative arc duration times of protective devices need to be investigated. Fault current distribution profiles may need to be determined in very large buildings. It also favors protective devices that open circuits based upon rate of change in current; namely, fuses. Thus, the proposal has the potential for being quite controversial in many quarters of the industry. Nevertheless, at this stage in the code-making process, it is better to err on the side of safety. I hope for lively and engaging debate on this subject in the ROC stage of 2002 NEC.

(Log #315)

1- 236 - (110-18): Reject
SUBMITTER: Charles J. McKnight, Indianapolis, IN
RECOMMENDATION: Add the following text to 110-18:
These parts shall be marked as to the hazard and these markings shall be of sufficient durability to withstand the environment involved.
SUBSTANTIATION: This will help to readily identify hazards and help to prevent possible injuries.
PANEL ACTION: Reject.
PANEL STATEMENT: The determination that arcing parts exist can be made without the need for marking all such equipment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #6)

1- 237 - (110-22): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for comment.

NOTE: The following proposal consists of Comment 1-281 on Proposal 1-268 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-268 was:

Revise the 2nd paragraph as follows:

"Where circuit breakers or fuses are applied in ~~compliance with~~ series combination ratings ~~marked on the equipment by the manufacturer~~, the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating."

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: The proposal should be accepted in principle. Revise the first sentence of the second paragraph of that section to read as follows:

"Where circuit breakers or fuses are applied in ~~compliance with~~ series combination ratings ~~marked on the equipment by the manufacturer~~, or otherwise in compliance with the provisions of Section 240-83(c), the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating."

SUBSTANTIATION: This comment is a companion to one made on Proposal 10-110 which did indeed make the change cited by the proposal submitter. CMP 1 must now correlate these two provisions. This comment should be accepted provisionally based on continued CMP 10 acceptance of the other proposal in some form, as now seems likely. This wording allows correlation between the two sections without needing to know in exactly what form the revision in Section 240-83(c) emerges, which we can't really tell at this point. My companion comment suggests a more restrictive form, and the split panel vote and Correlating Committee note suggests that this is a work in progress.

PANEL ACTION: Accept in Principle.

Revise the first sentence of the second paragraph to read as follows:

"Where circuit breakers or fuses are applied in compliance with the provisions of Section 240-86 for series combination ratings, the equipment enclosure(s) shall be legibly marked at each piece of equipment to indicate the equipment has been applied with a series combination rating."

Remove the FPN.

PANEL STATEMENT: The panel concludes that this revised wording meets the intent of the submitter. Refer to CMP-10 for comment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #667)

1- 238 - (110-22): Accept in Principle

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Identification of Disconnecting Means. Each disconnecting means ~~required by this Code~~ for motors and appliances, and each service, feeder, or branch circuit ~~at the point where it originates~~ shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident.

(remainder unchanged)

SUBSTANTIATION: The syntax does not make this rule clear. The heading refers to disconnecting means but "at the point where it originates" appears to refer to the service, feeder, or branch circuit supply connection point. For services, and conductors installed under tap rules the disconnect will not usually be at the originating point of the circuit and may be a substantial distance away. For example Section 240-21(b)(5) permits unlimited tap length on the supply side of the disconnecting means. Identification of the disconnect is a higher safety priority than the originating point of the circuit. Identification of disconnects which are not required by the Code is just as important as they perform the same function and many times are the most accessible and operated devices. The unintended operation of a disconnecting means due to lack of identification can have serious consequences.

PANEL ACTION: Accept in Principle.

Revise the first paragrah to read as follows:

"110-22. Identification of Disconnecting Means. Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved."

The remainder of this section is addressed in the panel actions of Proposals 1-237 and 1-241.

PANEL STATEMENT: The panel concludes that the revised wording satisfies the concerns of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2325)

1- 239 - (110-22): Accept in Principle

SUBMITTER: Mark Ptashkin, City of Phoenix, AZ

RECOMMENDATION: New text to be added is underlined.

"Where circuit breakers or fuses are applied in compliance with the series combination ratings marked on the equipment by the manufacturer, the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating. This marking shall be required at each piece of equipment that is part of a series combination system. The marking shall be readily visible and state the following:"

SUBSTANTIATION: The intent of this proposal is to clearly require that a label or other suitable means must be applied at all equipment that is part of a series rated system. For example it a 65/10 series rated system is installed (65 k upstream device, 10 k downstream device) a label indicating that it is part of a series rated system must be applied at both locations. If it is part of a "3 tier" system a label is required at all 3 locations. This will clarify that all pieces of a series rated system should be clearly marked so that any individual replacing or repairing devices or equipment is notified that they must use identified replacement components.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel believes that the action on Proposal 1-237 meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2884)

1- 240 - (110-22): Accept in Principle

SUBMITTER: George J. Ockuly, Cooper Bussmann

RECOMMENDATION: Delete the words "by the manufacturer" from the first sentence of the second paragraph.

SUBSTANTIATION: This change to the text is required to correlate with my proposal for 240-86. Marking by the manufacturer may not be possible for older systems that may be perfectly usable when properly protected by current-limiting devices. For example, some manufacturers of switchgear are no longer in business, but their equipment is still perfectly usable.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel believes that the action on Proposal 1-237 meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3257)

1- 241 - (110-22): Reject

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise the second paragraph of 110-22 with the addition (underlined) as shown. The entire text is shown for clarity, but only those changes shown underlined are part of this proposal.

Where circuit breakers or fuses are applied in compliance with the series combination ratings marked on the equipment by the manufacturer, the equipment enclosure(s) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating. The marking shall be readily visible and state the following or equivalent:

CAUTION - SERIES COMBINATION SYSTEM
RATED ____ AMPERES. IDENTIFIED
REPLACEMENT COMPONENTS REQUIRED.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Reject.

PANEL STATEMENT: The term "equivalent" is vague, subjective and can lead to misleading words intended to identify a possible hazard. Refer to the new NEC Style Manual, Section 3.2.1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2213)

1- 242 - (110-23 (New)): Reject

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

RECOMMENDATION: Add the following new text in the General Section of Article 110:

110-23. Flame or fire tests. Where not a part of a flame or fire tested cable assembly, or not installed in metallic raceways, or not installed in a flame or fire tested nonmetallic raceways, individual conductors where required shall meet applicable flame or fire test. Additionally, wire and cable products shall meet applicable requirements in following applications:

(1) Cables installed in construction Types III, IV, and V. Cables installed in Types III, IV, and V constructions shall meet a vertical flame test.

FPN No. 1: Building construction types are defined in NFPA 220 - 1998, Standard on Types of Building Construction, or the applicable building code, or both.

FPN No. 2: Vertical flame test is defined in UL 1581 - 1997, Reference Standard for Electrical Wires, Cables, and Flexible Cords. Products such as Types NM, SE, UF, etc. meet the requirements of this test.

(2) Cables installed in construction Types I and II; in cable trays; and in ducts, plenums, and other spaces not used to transport environmental air. Cables utilized in a construction Types I and II, in cable trays, and in ducts, plenums, and other spaces not used to transport environmental air shall meet a vertical tray flame test.

FPN No. 1: Building construction types are defined in NFPA 220 - 1998, Standard on Types of Building Construction, or the applicable building code, or both.

FPN No. 2: Vertical tray flame test is defined in UL 1685 - 1997, Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. Products such as Types AC, TC, MC, etc. meet the requirements of vertical tray flame test in this standard. Products marked for "limited smoke" meet the requirements of vertical tray flame test and smoke-release measurements in this standard.

(3) Cables installed vertically in shafts. Cables installed vertically in shafts shall meet a large-scale fire test for riser cables.

FPN: Large-scale fire test for riser cables is defined in UL 1666 - 1997, Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts. Types CL3R and CL2R, shown in Table 725-61, are examples of riser cables that meet the requirements of this test.

(4) Cables installed in ducts, plenums, and other spaces used to transport environmental air. Cables installed in ducts, plenums, and other spaces used to transport environmental air without the cables being enclosed in raceways in those spaces shall be capable of meeting a large-scale fire test for plenum cables.

FPN: Large-scale fire test for riser cables is defined in UL 910 - 1998, Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables used in Spaces Transporting Environmental Air. Types CL3P and CL2P, shown in Table 725-61, are examples of plenum cables that meet the requirements of this test.

SUBSTANTIATION: [Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively, in this Code. This is a general proposal that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of phrase "flame tested" or "fire tested" informs the user that the product shall be tested against the requirements for a specific flame test or fire test and directs the user's attention to seek further understanding about the given product's performance.

This proposal reflects the current relationship between the requirements in the Code and the applicable product standards for wire and cable products that are recognized in the Code. It is proposed to add this section in the general section of this article because the requirements for flame or fire test can be either product specific, or construction specific, or application specific. For example, flame test requirements for types of conductors recognized in Table 310-13 is covered in the applicable product standards for each type. Construction specific requirements can match the flame test performance requirement with type of building construction. Application specific requirements for installations in vertical risers and plenum spaces used for environmental air require products that can meet the applicable fire tests for their suitability in such applications.

Also, requirements for flame or fire tests for other products, where required, can be added in this section in the future.

Insulation and jacketing materials used with conductors and cables are required to provide necessary electrical, mechanical and flame or fire test performance in accordance with the requirements of the Code and the applicable product standards. In general, any improvement in one of these properties comes at the expense of the other two properties. This recommendation may facilitate harmonization of codes and standards. Also, it can promote development of cables that can deliver improved performance in all three properties whereby the insulation on conductor provides improved electrical and mechanical performance along with needed flame test performance. The overall assembly, on the other hand, can be designed and manufactured such that it provides improved mechanical and flame or fire test performance along with needed electrical performance. The overall product may have less smoke and less toxicity than products used today, which is a desirable goal.

Referencing of other NFPA standards and the test standards in the Fine Print Notes is in accordance with the latest editions of the NFPA Manual of Style and NEC Style Manual.

PANEL ACTION: Reject.

PANEL STATEMENT: The term "flame retardant" is used throughout the Code as a means of expressing to the user that the cables resist the spread of flames, albeit the test methods are often not defined. The term "flame tested" would be similarly undefined but can be understood to mean a test which does not necessarily measure the ability of a cable to resist the spread of flame-propagation (which is implied by "retardant"). Propagation is of paramount importance for conductors and cables. The Fine Print Notes in the proposal are not accurate in all cases in reflecting the flame test requirements in the product standards. Some articles of the NEC offer suggestions for the tests appropriate for the required level of flame retardance. Other articles rely on the product standards to provide such information. The panel suggests that specific proposals be made wherever the generic reference to "flame retardant" is not sufficient.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2213a)

6- 3 - (110-23 (New)): Reject

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

RECOMMENDATION: Add the following new text in the General Section of Article 110:

110-23. Flame or fire tests. Where not a part of a flame or fire tested cable assembly, or not installed in metallic raceways, or not installed in a flame or fire tested nonmetallic raceways, individual conductors where required shall meet applicable flame or fire test. Additionally, wire and cable products shall meet applicable requirements in following applications:

(1) Cables installed in construction Types III, IV, and V. Cables installed in Types III, IV, and V constructions shall meet a vertical flame test.

FPN No. 1: Building construction types are defined in NFPA 220 - 1998, Standard on Types of Building Construction, or the applicable building code, or both.
FPN No. 2: Vertical flame test is defined in UL 1581 - 1997, Reference Standard for Electrical Wires, Cables, and Flexible Cords. Products such as Types NM, SE, UF, etc. meet the requirements of this test.
(2) Cables installed in construction Types I and II; in cable trays; and in ducts, plenums, and other spaces not used to transport environmental air. Cables utilized in a construction Types I and II, in cable trays, and in ducts, plenums, and other spaces not used to transport environmental air shall meet a vertical tray flame test.
FPN No. 1: Building construction types are defined in NFPA 220 - 1998, Standard on Types of Building Construction, or the applicable building code, or both.
FPN No. 2: Vertical tray flame test is defined in UL 1685 - 1997, Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. Products such as Types AC, TC, MC, etc. meet the requirements of vertical tray flame test in this standard. Products marked for "limited smoke" meet the requirements of vertical tray flame test and smoke-release measurements in this standard.
(3) Cables installed vertically in shafts. Cables installed vertically in shafts shall meet a large-scale fire test for riser cables.
FPN: Large-scale fire test for riser cables is defined in UL 1666 - 1997, Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts. Types CL3R and CL2R, shown in Table 725-61, are examples of riser cables that meet the requirements of this test.
(4) Cables installed in ducts, plenums, and other spaces used to transport environmental air. Cables installed in ducts, plenums, and other spaces used to transport environmental air without the cables being enclosed in raceways in those spaces shall be capable of meeting a large-scale fire test for plenum cables.
FPN: Large-scale fire test for riser cables is defined in UL 910 - 1998, Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables used in Spaces Transporting Environmental Air. Types CL3P and CL2P, shown in Table 725-61, are examples of plenum cables that meet the requirements of this test.
SUBSTANTIATION: [Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively, in this Code. This is a general proposal that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of phrase "flame tested" or "fire tested" informs the user that the product shall be tested against the requirements for a specific flame test or fire test and directs the user's attention to seek further understanding about the given product's performance.
This proposal reflects the current relationship between the requirements in the Code and the applicable product standards for wire and cable products that are recognized in the Code. It is proposed to add this section in the general section of this article because the requirements for flame or fire test can be either product specific, or construction specific, or application specific. For example, flame test requirements for types of conductors recognized in Table 310-13 is covered in the applicable product standards for each type. Construction specific requirements can match the flame test performance requirement with type of building construction. Application specific requirements for installations in vertical risers and plenum spaces used for environmental air require products that can meet the applicable fire tests for their suitability in such applications.
Also, requirements for flame or fire tests for other products, where required, can be added in this section in the future.
Insulation and jacketing materials used with conductors and cables are required to provide necessary electrical, mechanical and flame or fire test performance in accordance with the requirements of the Code and the applicable product standards. In general, any improvement in one of these properties comes at the expense of the other two properties. This recommendation may facilitate harmonization of codes and standards. Also, it can promote development of cables that can deliver improved performance in all three properties whereby the insulation on conductor provides improved electrical and mechanical performance along with needed flame test performance. The overall assembly, on the other hand, can be designed and manufactured such that it provides improved mechanical and flame or fire test performance along with needed electrical performance. The overall product may have less smoke and less toxicity than products used today, which is a desirable goal.
Referencing of other NFPA standards and the test standards in the Fine Print Notes is in accordance with the latest editions of the NFPA Manual of Style and NEC Style Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: Cables are listed for their flame retardant properties and some of their applications are referenced in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GANATRA: The panel should have either Accepted or Accepted in Principle this proposal. Proposal reflects the existing installations in the US and Canada. Panel Action could be to add a definition in Article 310:
"Flame Retardant. Where specified, products meet this requirement in accordance with the applicable product standard."
COMMENT ON AFFIRMATIVE:
GALAN: In addition to the information stated in the Panel Statement, it should be noted that the second sentence of proposed Paragraph 110-23, as written, allows for a conductor which is installed in a raceway to be exempt from a flame test. This goes against the present philosophy of the NEC. This would allow a construction, such as USE cable, which does not comply with a flame test and is presently not Listed, for installation inside a building, to be used throughout a building. UL's Guide information for Service-Entrance Cable states "Types USE and USE-2 are not suitable for use in premises or aboveground except to terminate at the service equipment or metering equipment." Sections 338-2 and 338-4(b) indicate that USE is not for use inside a building. Presently, all single conductor building wires (e.g., XHHW, RHW, THWN, and THW) must comply with a flame test. This proposal would allow for that to change, which is a step backward.

(Log #4345)

1- 243 - (110-23 (New)): Accept
SUBMITTER: Robert B. Alexander, Fluor Daniel
RECOMMENDATION: ADD a new section to read
Current Transformers. Unused current transformers, associated with potentially energized circuits, shall be short circuited.
SUBSTANTIATION: Section 450-1 Exception 1 specifically exempts current transformers from consideration in the rest of Article 450.
Open circuited current transformers can cause lethal voltages and fires. CTs not actively used in control, measurement or protection of potentially energized circuits should be short circuited.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3312)

1- 244 - (110-24 (New)): Reject
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Add a new Section 110-24 to read as follows:
110-24. Identification of Receptacles. Receptacles installed on a branch circuit shall be legibly marked to identify the disconnecting means for the branch circuit.
SUBSTANTIATION: To safely perform maintenance at a receptacle outlet, the circuit should be disconnected from the source of supply. Identifying the branch circuit disconnecting means at the receptacle will prompt personnel to recognize that the branch circuit disconnect must be open before beginning work at the receptacle outlet. This requirement in conjunction with identification of the disconnecting means in Section 110-22 provides easily accessible information that will result in an increased level of safety for personnel working at a receptacle outlet.
PANEL ACTION: Reject.

PANEL STATEMENT: This requirement seems extreme. Receptacles associated with a particular disconnect can be referenced at the disconnect.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1505)

1- 245 - (110-26): Accept in Principle
SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text as follows:
110-26. Spaces About Electrical Equipment. Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment. Enclosures housing electrical apparatus that are controlled by lock and key shall be considered accessible to qualified persons. ...
(f) Dedicated Equipment Space. Equipment within the scope of Article 384, and motor control centers, shall be located in dedicated spaces and protected from damage as covered in (1) and (2).
Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.
(1) Indoor. For indoor installations, the dedicated space shall comply with the following.
a. Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of 6 ft (1.83 m) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, or equipment foreign to the electrical installation shall be located in this zone.
Exception: Equipment that is isolated from the foreign equipment by height or physical enclosures or covers that will afford adequate mechanical protection from vehicular traffic or accidental contact by unauthorized personnel or that complies with b., shall be permitted in areas that do not have the dedicated space described in this rule.
b. Foreign Systems. The ~~space~~ area above the dedicated space required by 110-26(f)(1)(a), may contain foreign systems provided protection is installed to avoid damage from condensation, leaks, or breaks in such foreign systems. ~~equal to the width and depth of the equipment shall be kept clear of foreign systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign systems. This zone shall extend from the top of the electrical equipment to the structural ceiling.~~
c. Sprinkler Protection. Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section.
d. Suspended Ceilings. A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.
(2) Outdoor. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in Section 110-26(a). No architectural appurtenance or other equipment shall be located in this zone.
SUBSTANTIATION: The wording between Sections 110-26(f)(1)(a) and 110-26(f)(1)(b) is unclear and confusing and could be in conflict with each other with the intent of the requirements. The proposed changes to the wording should clarify the confusion and potential conflict. This establishes that there is a truly dedicated space and that only the space above 6 feet above the equipment, if any, to the structural ceiling may have foreign systems installed only if the foreign system meets the requirements of having protection installed for the electrical equipment due to leaks, condensation, or breaks.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposal 1-271a meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1744)

1- 246 - (110-26): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise as follows:
110-26 (e) Headroom. The minimum headroom of working spaces about service equipment, switchboards, panelboards, or motor control centers shall be 6 ft (1.98 m). Where the electrical equipment exceeds 6 ft (1.98 m) in height, the minimum headroom shall not be less than the height of the equipment. Headroom shall be maintained from equipment to outside the building.
Exception: Service equipment or panelboards, in existing dwelling units, that do not exceed 200 amperes.
SUBSTANTIATION: This will make it clear that the headroom is to be maintained until a person is outside and free of any and all obsticals.
PANEL ACTION: Reject.
PANEL STATEMENT: Headroom is required above the working space. Headroom outside the work spaces is beyond the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2924)

1- 247 - (110-26): Accept in Principle
SUBMITTER: Frank Pologruto, Rep. IBEW L.U. 98
RECOMMENDATION: Add a paragraph to 110-26 to read:
"Electrical equipment rooms with transformers that have a rating of 750 kVA or greater shall have doors that swing out into egress, equipped with panic hardware."
SUBSTANTIATION: In the last three code cycles, proposals to add this device to be included in the National Electrical Code. The response that was generated by the comments on proposals was indeed a concern for safety for electricians working in these electrical rooms.
I personally experienced a ground fault explosion of an electrical transformer where the entire building was put out of service, the personnel in the room had trouble getting out of the room due to the door being shut and had difficulty turning the door knob.
The panel statement suggested that this proposal be submitted to the Life Safety Code, however, the verbal response from the Life Safety Code was the same as the NEC. With safety in mind one can only be bewildered by a negative response from both the NEC and the Life Safety Code.
The unfortunate aspects of this proposal is that we have to submit a casualties count in order to get our point across. This proposal should belong in the National Electrical Code, especially if the Section 450-43(c) requires doors that swing out and equipped with panic bars, the panel can certainly see the need to change their position on panic bars in electrical rooms.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that Proposal 1-260a addresses the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4427)

1- 248 - (110-26): Accept in Principle
SUBMITTER: Alan Chessman, Flag Electric
RECOMMENDATION: Add the following text:
All electric closet doors shall be installed with a panic bar so as to aid escape in case of emergency.
SUBSTANTIATION: I was in such a situation where a piece of electrical switchgear caught on fire. My partner and myself were caught in the electric room and when it filled with smoke we had to crawl out to the door. When we got to the door we tried to open it, but when I tried to pull on the door I could not get it open. It was a push open door, but with all of the smoke I could not tell that. Luckily for my partner and myself someone heard the explosion and opened the door to let us out. If there had been a panic door I could have gotten out with ease and my life would not have been in danger.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that Proposal 1-260a addresses the submitters concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4451)

1- 249 - (110-26(a)): Accept in Principle
SUBMITTER: Jennfier G. Lambert, Long Electric
RECOMMENDATION: Add the following text:
In office buildings, hospitals, schools, and all other public buildings where electrical equipment is housed in a separate room, the exit door shall be equipped with a crash bar type exit for the safety and security of qualified persons working in these areas.
SUBSTANTIATION: In the unfortunate event of a panel fire, explosion, or other emergency in these specified rooms, the person or people (if burned, electrocuted) can quickly escape the hazardous area.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that Proposal 1-260a addresses the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #447)

1- 250 - (Table 110-26(a)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 110-26(a) to read as follows.
(Table shown below)
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show the SI units as the preferred and inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Editorially added Condition No. 1 heading. Incorporated the proposed table in this proposal into Proposal 1-252a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3003)

1- 251 - (Table 110-26(a)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Revise first sentence as follows:
Exposed live parts on one side and exposed live parts on other side of working space effectively guarded by suitable insulating materials or exposed live parts on both sides effectively guarded by suitable insulating materials.
SUBSTANTIATION: A clarification of "no live or grounded parts" is presented to minimize any confusion.
PANEL ACTION: Reject.
PANEL STATEMENT: The present text is clear and the proposal represents a misunderstanding of the requirements by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2097)

1- 252 - (Table 110-26(a) Note): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add at the start of each Condition before the words (exposed live parts) the following words (the enclosure or)
Condition 1 — The enclosure or exposed live parts on one side and no live or grounded parts on the other side of the working space, or the enclosure or exposed live parts on both sides effectively guarded by suitable wood or other insulating materials. Insulated wire or insulated busbars operating at not over 300 volts to ground shall not be considered live parts.
Condition 2 — The enclosure or exposed live parts on one side and grounded parts on the other side. Concrete, brick, or tile walls shall be considered as grounded.
Condition 3 — The enclosure or exposed live parts on both sides of the work space (not guarded as provided in Condition 1) with the operator between.
SUBSTANTIATION: The main section refers to the enclosure but the conditions do not.
By adding these words will correlate the main requirement to the conditions.
This will make the notes more understandable.
Appears that the intent is to require the enclosure to the conditions but does not state in conditions.

Table 110-26(a) Working Spaces

Nominal Voltage to ground	Minimum Clear Distance Condition 1	Condition 2	Condition 3
0-150	900 mm (3 ft)	900 mm (3 ft)	900 mm (3 ft)
151-600	900 mm (3 ft)	1 m (3 1/2 ft)	1.2 m (4 ft)

Note: Where the conditions are as follows:

Conditions 1, 2 and 3 remain unchanged.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the additional wording does not add clarity to the requirements. Refer to Proposal 1-252a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #CP102)

1- 252a - (110-26(a)(1)): Accept
SUBMITTER: CMP 1
RECOMMENDATION: Revise text as follows:

(1) Depth of Working Space. The depth of the working space in the direction of live parts shall not be less than ~~indicated~~ that specified in Table 110-26(a), ~~except where~~unless the requirements in (a), (b), or (c) are met. Distances shall be measured from the exposed live parts ~~if such are exposed~~,or from the enclosure or opening if ~~such~~ the live parts are enclosed.

Table 110-26(a) Working Spaces

Nominal Voltage to ground	Minimum Clear Distance Condition 1	Condition 2	Condition 3
0-150	900 mm (3 ft)	900 mm (3 ft)	900 mm (3 ft)
151-600	900 mm (3 ft)	1 m (3 1/2 ft)	1.2 m (4 ft)

Note: Where the conditions are as follows:
Conditions 1, 2 and 3 remain unchanged.

~~Exception No. 1:~~ (a) Dead-front assemblies. Working space shall not be required in back or sides of assemblies, such as dead-front switchboards or motor control centers, ~~where there are no renewable or adjustable parts, such as fuses or switches, on the back or sides and~~ where all connections and all renewable or adjustable parts, such as fuses or switches, are accessible from locations other than the back or sides. Where rear access is required to work on ~~de-energized~~ non-electrical parts on the back of enclosed equipment, a minimum horizontal working space of 762 mm (30 in.) ~~horizontally~~ shall be provided.
~~Exception No. 2:~~ (b) Low voltage. By special permission, smaller working spaces shall be permitted where all uninsulated parts ~~are at a voltage~~ operate at no greater than 30 volts rms, 42 volts peak, or 60 volts dc.
~~Exception No. 3:~~ (c) Existing buildings. In existing buildings where electrical equipment . . . [no change to balance of text]
SUBSTANTIATION: The substantiation for this panel proposal is as follows:
a.) To minimize the use of exceptions and express Code requirements in positive language as required by 3.1.4 of the NEC Style Manual.
b.) To incorporate metric changes into Table 110-26(a).
c.) To substitute the word non-electrical for de-energized in 110-26(a)(1) for clarity.
d.) To retain the soft metric conversion of 30 inches equals 762 mm in Section 110-26(a)(1) for safety reasons to avoid reducing the work space.
e.) To incorporate some of the material from Proposals 1-254 and 1-287 and 1-250.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2853)

1- 253 - (Table 110-26(a)(1) Note 2 (New)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Add a new Note 2 to Table 110-26(a) and renumber existing the Note 2 to Note 3.
New Note 2:
In all (3) conditions the minimum clear distance shall be increased to permit at least 90 degree opening of enclosures with hinged doors or hinged panels without touching any parts of the opposite side. For enclosures with sliding doors or removable panels the requirements of Table 110-26(a) remain unchanged.
SUBSTANTIATION: This note is required to cover installations where the width of a hinged door or a hinged panel is more than the minimum clear distance of Table 110-26(a).
PANEL ACTION: Reject.
PANEL STATEMENT: The concern of the submitter is addressed in existing Section 110-26(a)(2). Also, there is no substantiation for increasing the work space dimension.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3258)

1- 254 - (110-26(a)(1), Exception): Accept in Principle
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise NEC 110-26(a)(1) Exception No. 1 with the additions (underlined) and deletions (strike through) as shown. The entire text of 110-26(a) Exception No. 1 is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
Exception No. 1: Working space shall not be required in back or sides of assemblies, such as dead-front switchboards or motor control centers, where there are no renewable or adjustable parts, such as fuses or switches, on ~~the~~ that back or sides and where all connections are accessible from other required working space. ~~locations other than the back or sides.~~ Where rear access is required to work on de-energized parts on the back of enclosed equipment, a minimum working space of 30 in. (762 mm) horizontally shall be provided.
SUBSTANTIATION: 110-26(a)(1) Exception 1 was revised in the 1999 cycle by adding "or sides" following the word "back" to indicate that working space is also not required at the sides when certain criteria is met. This was a little too simplistic. The last phrase of the first sentence ("… accessible from locations other than the back or sides.") could be interpreted to indicate that you can only eliminate side or back working space when everything is accessible from the front.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that the action on Proposal 1-252a meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #397)

1- 255 - (110-26(a)(2)): Reject
SUBMITTER: Michael J. Hartley, Rep. IBEW Local 292
RECOMMENDATION: Revise 110-26(a)(2) to read as follows:
(2) Width of Working Space. The width of working space in front of the electric equipment shall be the width of the equipment or 30 in. (762 mm) whichever is greater. It shall also be kept a minimum of 12 in. away from any wall perpendicular to equipment. In all cases...
SUBSTANTIATION: With room getting taken away consistently by architects from the electrical rooms, I am more and more seeing panels stuffed into room corners making a front on view of breaker landing spots almost impossible to do without compromising safety of the wireman.

PANEL ACTION: Reject.
PANEL STATEMENT: The proposal seems to address location of equipment rather than the width of the work space. There is no substantiation presented for increasing the width of the work space beyond the present requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2805)

1- 256 - (110-26(a)(2)): Reject
SUBMITTER: Bud Swathwood, Bud Swathwood Consulting
RECOMMENDATION: Add sentence to paragraph (2) to read:
In addition to the space for the 90 degree opening of the door there shall be 6 in. space more than the width of the door and the opposite wall or boundry.
SUBSTANTIATION: This addition will make it clear that there must be enough space allowed for large doors especially, to open easily. Some installers leave only enough room for the doors to open and sometimes scrape the opposite wall or "bind" when opened. This addition will also help to meet the OSHA standard 1910.303 (g) (i) (1)(i).
PANEL ACTION: Reject.
PANEL STATEMENT: The concern of the submitter is addressed in existing Section 110-26(a)(2). Also, there is no substantiation for increasing the work space dimension.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4157)

1- 257 - (110-26(a)(2) Exception No. 2): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise Exception No. 2 as follows:
Exception No. 2: By special permission, smaller spaces may be permitted (1) where it is judged that the particular arrangement of the installation will provide adequate accessibility; or (2) where all uninsulated parts are at a voltage no greater than 30 volts RMS, 42 volts peak, or 60 volts dc.
SUBSTANTIATION: This proposal restores the 1993 NEC permission for the inspector, by special permission, to allow clearance reductions where "the particular arrangement of the installation will provide adequate accessibility." The lack of this language routinely sends inspectors off into Section 90-4, which is far less desirable, and which doesn't even invoke special permission. The special permission process is appropriate in the many instances where clearances cannot quite be obtained.
I can remember granting special permission under this rule in a case where the clearance to part of the panel front was 36 inches, but due to an unusual opposing wall construction, another part of the panel only had 33 inches of clearance (36 inches was required). Here, the fact that the opposing wall was wood, and that the space was very well lit, and the fact that not allowing the location would have dramatically escalated the cost of the job without significantly increasing safety, all combined to make my decision fairly easy. Another example involved spacing between a 24-ft switchboard lineup and an opposing masonry wall. Yes, there was the required 42 in., except where a 6 ft by 4 ft air intake grille protruded into the room 1 1/2 in. due to an oversight. With the degree of qualified maintenance and supervision involved at this facility, again the inspector had a clear conscience in not requiring reconstruction of the room at negligible safety benefit.
In the real world, inspectors have to confront these problems and make decisions based on the total picture. The Code should resume allowing this sort of latitude instead of making officious bureaucrats out of the inspectors who have to live with these decisions. This permission continues very successfully in Massachusetts by state rule since it dropped from the 1996 NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel understands that the referenced section is 110-26(a)(1), Exception No. 2. The panel reaffirms that this provision is covered by 90-4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #373)

1- 258 - (110-26(a)(3)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
Meters, recorders, and similar apparatus that are installed as an integral part of listed equipment shall be permitted to extend not more than 12 in. (305 mm) beyond the front of the electrical equipment.
SUBSTANTIATION: The allowance for a 6 in. intrusion into the work space appears to be concerned with associated equipment such as small transformers, wireways or gutters, and the like although "equipment" (apparatus) may be construed to include watt-hour meters, etc. Such meters in separate sockets or part of a combination panelboard for smaller services are generally 6 in. or less in depth. However watt-hour, kilovar, etc. meters mounted on some switchboards and panelboards may have a depth exceeding 6 in. Work space measured from the face of such apparatus could be interpreted to require an increase in the required space fromt he switchboard enclosure for the entire length of the equipment per (a)(2).
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not included any substantiation of an actual field problem.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #648)

1- 259 - (110-26(a)(3)e): Reject
SUBMITTER: Bruce Fairweather, Electrical Safety Inc.
RECOMMENDATION: New subparagraph 1. Branches from busways installed in accordance with section 364-8 (b) and retractable cable containers shall maintain a minimum headroom clearance of 6 and 1/2 feet between the drop cable connector or the container and the floor.
SUBSTANTIATION: Many industrial plants have setup and test stations that require equipment to be tested prior to packaging and shipping. In my surveys of these sites I find numerous cases where the length of the vertical bus drop cable from the strain relief is quite long encroaching into what would otherwise be walking space and aisle. The encroachment has resulted in head injuries when an employee comes in contact with the dangling connector. There doesn't appear to be specific language anywhere on minimum headroom clearance for bus drop cable or retractable cable assemblies. This should provide it.
PANEL ACTION: Reject.
PANEL STATEMENT: The problem described is not related to required working space about electrical equipment covered by this Section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4471)

1- 260 - (110-26(b)): Reject
SUBMITTER: Roy Mundt, Miller-Eads Electrical Contractors
RECOMMENDATION: Recommend that crash bars be put on all electrical closets so that no knobs have to be turned in case of an emergency.
SUBSTANTIATION: If one person is in an electrical closet and something goes wrong they must find the knobs and turn. But if crash bars were installed all you have to do is hit the bar with any part of your body and you're out the door.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not contain recommended text as required by Section 4-3.3(c) of the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #CP103)

1- 260a - (110-26(c)): Accept
SUBMITTER: CMP 1
RECOMMENDATION: Revise as follows:
(c) ~~Access and~~ Entrance to Working Space. ~~At least one entrance of sufficient area shall be provided to give access to the working spaces about electrical equipment.~~
(1) Minimum Required. At least one entrance of sufficient area shall be provided to give access to the working space about electrical equipment.
(2) Large Equipment. For equipment rated 1200 amperes or more and over 1.8 m (6 ft) ~~(1.83 m)~~ wide that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to the required working space not less than 610 mm (24 in.) ~~(610 mm)~~ wide and 2.0 m (6_ ft) ~~(1.98 m)~~ high at each end of the working space. Where the entrance has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.
A single entrance to the required working space shall be permitted where either of the conditions in (a) or (b) are met.
~~Exception No. 1:~~ (a) Unobstructed exit. Where the location permits a continuous and unobstructed way of exit travel, ~~one means of access~~ a single entrance to the working space shall be permitted.
(b) Extra working space. Where the depth of the working space is twice that required by 110-26(a), a single entrance shall be permitted. It shall be located so that the distance from the equipment to the nearest edge of the entrance is not less than the "Minimum Clear Distance" specified in Table 110-26(a) for equipment operating at that voltage and in that condition.
~~Exception No. 2: Where the work space required by Section 110-26(a) is doubled, only one entrance to the work space is required. It shall be located so the edge of the entrance nearest the equipment is the minimum clear distance given in Table 110-26(a) away from such equipment.~~
SUBSTANTIATION: The substantiation for this panel proposal CP103 is as follows:
a.) To minimize the use of exceptions and express Code requirements in positive language as required by 3.1.4 of the NEC Style Manual.
b.) Incorporate metric changes.
c.) Retained the soft metric conversion of 24 inches equals 610 mm in Section 110-26(c)(2) for safety reasons to avoid reducing the opening to the required workspace.
e.) Incorporated some of the material from Proposals 1-247 and 1-287 and 1-250.
f.) The panel recognizes that the safety of workers who are exposed to energized conductors is of great concern. The revision will limit the application of the requirement for panic hardware to personnel doors to workspaces where doors are provided.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #668)

1- 261 - (110-26(c) and Exception No. 1): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add to second paragraph:
"Width determination shall be applied to contiguous equipment supplied by a common set of conductors."
Revise Exception No. 1 to read as follows:
Exception No. 1: Where the location permits a continuous and unobstructed way of exit travel without passing through the required work space one means of access shall be permitted.
SUBSTANTIATION: Width should be indicated to apply to the width totality of separate equipment where installed side-by-side (with side panels) and individually fed from above or through nipples between equipment sides by the same set of conductors. This is essentially the same as one equipment.
The exception may have contemplated an exit travel at right angles from equipment, but can be construed as permitting exit travel parallel to equipment and within required work space. In a U-shaped configuration of equipment, one entrance at the open end would be at "each end" and technically conform to the exception, or may be interpreted as complying with Exception No. 2. If an electrical mishap occurs at the entrance (exit) end a person would have to exit near the occurance.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes the present language is clear. Requirements for access to work space are not dependent on the nature of supply to the equipment. Exiting the working space through the required means of access may well require traveling through the workspace.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1456)

1- 262 - (110-26(c)): Reject
SUBMITTER: Daniel McIntyre, Town of Westwood, MA
RECOMMENDATION: Insert "400 ampere".
Delete "1200 ampere or more and over 6 ft wide."
(c) Access and Entrance to Working Space. At least one entrance of sufficient area shall be provided to give access to the working space about electric equipment.
For equipment rated ~~1200 amperes or more and over 6 ft (1.83 m) wide~~ that contains overcurrent devices, switching devices, or control devices, there shall be one entrance not less than 24 in. (610 mm) wide and 6 1/2 ft (1.98 m) high at each end of the work space.
SUBSTANTIATION: Residential homes with 400 ampere and larger services, are installing generator backup power, requiring large transfer switches to be installed and in some cases in very restricted access locations.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation provided is insufficient to justify the proposed change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2887)

1- 263 - (110-26(c)): Accept in Principle in Part
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Add new paragraph at the end of Section 110-26(c) after Exceptions No. 1 and 2 to read as follows:
All rooms or spaces as described in Section 110-26(a), dedicated to electric equipment, shall have all doors open outward. Such doors shall be a minimum of 24 in. (610 mm) wide and 6-1/2 ft (1.98m) high.
SUBSTANTIATION: Electrical equipment less than 1200 amps does not require any specific size of access and entrance to working space. There is also no requirement to be able to exit the working space after a person enters. If an emergency occurs, there will not be adequate access for emergency teams. If the entrance or access door opens inward and slows down emergency egress during a fault the severity of burns and bodily injury a person may receive is directly related to the distance a person is away from the faulting equipment. An inward opening door restricts that exiting speed and increases the possibility of more severe injuries.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The panel rejects the "all rooms" requirement as being overly restrictive. The panel believes that panel Proposal 1-260a partially addresses the submitter's concern of egress. The substantiation does not totally support the recommendations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2888)

1- 264 - (110-26(c)): Reject
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Add a new paragraph at the end of Section 110-26(c) after Exceptions No. 1 and 2 to read as follows:
Access and Entrance to Working Space.
For electric equipment having hinged doors or panels, a clear means of egress shall be provided when doors or panels are open in any position. Such means of egress shall not be less than 24 in. (610 mm) in width.
SUBSTANTIATION: This requirement allows for emergency egress from electrical equipment when the door or panels block the means

of access or egress. Since 24 in. is required as a means of access it is unclear when this clearance is required, with or without the doors open. There have been many times equipment has been installed close to walls or other equipment that when the doors are open the access and egress space is reduced or eliminated. This clear path is essential during emergencies.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal would, in effect, require an increase in size of the work space. There is no substantiation that work spaces need to be larger than those required in Table 110-26(a). The situation described by the submitter is best addressed by safe work practices.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3846)

1- 265 - (110-26(c)): Accept in Principle
SUBMITTER: Lanny McMahill, Phoenix, AZ
RECOMMENDATION: Add the following text:
Entrance doors shall open outward from the working space. Such doors shall be not less than 24 in. (610 mm) wide and 6-1/2 ft (1.98 m) high.
SUBSTANTIATION: The possibility of a door opening into a working space can create a potential unsafe condition for service personnel. Requiring the doors to open outward from the working space eliminates this problem. Sufficient area is not defined in the Code. Requiring a minimum size door clarifies sufficient area.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that the submitter's concerns are addressed in Proposal 1-260a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4459)

1- 266 - (110-26(c)): Reject
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
RECOMMENDATION: Add the following text:
At least one entrance of sufficient area , providing a continuous and unobstructed way of exit travel, shall be provided.
SUBSTANTIATION: "Sufficient area" is a difficult judgment call, which is most likely why the language guidance for the NEC discourages the use of terms such as "sufficient." In dealing with equipment rated less than 1200 amperes, the presently-required space is adequate for the actual work. However, even aside from the fact that it can be reduced by setting down a panelboard cover, it is marginally adequate for flinching and meaningless in terms of the need to flee. I can prevail upon customers to clear the required working space. It will help, though, to have a section that says, "See to it that you can get at your fuse box when there is urgent need. See to it that I don't have to clamber over cardboard boxes that stand between the 30 inches by three feet if I need to get away from your panel without moving like a crab sideways." To get at the fuse box of one lady in her mid-80's, I had to crawl through a structure that once had been a wall-in-the-making, consisting of vertical two-by-fours on 16 inch centers with a horizontal, firestop type bracing member between them about three feet up. Was the area adequately illuminated? A judgment call. I couldn't say no with absolute certainty, until I stood in front of the panel, where I couldn't help but block the light with my body. Based on her experience in changing fuses (actually, in having others change fuses--she just couldn't get at them) she offered me a candle! Was all this absurd? Yes. Illegal? Not explicitly. Other cases are harder to call, but still dangerous.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement is to assure access to the work space. Requiring and maintaining a path through the building is not within the Scope of the NEC Committee. The problem addressed may best be handled by the use of safe work practices or housekeeping.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4473)

1- 267 - (110-26(c)): Reject
SUBMITTER: Glenn Soles, Clark County Building Dept., NV/Rep. Southwestern Section IAEI
RECOMMENDATION: Add a new paragraph at the end of section 110-26 (c) after Exceptions No. 1 and No. 2 to read as follows:
"Access and Entrance to Working Space. For electric equipment having hinged doors or panels, a clear means of egress shall be provided when doors or panels are open in any position. Such means of egress shall not be less than 24 inches (610 mm) in width."
SUBSTANTIATION: This requirement allows for emergency egress from electrical equipment when the door or panels block the means of access or egress. Since 24" is required as a means of access it is unclear when this clearance is required, with or without the doors open. There have been many times equipment has been installed close to walls or other equipment that when the doors are open the access and egress space is reduced or eliminated. This clear path is essential during emergencies.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal would, in effect, require an increase in size of the work space. There is no substantiation that work spaces need to be larger than those required in Table 110-26(a). The situation described by the submitter is best addressed by safe work practices.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #301)

1- 268 - (110-26(d)): Accept in Principle
SUBMITTER: Vincent Metallo, Sr., Baltimore County, MD
RECOMMENDATION: Revise 110-26(d) to read as follows:
Additional lighting fixtures shall not be required where the work space is illuminated by an adjacent light source (or as permitted by 210-70(a)(1) Exception No. 1.
SUBSTANTIATION: Many times panels are located in habital rooms of dwelling units. The lighting requirements for these rooms can be met by a switched controlled receptacle by 210-70(a)(1) Exception No. 1. Inspectors are requiring lighting fixtures in front of these panels even if these rooms have a switched controlled receptacle. If 210-70(a)(1) Exception No. 1 provides proper illumination for the room, then it provides proper illumination for a panel in this room.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel agrees with the submitter's substantiation, but chose to make the recommended addition in Proposal 1-269. The panel believes that the submitter was addressing the second sentence only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #669)

1- 269 - (110-26(d)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence:
Additional lighting outlets ~~fixtures~~ shall not be required where the work space is illuminated by an adjacent light source.
SUBSTANTIATION: Editorial. The definition of lighting outlet includes provisions for a lampholder or pendant cord terminating in a lampholder, which are apparently not considered lighting fixtures, per se. Present wording infers if additional lighting is required, lampholders are not permitted.
PANEL ACTION: Accept in Principle.
Revise Section 110-26(d) to read as follows:
"(d) Illumination. Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, or motor control centers installed indoors. Additional lighting outlets fixtures shall not be required where the work space is illuminated by an adjacent light source or as permitted by 210-70(a)(1), Exception No. 1. In electrical equipment rooms, the illumination shall not be controlled by automatic means only."
PANEL STATEMENT: CMP-1 does not want proposal 1-1 to affect this proposal. The reference to Section 210-70 was added to clarify which lighting sources are permitted. See panel action and statement on Proposal 1-268.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #300)

1- 270 - (110-26(e)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 13 for information.
SUBMITTER: Vincent Metallo, Sr., Baltimore County, MD
RECOMMENDATION: Revise 110-26(e) to read as follows:
The minimum head room of working spaces about service equipment, switchboards, panelboards, transformers, or motor control centers shall be 6 1/2 ft (1.98 m).
SUBSTANTIATION: Transformers can be installed in a crawl space as long as they meet article 450-13 and 450-21. Trouble shooting and maintenance can be dangerous by working on exposed live parts on your knees or sitting in front of the equipment. Low headroom makes a quick escape impossible.
PANEL ACTION: Reject.
PANEL STATEMENT: There is insufficient substantiation presented to consider transformers, in general, as a type of equipment needing work space headroom required of switchboards, panelboards, or motor control centers. Refer to CMP-13 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3860)

1- 271 - (110-26(e), Exception): Accept
Note: The Technical Correlating Committee directs the panel to review the sequence and values on the metrication. This action will be considered by the Panel as a Public Comment.
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise the exception as follows:
Exception: In existing dwelling units, service equipment or panelboards~~, in existing dwelling units~~, that do not exceed 200 amperes shall be permitted in spaces where the headroom is less than 6-1/2 ft (1.98 m).
SUBSTANTIATION: This proposal is intended to bring this exception into compliance with the NEC Style Manual by making the exception into a complete sentence.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #CP104)

1- 271a - (110-26(f)): Accept
SUBMITTER: CMP 1
RECOMMENDATION: Revise Section 110-26(f) to read as follows:
(f) Dedicated Equipment Space. ~~Equipment within the scope of Article 384, and~~ All switchboards, panelboards, distribution boards and motor control centers shall be located in dedicated spaces and protected from damage ~~as covered in (1) and (2)~~.
Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.
(1) Indoor. Indoor installations~~, the dedicated space~~ shall comply with the following.
(a) Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of 1.8 m (6 ft.) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone.
Exception: ~~Equipment that is isolated from the foreign equipment by height or physical enclosures or covers that will afford adequate mechanical protection from vehicular traffic or accidental contact by unauthorized personnel or that complies with (b), shall be permitted in areas that do not have the dedicated space described in this rule.~~ Suspended ceilings with removable panels shall be permitted within the 1.8 m (6 ft.) zone.
(b) Foreign Systems. The area above the dedicated space required by 110-26(f)(1)(a) shall be permitted to contain foreign systems provided protection is installed to avoid damage to the electrical equipment from condensation, leaks, or breaks in such foreign systems.
(c) Sprinkler Protection. Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section.
(d) Suspended Ceilings. A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.
(2) Outdoor. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in Section 110-26(a). No architectural appurtenance or other equipment shall be located in this zone.
SUBSTANTIATION: The panel provides the following substantiation:
a.) The panel identified specific equipment to be covered by this section for clarity.
b.) The panel clarified that leak protection apparatus is not allowed in the dedicated space.
c.) The panel modified the exception to allow suspended ceilings with removeable panels in the dedicated space.
d.) The panel revised (b) foreign systems to specifically identify where these foreign system are allowed.
e.) The panel placed hard metric dimensions before inch-pound units.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #363)

1- 272 - (110-26(f)): Reject
SUBMITTER: Kenneth W. Birringer, University of Michigan
RECOMMENDATION: Revise to read as follows:
"Equipment within the scope of Article 384, motor controllers other than attachment plugs and receptacles, and motor control centers,..."
SUBSTANTIATION: Motor controllers including combination motor starters and adjustable speed controllers are often maintained and tested while they are energized and their access doors are open. A dedicated equipment space should be required.
A. To ensure personnel safety during equipment maintenance and testing.
B. To protect this equipment from damage.
PANEL ACTION: Reject.
PANEL STATEMENT: Motor controllers require work space per Section 110-26. The substantiation addresses the need for work space and not a need for dedicated space.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3756)

1- 273 - (110-26(f)): Accept in Principle
SUBMITTER: Timothy M. Croushore, Allegheny Power Service Corp.
RECOMMENDATION: 1. Delete the exception to 110-26(f)(1)(a) Dedicated Electrical Space.
2. Reword (b) and (c) to read as follows:
(b) Foreign Liquid Systems. The space equal to the width and depth of the equipment shall be kept clear of foreign liquid systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign liquid systems. This zone shall extend from the top of the electrical equipment to the structural ceiling.
(c) Sprinkler Protection. Sprinkler protection shall be permitted for the dedicated space where the piping is outside of the dedicated space as required in (a) Dedicated Electrical Space, above and where the electrical equipment is protected from damage from condensation, leaks, or breaks in the piping.
Exception: Dry pipe sprinkler systems shall not be required to have protection from damage from condensation, leaks, or breaks.
SUBSTANTIATION: The above changes fix the conflicting text problems with current language of Section 110-26(f) and the exception to 110-26(f)(1)(a) Dedicated Electrical Space.
PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel concludes that Proposal 1-271a addresses the problem identified in the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4087)

1- 274 - (110-26(f)): Accept in Principle
SUBMITTER: Thomas E. Trainor, City of San Diego, CA
RECOMMENDATION: Revise Section 110-26(f) to read as follows:
(f) Dedicated Equipment Space. Equipment within the scope of Article 384, and motor control centers, shall be located in dedicated spaces and protected from damage ~~as covered in (1) and (2)~~.
Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.
(1) Indoor. ~~For i~~ Indoor installations~~, the dedicated space~~ shall comply with the following.
a. Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of 6 ft (1.83 m) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, or equipment foreign to the electrical installation shall be located in this zone.
~~Exception: Equipment that is isolated from the foreign equipment by height or physical enclosures or covers that will afford adequate mechanical protection from vehicular traffic or accidental contact by unauthorized personnel or that complies with b., shall be permitted in areas that do not have the dedicated space described in this rule.~~
b. Foreign Systems. ~~The space equal to the width and depth of the equipment shall be kept clear of foreign systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign systems. This zone shall extend from the top of the electrical equipment to the structural ceiling.~~ Piping, ducts, and other equipment foreign to the electrical installation shall be permitted above the dedicated electrical space where shields or covers are installed that protect the electrical equipment from condensation, leaks, or breaks in such foreign systems.
c. Sprinkler Protection. Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section.
d. Suspended Ceilings. A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.
(2) Outdoor. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in Section 110-26(a). No architectural appurtenance or other equipment shall be located in this zone.
SUBSTANTIATION: Subsection (1)(a) requires a minimum dedicated space above switchboards and motor control centers to allow for the safe and proper installation of conduit or cable entering or leaving such equipment. Equipment foreign to the electrical installation is prohibited in this dedicated space.
As presently written, Subsection (1)(b) directly contradicts Subsection (1)(a) by permitting ducts and piping in the area above switchboards so long as protection is provided from leaks or spillage. Subsection (1)(b) specifically allows this "protection" to be installed at the top of the equipment and totally ignores the need for conduit and cable space in order for this equipment to be properly and safely installed. The need for a minimum dedicated "wiring" space was fully documented in several proposals for the 1999 NEC and accepted by the panel in Subsection (1)(a). It is necessary and important for Subsection (1)(b) to be revised to recognize this minimum requirement.
Previous editions of the NEC have implied that protection is required from accidental spillage or leakage from piping systems, from damage by vehicular traffic, and to prevent accidental contact by unauthorized personnel. This implication arises because of the mention of these issues in the exception to (1)(a). In my opinion, this exception is meaningless since it provides exceptions to requirements that don't exist in (1)(a). In fact, it was first written to provide relief from the 25 ft requirement in industrial plants and, with the change to 6 ft, is not longer needed. The proposed revision includes the deletion of the exception and the deletion of the reference to "(1) and (2)" in (f) so that the basic requirement is to provide protection from damage. Trying to list all of the specific ways this equipment could be damaged is inappropriate. If one type of damage is not on the list, then there is no requirement to provide protection for it.
If this proposal is accepted, Section 110-26(f) would read as follows:
(f) Dedicated Equipment Space. Equipment within the scope of Article 384, and motor control centers, shall be located in dedicated spaces and protected from damage.
Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.
(1) Indoor. Indoor installations shall comply with the following:
a. Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of 6 ft (1.83 m) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, or equipment foreign to the electrical installation shall be located in this zone.
b. Foreign Systems. Piping, ducts, and other equipment foreign to the electrical installation shall be permitted above the dedicated electrical space where shields or covers are installed that protect the electrical equipment from condensation, leaks, or breaks in such foreign systems.
c. Sprinkler Protection. Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section.
d. Suspended Ceilings. A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.
(2) Outdoor. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in Section 110-26(a). No architectural appurtenance or other equipment shall be located in this zone.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposal 1-271a meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4158)

1- 275 - (110-26(f)): Accept in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
(f) Dedicated Equipment Space. Equipment within the scope of Article 384, and motor control centers, shall be located in dedicated spaces and protected from damage as covered in (1) and (2).
Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.
(1) Indoor. For indoor installations, ~~the dedicated space shall comply with the following.~~
a. Dedicated Electrical Space. ~~The space equal to the width and depth of the equipment and extending from the floor to a height of 6 ft (1.83 m) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, or equipment foreign to the electrical installation shall be located in this zone.~~
~~Exception: Equipment that is isolated from the foreign equipment by height or physical enclosures or covers that will afford adequate mechanical protection from vehicular traffic or accidental contact by unauthorized personnel or that complies with b., shall be permitted in areas that do not have the dedicated space described in this rule.~~
~~b. Foreign Systems.~~ The space equal to the width and depth of the equipment shall be kept clear of foreign systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign systems. This zone shall extend from the top of the electrical equipment to the structural ceiling.
~~c. Sprinkler Protection.~~ Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section.
~~d. Suspended Ceilings.~~ A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.
(2) Outdoor. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in Section 110-26(a). No architectural appurtenance or other equipment shall be located in this zone.

As revised, the subsection would read as follows:

(f) Dedicated Equipment Space. Equipment within the scope of Article 384, and motor control centers, shall be located in dedicated spaces and protected from damage as covered in (1) and (2).

Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.

(1) Indoor. For indoor installations, the space equal to the width and depth of the equipment shall be kept clear of foreign systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign systems. This zone shall extend from the top of the electrical equipment to the structural ceiling. Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section. A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.

(2) Outdoor. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in Section 110-26(a). No architectural appurtenance or other equipment shall be located in this zone.

SUBSTANTIATION: This, effectively, is the version CMP 9 voted at the end of the 1996 Code cycle. It's simple, and straightforward. It addresses genuine safety issues and nothing else. Absolutely nothing else. It doesn't substantively differ from the present requirements, but it's a lot easier to read. Now it's true that there isn't a 6 ft rule here, but there really isn't one in the 1999 NEC either. That's because present Section 110-26(f)(1)(a) Exception concludes by saying "or complies with (b)." Since (b) only requires leak protection, that's how you end up, although there's a lot of eye wash along the way. This proposal presents the straightforward version.

This topic has become a very loaded one on an emotional level. I want to take this opportunity to put it in some historical perspective for the perspective of CMP 1, which is looking at it for the first time. Since a good part of this discussion will focus on that exception, for simplicity, here it is:

Exception: Equipment that is isolated from the foreign equipment by height or physical enclosures or covers that will afford adequate mechanical protection from vehicular traffic or accidental contact by unauthorized personnel or that complies with (b), shall be permitted in areas that do not have the dedicated space described in this rule.

When the dedicated space rule first appeared in the NEC (the 1981 edition), it carried with it essentially the same exception, with one crucial difference: It only applied to "Equipment <u>located throughout industrial plants…</u>" That allowance followed this rule intact through the years until this cycle.

When CMP 9 took up this issue during the 1999 NEC comment period, the Panel decided to work from two comments on its earlier work that didn't mention any dimensions at all. One comment asked for a dedicated 6-ft zone <u>while retaining the 1996 exception intact,</u> and one suggested reorganizing the 1996 NEC requirements to tease out the foreign systems rule, but make no other substantive change.

A Panel member moved to combine the two comments, adding the dedicated 6-ft clearance to the reorganization proposal. That was the main motion. I immediately moved to amend the motion by stripping the four words "located throughout industrial plants" from the exception.

Now CMP 9 members discussed the merits of whether there was any reason other than politics to prevent other occupancies than industrials from using an allowance that had been in place for six Code cycles without reported incident. <u>Not one single member of the Panel could think of any safety reason why that should not be so.</u> Why should only industrial occupancies, some with tremendous process fluid exposures, be allowed to use drip shields? Why indeed, when a single family home had to rack a panel out from the wall just because the plumber got there first, and ran a sewer pipe past the panel location? <u>Even underneath the panel,</u> with no exceptions allowed? <u>Even with Type NM cable</u> as the wiring method, which hardly requires anything approaching 6 ft to entrain into a panel?

Not one single member of CMP 9 could think of a safety reason to vote no on the amendment, and it carried unanimously, with one abstaining vote. Subsequently, another Panel member pointed out that with the foreign system rule (b) separated from the principal rule (a), the exception had to be further amended to reference the following paragraph, and so it was. If you have the dedicated space, use it. If you don't, use the appropriate equipment or provide adequate barriers.

<u>Is there a safety issue?</u> The back and sides of electrical equipment comprise 5 sides of a rectangular solid. You can exit any one of those sides safely, although the more options you have, the better the overall design. So, what about the proverbial air duct running 2-in. above a panel? Under the present exception, could you get away with a drip shield to protect against condensation, and locate a panel at that point? Absolutely; you don't "have the dedicated space described in this rule" and thereby qualify for the exception.

Are we all going to die because you can't exit vertically in that case? I don't think so. What about a column-width panel in the webbing of a vertical I column? Horrors—two whole sides of the panel, and the back, completely obstructed! Some members of my former EC&M panel, including former CMP 1 member Bill Summers, have been in the position of having to defend enforcement of the prior version of this rule in front of a disinterested authority. The result? With no safety issue at hand, enforcement of the rule lost every time.

It gets even better when you look at medium voltage installations. Former Section 710-9, now relocated as Section 110-34(f), allows the same thing as this proposal would allow for 600V and below:

<u>(f) Protection of Service Equipment, Metal-Enclosed Power Switchgear, and Industrial Control Assemblies.</u> Pipes or ducts foreign to the electrical installation that require periodic maintenance or whose malfunction would endanger the operation of the electrical system shall not be located in the vicinity of the service equipment, metal-enclosed power switchgear, or industrial control assemblies. Protection shall be provided where necessary to avoid damage from condensation leaks and breaks in such foreign systems. Piping and other facilities shall not be considered foreign if provided for fire protection of the electrical installation.

This section actually has a longer pedigree than the rule for 600V and below, having first entered the 1975 NEC. Here again, the rule squarely addresses safety, allowing for the arrangement of field protection if necessary. This proposal avoids having more stringent rules for lower hazard work (600V and below.)

Communication is the key. Let's try to remember that we don't own the real estate. In the end the owners have to live with whatever decisions they make about sacrificing future workability on the altar of low initial costs. There are always ways, often very expensive, for you to get wiring extensions out of overly cramped electrical rooms, and done safely. I know, because I've carried tools for years and I've had to do it often.

It's our job, though, to carry this burden of communicating with other professionals. We must not ask the Code to do it for us. If we were to succeed, we'd only lose in the end, because in so doing we destroy the moral authority of a Code squarely based on minimum safety, and not the convenience of its users. Remember, other interests want to take the NEC away from our industry. Ultimately, public authorities outside our industry will make that decision. They never heard of Ohm's Law, but they'll spot something that looks and smells like an economic benefit to a special interest masquerading as a safety rule from far off.

If CMP 1 accepts this proposal, they'll just have to look somewhere else.

PANEL ACTION: Accept in Part.

PANEL STATEMENT: The panel accepts the deletion of the exception by Proposal 1-271a. The Panel chooses to retain a 6 foot dedicated space above the equipment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3861)

1- 276 - (110-26(f), Exception): Accept in Principle

SUBMITTER: J. Philip Simmons, Olympia, WA

RECOMMENDATION: Delete the exception that follows Section 110-26(f)(1)(a).

SUBSTANTIATION: This exception is confusing and is unnecessary as the subject of protection against accidental contact with live parts and preventing physical damage is provided in Section 110-27.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel concludes that panel Proposal 1-271a meets the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1480)

1- 277 - (110-26(f)(1)(a)): Accept in Principle
SUBMITTER: Steve McNamara, FMK Electric
RECOMMENDATION: Remove text from exception "~~or that complies with (b)~~".
SUBSTANTIATION: It is not right to allow equipment in the dedicated electrical space. Six feet should be the minimum clearance height above an electrical installation. The authority having jurisdiction in the very rare case can use 90-4 to permit these installations.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposal 1-271a meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2520)

1- 278 - (110-26(f)(1)a): Reject
SUBMITTER: Richard P. Owen, City of St. Paul, MN
RECOMMENDATION: Revise as follows:
(a) Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of ~~6 ft (1.83m)~~10 ft (3.05m) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, or equipment foreign to the electrical installation shall be located in this zone.
SUBSTANTIATION: The reduction of the dedicated space above equipment from 25 ft to 6 ft above the equipment made some larger equipment installations difficult, if not impossible to accomplish. To have only 6 ft above a large switchboard to install several large capacity busways from the top of the switchboard is in some cases unworkable.
Even an installation as small as a surface-mounted panelboard runs into difficulty in some cases, since the distance from the top of the panelboard to the nonstructural ceiling must be subtracted from the 6 ft space. In some installations, depending on the height of the nonstructural ceiling, it may leave very little room above the ceiling for cables, raceways, etc. to be installed in a "neat and workmanlike manner" below the ceiling, and still have enough room above the nonstructural ceiling to be able to direct these raceways or cables out to the rest of the electrical system. I think that the additional 4 ft I would propose to add to the dedicated space would allow the electricians, who are the primary focus of this Code, to install their equipment properly, but would still leave space for other trades to use the former dedicated space for their own purposes.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation is insufficient to justify increased dedicated space as proposed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #346)

1- 279 - (110-26(f)(1)a, Exception): Accept in Principle
SUBMITTER: Don A. Hursey, Durham City County Insp., NC
RECOMMENDATION: Delete the following:
~~Exception: Equipment that is isolated from the foreign equipment by height or physical enclosures or covers that will afford adequate mechanical protection from vehicular traffic or accidental contact by unauthorized personnel or that complies with (b), shall be permitted in areas that do not have the dedicated space described in this rule.~~
SUBSTANTIATION: The dedicated space (from the floor to a height of 6 ft (1.83 m) above the equipment or to the structural ceiling) should not include an exception that allows any foreign systems in that area. The exception (in some cases) would prohibit the electrician sufficient space for raceway installations in that area.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposal 1-271a meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1924)

1- 280 - (110-26(f)(1)(a) Exception (New)): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
RECOMMENDATION: Add a new exception to read as follows:
Exception: Recessed or flush panelboards.
SUBSTANTIATION: The lower plate and the doubled upper plate in conventional wood frame construction are in the dedicated space when a panelboard is installed flush with the wall finish.
This exception is necessary in order that the code recognize the common practice of mounting panelboards within walls.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes that the double upper plate is not in the dedicated space but rather the double upper plate is the structural ceiling for that hollow wall space.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3786)

1- 281 - (110-26(f)(1)a, Exception): Reject
SUBMITTER: John I. Williamson, Minnesota Board of Electricity
RECOMMENDATION: Modify the wording in the exception in part, as follows:
Exception: Equipment that is isolated from the foreign equipment … shall be permitted in existing buildings that do not have the dedicated space described in this rule.
SUBSTANTIATION: Substantiation - For new construction, there should not be any exception to the main rules of 110-26(f)(1)(a) or (b). Careful design and planning can ensure proper dedicated workspace. However, an exception is appropriate for "existing buildings" that are renovated, whereby the exception to the main rule is offset by the overall improvements that are made to the building's electrical system. Inspection authorities all too often are expected to approve electrical installations for which a serious lack of careful design and underlying economic factors result in electrical equipment areas that are undersized. Very often these areas violate all of the requirements for working space, clear space, access and entrance to working space, and dedicated equipment space, and ultimately increase the risk of injury to personnel.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not consider a general relaxation of the requirements for dedicated space in existing buildings is warranted. The provisions of Section 90-4 can be invoked where deemed necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #333)

1- 282 - (110-26(f)(1)b): Accept in Principle
SUBMITTER: Mike Theisen, St. Cloud, MN
RECOMMENDATION: Add the word "zone" after the word "equipment" in the last sentence of this section, sentence will then read as follows:
This zone shall extend from the top of the equipment zone to the structural ceiling.
SUBSTANTIATION: If foreign systems with protection were allowed in close proximity to the top of the electrical equipment, then the dedicated electrical space required in Section 110-26(f)(1)(a) could be made unavailable.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes its action on Proposal 1-271a meets the intent of the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2789)

1- 283 - (110-26(f)(1)b): Accept in Principle
SUBMITTER: Richard P. Owen, City of St. Paul, MN
RECOMMENDATION: Revise as follows:
(b) Foreign Systems. The space equal to the width and depth of the equipment shall be kept clear of foreign systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign systems. Any protection required by this

section shall be placed outside the dedicated space as described in 110-26(f)(1)(a). This zone shall extend from the top of the electrical equipment to the structural ceiling.
SUBSTANTIATION: This section may imply that any protection against spillage, etc. onto electrical equipment must be out of the dedicated space, but unless it is specifically stated, the arguments we have encountered would continue. I think the 6 ft dedicated space is an absolute minimum to allow electricians to install their raceways, etc. above equipment. To allow some type of "awning", "trough" or other such spillage protection within that 6 ft space makes installations difficult, if not impossible to do.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposal 1-271a meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3611)

1- 284 - (110-26(f)(1)(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
110-26. Spaces About Electrical Equipment. Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment. Enclosures housing electric apparatus that are controlled by lock and key shall be considered accessible to qualified persons.
[subparagraphs (a) to (e) remain the same]
(f) Dedicated Equipment Space. Equipment within the scope of Article 384, and motor control centers, shall be located in dedicated spaces and protected from damage as covered in (1) and (2).
Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.
(1) Indoor. For indoor installations, dedicated space shall comply with the following.
a. Dedicated Electrical Space. The space equal to the width and depth of the equipment and extending from the floor to a height of 6 ft (1.83 m) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, or equipment foreign to the electrical installation shall be located in this zone.
Exception: Equipment that is isolated from the foreign equipment by height or physical enclosures or covers that will afford adequate mechanical protection from vehicular traffic, or accidental contact by unauthorized personnel or that complies with b., shall be permitted in areas that do not have the dedicated space described in this rule.
b. Foreign Systems. The ~~space~~ area above the dedicated space required by 110-26(f)(1)(a), ~~may~~ shall be permitted to contain foreign systems provided protection is installed to avoid damage to the electrical equipment from condensation, leaks, or breaks in such foreign systems, ~~equal to the width and depth of the equipment shall be kept clear of foreign systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign systems. This zone shall extend from the top of the electrical equipment to the structural ceiling.~~
c. Sprinkler Protection. Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section.
d. Suspended Ceilings. A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.
(2) Outdoor. Outdoor electrical equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. The working clearance space shall include the zone described in Section 110-26(a). No architectural appurtenance or other equipment shall be located in this zone.
SUBSTANTIATION: The wording between Sections 110-26(f)(1)(a) and 110-26(f)(1)(b) is unclear and confusing and could be in conflict with each other with the intent of the requirements. The proposed changes to the wording should clarify the confusion and potential conflict. The proposed text establishes that there is a truly dedicated space and that only that space that may exist above 6 ft above the equipment, if any, to the structural ceiling may have foreign systems installed and then only if the foreign system meets the requirement of having protection installed for the electrical equipment due to leaks, condensation or breaks.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposal 1-271a meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3122)

1- 285 - (110-26(f)(2)): Reject
SUBMITTER: John A. Hoffman, Centre Region Code Admin.
RECOMMENDATION: New additional sentence at the end of paragraph: Outdoor electrical equipment shall not be located within 10 ft of a fire department connection or a fire hydrant.
SUBSTANTIATION: This new sentence will provide fire department personnel with safe, adequate clearance to electrical equipment that is likely to be energized while connecting hose. Service equipment, pad mounted transformers, air conditioning units and like equipment can hinder the efforts of fire department personnel even though 110-26 clearances have been met. In addition, the extended clearance will afford a greater degree of safety for fire department personnel particularly during inclement weather. A similar proposal for clearance will be submitted to NFPA 13.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: While the panel is cognizant to the need for fire hydrant connection clearance, there is no substantiation that Fire Department operations are impeded or jeopardized by the presence of electrical or any other equipment in the vicinity of hose connections.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4448)

1- 286 - (110-26(g) (New)): Reject
SUBMITTER: Frants Marvin Jensen, Consolidated Engr Labs
RECOMMENDATION: Add new Section 110-26(g) as follows:
All workspace in this section shall be substantially flat and level.
Exception: Areas required to be arranged to drain.
SUBSTANTIATION: This should be self explanatory: Too many times we see panels in stairways, services on the exterior with no flat space to stand. It is very awkward to work on energized equipment while trying to keep your footing.
PANEL ACTION: Reject.
PANEL STATEMENT: It is impracticable to require all floors or platforms to be level for a number of reasons. Ramps are common in structures and, depending on the slope, do not necessarily present an impediment to the safe operation and maintenance of electrical equipment. The use of the term "substantially" as proposed is unenforceable per Section 3.2.1 of the National Electrical Code Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2050)

1- 287 - (110-26(l)): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Change Exception No. 1 and No. 3 to positive text and change Exception No. 2 to Exception to read as follows:
(1) Depth of Working Space. The depth of the working space in the direction of access to live parts shall not be less than indicated in Table 110-26(a). Distances shall be measured from the live parts if such are exposed or from the enclosure front or opening if such are enclosed.
Table 110-26(a) to remain as is now in the code with notes:
Exception: By special permission, smaller spaces shall be permitted where all uninsulated parts are at a voltage no greater than 30 volts rms, 42 volts peak, or 60 volts dc.
Working space shall not be required in back or sides of assemblies, such as dead-front switchboards or motor control centers, where

there are no renewable or adjustable parts, such as fuses or switches, on the back or sides and where all connections are accessible from locations other than the back or sides. Where rear access is required to work on de-energized parts on the back of enclosed equipment, a minimum working space of 30 in. (762 mm) horizontally shall be provided.

In existing buildings where electrical equipment is being replaced, Condition 2 working clearance shall be permitted between dead-front switchboards, panelboards, or motor control centers located across the aisle from each other where conditions of maintenance and supervision ensure that written procedures have been adopted to prohibit equipment on both sides of the aisle from being open at the same time and qualified persons who are authorized will service the installation.

SUBSTANTIATION: The Exception that remains is to be placed before the two added paragraphs.

There is no technical changes intended.

This will eliminate two exceptions and make the code easier to read.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel understands the submitter is intending to revise Section 110-26(a)(1). The panel believes that the action on Proposal 1-252a meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2746)

1- 288 - (110-27(b)): Reject

SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.

RECOMMENDATION: Revise as follows:

(b) In locations where electrical equipment is likely to be exposed to physical damage, enclosures or guards shall be so arranged and of such strength to prevent such damage. (In an area deemed to be a flood zone by Federal or state bodies, electrical equipment shall not be installed below grade level.)

SUBSTANTIATION: During Hurricane Floyd, as an electrical inspector part of a FEMA advance team, I noted a problem of accessibility. When the emergency personnel as well as the occupants needed to shut off power they were unable to. During this time and after the waters receded, many persons were put in extremely hazardous positions not being able to turn off the power for safety.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal would not necessarily prevent the problem addressed in the substantiation. In flood zones, water can rise above grade level.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1465)

1- 289 - (110-31): Accept in Principle

SUBMITTER: William M. Lewis, Eli Lilly and Co.

RECOMMENDATION: In Section 110-31 after second paragraph, insert:

The distance from the fence to live parts shall be not less than the following:

601 to 13799 volts	10 ft (3.05 m)
13800 to 230,000 volts	15 ft (4.57 m)
Over 230,000 volts	18 ft (5.49 m)

FPN: For clearances of conductors for specific system voltages and typical BIL ratings see National Electrical Safety Code, ANSI C2-1997.

SUBSTANTIATION: This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis, (CMP 4), committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)

PANEL ACTION: Accept in Principle.

Revise table to place the metric dimensions first and inch-pound units second.

PANEL STATEMENT: The dimensions are interchanged to comply with the new NEC Style Manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #670)

1- 290 - (110-31(a)(1)): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise first sentence: Indoor electrical installations that are ~~open~~ accessible to unqualified persons shall be made with metal-enclosed equipment. ~~or shall be enclosed in a vault or in an area to which access is controlled by a lock.~~

SUBSTANTIATION: Enclosed in a vault or controlled by a lock is considered by the first paragraph to be accessible to qualified persons only. This subsection relates to installations accessible to unqualified persons which is a different condition and the rule should apply to that condition. "In a vault or locked" is not accessible to unqualified persons. "Accessible" is defined and preferable to "open".

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #2761)

1- 291 - (110-32): Accept

SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.

RECOMMENDATION: Delete the words 'be adequate to" in the last sentence.

SUBSTANTIATION: The term adequate is vague and undefined, and is not supposed to be used in accordance with NEC Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #CP105)

1- 291a - (110-33): Accept

SUBMITTER: CMP 1

RECOMMENDATION: Revise as follows;

110-33. Entrance and Access to Work Space

(A) Entrance. At least one entrance not less than 610 mm (24 in.) ~~(610 mm)~~ wide and 2.0 m (6 1/2 ft) ~~(1.98 m)~~ high shall be provided to give access to the working space about electric equipment. Where the entrance has a personnel door(s), the door(s) shall open in the direction of egress and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.

(1) Large Equipment. On switchboard and control panels exceeding 1.8 m (6)1/2 ft ~~(1.83 m)~~ in width, there shall be one entrance at each end of the equipment ~~such boards~~.

A single entrance to the required working space shall be permitted where either of the conditions in (a) or (b) are met.

(a) Unobstructed exit. Where the location permits a continuous and unobstructed way of exit travel, a single entrance to the working space shall be permitted.

~~unless the location of the switchboards and control panels permits a continuous and unobstructed way of exit travel, or unless the work space required in Section 110-34(a) is doubled.~~

(b) Extra working space. Where the depth of the working space is twice that required by 110-34(a), a single entrance shall be permitted. It shall be located so that the distance from the equipment to the nearest edge of the entrance is not less than the "Minimum Clear Distance" specified in Table 110-34(a) for equipment operating at that voltage and in that condition.

~~(2.) Where one entrance to the working space is permitted under the conditions described in (1), the entrance shall be located so that the edge of the entrance nearest the switchboards and control panels is the minimum clear distance given in Table 110-34(a) away from such equipment.~~

(2) ~~(3.)~~ Guarding. Where bare energized parts at any voltage or insulated energized parts above 600 volts, nominal, to ground are located adjacent to such entrance, they shall be suitably guarded.

(B) Access. Permanent ladders or stairways shall be provided to give safe access to the working space around electric equipment installed on platforms, balconies, mezzanine floors, or in attic or roof rooms or spaces.

SUBSTANTIATION: The substantiation for this Proposal CP105 is as follows:

a) The revision utilizes parallel construction to the similar requirements for under 600-volt installations as recommended in the Style Manual Section 3.3.5.

b.) Incorporate metric changes.

c.) Retained the soft metric conversion of 24 inches equals 610 mm in Section 110-33(a) for safety reasons to avoid reducing the opening to the required workspace.

d.) Incorporated some of the material from Proposals 1-292, 1-293, 1-294 and 1-295.

e.) The panel recognizes that the safety of workers who are exposed to energized conductors is of great concern. The revision will limit the application of the requirement for panic hardware to personnel doors to workspaces where doors are provided.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2889)

1- 292 - (110-33(a)): Accept in Principle
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Section 110-33(a) add new paragraph at the end of this section to read as follows:

All rooms or spaces as described in Section 110-34(a), dedicated to electric equipment, shall have all doors open outward. Such doors shall be a minimum of 24 in. (610 mm) wide and 6-1/2 ft (1.98m) high).

SUBSTANTIATION: Electrical equipment less than 1200 amps does not require any specific size of access and entrance to working space. There is also no requirement to be able to exit the working space after a person enters. If an emergency occurs, there will not be adequate access for emergency teams. If the entrance or access door opens inward and slows down emergency egress during a fault the severity of burns and bodily injury a person may receive is directly related to the distance a person is away from the faulting equipment. An inward opening door restricts that exiting speed and increases the possibility of more severe injuries.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 1-291a. The panel does not agree with the submitter's substantiation contained in the first sentence.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2890)

1- 293 - (110-33(a)): Reject
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Add a new paragraph at the end of Section 110-33(a) to read as follows:

For electric equipment having hinged doors or panels, a clear means of egress shall be provided when doors or panels are open in any position. Such means of egress shall not be less than 24 in. (610mm) in width.

SUBSTANTIATION: This requirement allows for emergency egress from electrical equipment when the door or panels block the means of access or egress. Since 24 in. is required as a means of access it is unclear when this clearance is required, with or without the doors open. There have been many times equipment has been installed close to walls or other equipment that when the doors are open the access and egress space is reduced or eliminated. This clear path is essential during emergencies.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any technical substantiation to warrant increasing the workspace beyond that required in Section 110-34. See panel action and panel statement on Proposal 1-291a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3847)

1- 294 - (110-33(a)): Accept in Principle
SUBMITTER: Lanny McMahill, Phoenix, AZ
RECOMMENDATION: Add the following text:

Entrance doors shall open outward from the working space.

SUBSTANTIATION: The possibility of a door opening into a working space can create a potential unsafe condition for service personnel. Requiring the doors to open outward from the working space eliminates this problem.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See the Proposal 1-291a. The panel believes this action addresses the concern of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4474)

1- 295 - (110-33(a)): Reject
SUBMITTER: Glenn Soles, Clark County Building Dept., NV/Rep. Southwestern Section IAEI
RECOMMENDATION: Add a new paragraph at the end of Section 110-33(a) to read as follows:

"For electric equipment having hinged doors or panels, a clear means of egress shall be provided when doors or panels are open in any position. Such means of egress shall not be less than 24 in. (610 mm) in width."

SUBSTANTIATION: This requirement allows for emergency egress from electrical equipment when the door or panels block the means of access or egress. Since 24 in. is required as a means of access it is unclear when this clearance is required, with or without the doors open. There have been many times equipment has been installed close to walls or other equipment that when the doors are open the access and egress space is reduced or eliminated. This clear path is essential during emergencies.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any technical substantiation to warrant increasing the workspace beyond that required in Section 110-34. See Proposal 1-291a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3259)

1- 296 - (110-34): Reject
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise NEC 110-34 with the additions (underlined) and deletions (strike through) as shown. The entire text of 110-34 and 110-34(a) is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

110-34. Work Space and Guarding. Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment.

(a) Working Space. Except as elsewhere required or permitted in this Code, equipment likely to require examination, adjustment, servicing, or maintenance while energized shall have ~~the minimum~~ clear working space in the direction of access to live parts of the electrical equipment and shall not be less than specified in Table 110-34(a). Distances shall be measured from the live parts, if such are exposed, or from the enclosure front or opening if such are enclosed.

SUBSTANTIATION: The proposal accomplishes the objective of providing some consistency with 110-26. The first change indicates that you have to have sufficient access and space about all electrical equipment to allow it to be operated.

The revision in (a) parallels the requirement in 110-26(a) that "working space" is required where the equipment might be adjusted, maintained, examined or serviced while energized. The presently language could be interpreted to require "working space" about any piece of >600V equipment regardless of whether it might be worked on while energized. This view would seem to be counter to the stated need that the working space is determine based on access to live parts.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed intoductory text added to 110-34 is presently contained in Section 110-32. The submitter has not provided substantiation to support the proposed recommendation in Section 110-34(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #448)

1- 297 - (Table 110-34(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 110-34(a) to read as follows:

~~*Table 110-34(a) Minimum Depth of Clear Working Space at Electrical Equipment*~~

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
601-2500 V	900 mm (3 ft)	1.2 m (4 ft)	1.5 m (5 ft)
2501-9000 V	1.2 m (4 ft)	1.5 m (5 ft)	1.8 m (6 ft)
9000-25,000 V	1.5 m (5 ft)	1.8 m (6 ft)	2.8 m (9 ft)
25,001 – 75 kV	1.8 m (6 ft)	2.5 m (8 ft)	3.0 m (10 ft)
Above 75 kV	2.5 m (8 ft)	3.0 m (10 ft)	3.7 m (12 ft)

Note: Where the conditions are as follows:

Conditions 1, 2 and 3 remain unchanged.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show the SI units as the preferred and inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
PANEL STATEMENT: Editorially revise proposed table to replace 9000 -25,000 V with 9001-25,000 V to match Table 110-34(a) from the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4281)

1- 298 - (Table 110-34(a)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Add a new Note 2 and Change existing Note 2 to Note 3.
Note 2. The minimum clearence distance indicated in Table shall be increased to permit at least a 90 degree opening of hinged equipment doors or hinged panels.
SUBSTANTIATION: This change will prevent hinged doors or hinged panels to touch an equipment on the opposite side. Which may become a safety hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed requirement presently exists in Section 110-32 and would be redundant as a note to the table.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4342)

1- 299 - (Table 110-34(a)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Revise the first line of Condition 1
Exposed live parts on one side and exposed live parts on on opposite side of working space effectively guarded by insulating materials, or exposed live parts on both sides effectively guarded by insulating materials.
SUBSTANTIATION: This revision will give a clear picture of an installation.
Wood insulation is an insulating material. Why mention it as a seperate item?
PANEL ACTION: Reject.
PANEL STATEMENT: The present text is clear and the proposal represents a misunderstanding of the requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2098)

1- 300 - (Table 110-34(a) Note): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add at the start of each Condition before the words (exposed live parts) the following words (the enclosure or)
Condition 1 — The enclosure or exposed live parts on one side and no live or grounded parts on the other side of the working space, or the enclosure or exposed live parts on both sides effectively guarded by suitable wood or other insulating materials. Insulated wire or insulated busbars operating at not over 300 volts to ground shall not be considered live parts.
Condition 2 — The enclosure or exposed live parts on one side and grounded parts on the other side. Concrete, brick, or tile walls shall be considered as grounded.
Condition 3 — The enclosure or exposed live parts on both sides of the work space (not guarded as provided in Condition 1) with the operator between.
SUBSTANTIATION: The main section refers to the enclosure but the conditions do not.
By adding these words will correlate the main requirement to the conditions.
This will make the notes more understandable.
Appears that the intent is to require the enclosure to the conditions but does not state in conditions.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the additional wording does not add clarity to the requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #671)

1- 301 - (110-34(b), (c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Separation from Low-voltage Equipment. Where switches, cutouts, or other equipment operating at 600 volts, nominal, or less, are installed in a room or enclosure where there are exposed live parts or exposed conductors ~~wiring~~ operating at over 600 volts, nominal, the high-voltage equipment shall be effectively separated from the space occupied by the low-voltage equipment by a suitable partition, fence, or screen.
Exception: Switches or other equipment operating at 600 volts, nominal, or less, and serving only the high-voltage equipment ~~within the high-voltage vault, room, or enclosure,~~ shall be permitted ~~to be installed in the high-voltage room, or vault operating at over 600 volts, nominal,~~ without a partition, fence or screen if accessible to qualified persons only.
(c) Locked Rooms or Enclosures. The entrance(s) to all ~~buildings,~~ vaults, rooms, or other enclosures containing live parts or exposed conductors operating at over 600 volts, nominal, shall be kept locked, access being allowed only to qualified persons, unless such entrance(s) is ~~are~~ under the observation of a ~~qualified~~ person authorized to forbid entry, at all times.

SUBSTANTIATION: In (b) exposed wiring could apply to over 600 volt conductors in surface-mounted rigid metal conduit, which in general would not require special separation or isolation. Subsection (c) references exposed conductors.

The rule of (b) permits low-voltage equipment if separation is provided whether or not serving only high-voltage equipment and doesn't deny access to unqualified persons since the partitioned area is required to be locked per (c). The exception literally nullifies the rule by requiring a relation between low- and high-voltage equipment and limiting access to qualified persons even where separation is provided since it is not based on a condition such as the omission of the partition, which seems to be the intent. The multiple references in the exception to the high-voltage enclosure are superfluous as it is stated in the rule.

In (c) the literal wording broadly requires all building entrances to be kept locked even where the equipment room comprises only a small part of the building. The definition of enclosure indicates fences, walls, etc., for a particular purpose. The proposed addition for (c) specifies obvious access requirements for qualified persons and deletes requirement for a qualified person since a security guard, for example, should not have to meet Article 100 definition of qualified person.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel appreciates the submitter's complete subsection and exception text recommendation using strikethrough for recommended text deletion and underlining for recommended text addition. However, several key words were both omitted and added without benefit of strikethrough and underline identification. As several of the omitted and added words are key to the requirements, the panel was uncertain as to the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3260)

1- 302 - (110-34(c)): Reject

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise the second paragraph of 110-34(c) with the additions (underlined) and deletions (strike through) as shown. The entire text of paragraph is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

Where the voltage exceeds 600 volts, nominal, permanent and conspicuous warning signs shall be provided~~, reading as follows:~~ with the following words or equivalent.

DANGER - HIGH VOLTAGE - KEEP OUT

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard. The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Reject.

PANEL STATEMENT: The term "equivalent" is vague, subjective and can lead to misleading words intended to identify a possible hazard. Refer to the new NEC Style Manual, Section 3.2.1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #3783)

1- 303 - (110-34(c)): Reject

SUBMITTER: Jack H. Zewe, Electrical Consultants, Inc.

RECOMMENDATION: Revise section 110-34 c, warning sign requirements.

Old Text: Danger- High Voltage – Keep Out

Proposed Text: Danger-Hazardous Voltage - Unqualified Personnel - Keep Out

SUBSTANTIATION: Present wording does not reflect the requirements of OSHA Electrical Safe Work Practices. The present wording implies that the person viewing the warning sign would or should have know what "High Voltage" is. High Voltage is a relative term and may mean something different to manny people. OSHA requires warnign signs that tell a person of a HAZARD and WHAT to DO. If you take the present Warning Sign language literaly, no one could work in or proceed pass a sign that states, Warning- Keep Out. There are no exceptions that follwing the present sign requirements. Electrical Workers violate this Keep Out warning every day.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed wording is not mandated by OSHA. The present wording adaquately identifies the hazard involved.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #449)

1- 304 - (Table 110-34(e)): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Table 110-34(e) to read as follows. (Table shown below)

Table 110-34(e). Elevation of Unguarded Live Parts Above Working Space

Nominal Voltage Between Phases	Elevation
601-7500 V	2.5 m (8 1/2 ft)
7501-35,000 V	2.8 m (9 ft)
Over 35 kV	2.8 m + 9.5 mm/kV above 35 (9 ft + 0.37 in./kv above 35)

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show the SI units as the preferred and inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
Revise Table 110-34(e) to read as follows:

Table 110-34(e). Elevation of Unguarded Live Parts Above Working Space

Nominal Voltage Between Phases	Elevation
601-7500 V	2.8 m (9 ft)
7501-35,000 V	2.9 m (9 1/2 ft)
Over 35 kV	2.9 m + 9.5 mm/kV above 35 (9 1/2 ft + 0.37 in./kv above 35)

PANEL STATEMENT: The panel has accepted the metric additions to this table. The panel has also accepted the revisions to increase the dimensions from Proposal 1-305. Both of these proposals are incorporated in the revised Table 110-34(e) .
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #1466)

1- 305 - (Table 110-34(e)): Accept in Principle
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Change the 8 ft 6 in. to 9 ft and the 9 ft to 9 ft 6 in. in two places.
SUBSTANTIATION: For consistency with Table 124-1 of the NESC.
This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.
The Task Group participants consisted of William M. Lewis (CMP 4), committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA
Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)
PANEL ACTION: Accept in Principle.
Add metric dimensions as follows:
Change the 8 ft 6 in. to 2.8 m (9 ft) in one place and the 9 ft to 2.9 m (9 ft 6 in.) in two places.
PANEL STATEMENT: Editorially add metric dimensions to the dimensions in this proposal. The panel believes that the intent of the submitter was to increase the dimensions in all three rows of the table. See Proposal 1-304 for actual table revisions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2448)

1- 306 - (110-34(f)): Reject
SUBMITTER: John A. Hoffman, Centre Region Code Admin.
RECOMMENDATION: Revise as follows:
Pipes or ducts foreign to the electrical installation that require periodic maintenance or whose malfunction would endanger the operation of the electrical system shall not be located within 20 ft extending in all directions from service equipment, metal enclosed power switchgear, or industrial assemblies. This zone shall extend from the floor to the structure ceiling.
SUBSTANTIATION: The wording in the 1999 edition states that pipes or ducts foreign to the electrical installation shall not be located "in the vicinity" of the service equipment, metal enclosed power switchgear or industrial control assemblies. This wording is too ambiguous for inspectors to use. It calls on the inspector to make a determination of an acceptable clearance which is not enforced unilaterally nationwide. If the inspector errs in their judgement of an acceptable clearance (5 ft, 8 ft, 10 ft). Failure of piping systems could produce catastrophic results for which he or she could now be held liable. The change affords a standard for the inspector to use as an acceptable clearance.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is considered too restrictive and the panel prefers the performance language as presently contained in Section 110-34(f).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #4447)

1- 307 - (110-34(g) (New)): Reject
SUBMITTER: Frants Marvin Jensen, Consolidated Engr Labs
RECOMMENDATION: Add new Paragraph (g) as follows:
All workspace in this section shall be substantially flat and level.
Exception: Areas required to be arranged to drain.
SUBSTANTIATION: This should be self explanatory: Too often we see switchyards with the required clearances built into a hillside but no footing or place to stand in front of the equipment, especially when using a "hot stick."
PANEL ACTION: Reject.
PANEL STATEMENT: It is impracticable to require all floors or platforms to be level for a number of reasons. Ramps are common in structures and, depending on the slope, do not necessarily present an impediment to the safe operation and maintenance of electrical equipment. The use of the term "substantially" as proposed is unenforceable per Section 3.2.1 of the National Electrical Code Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #3859)

1- 308 - (110 Part D): Accept
NOTE: The Technical Correlating Committee rejects the panel action to move the material noting that it is outside the Scope of Article 490. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 13 for information.
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Move Part D of Article 110 to be Part E of Article 490.
Renumber existing Part E of Article 490 to Part F.
SUBSTANTIATION: It seems Part D of Article 110 belongs in Article 490 for the following reasons:
1. Article 110 generally applies to all electrical installations.
2. The present Part D of Article 110 applies to a very narrow class of installation.
3. Article 490 applies to the over 600 volt equipment class of installation covered in existing Part D of Article 110.

4. Existing Part D of Article 490 covers the closely related "Mobile and Portable Equipment." Note the following text from Section 490-51(a) indicating what is covered in Part D: "(a) Covered. The provisions of this part shall apply to installations and use of high-voltage power distribution and utilization equipment that is portable or mobile, or both, such as substations and switch houses mounted on skids, trailers, or cars; mobile shovels; draglines; cranes; hoists, drills; dredges; compressors; pumps; conveyors; underground excavators; and the like."

5. Compare what is covered in Part D of Article 490 with the following text from Section 110-51(a) indicating what is covered in Part D of Article 110 and note the similarity: "(a) Covered. The provisions of this part shall apply to installation and use of high-voltage power distribution and utilization equipment that is portable and/or mobile, such as substations, trailers, or cars, mobile shovels, draglines, hoists, drills, dredges, compressors, pumps, conveyors, underground excavators, and the like."

6. Locating the text from Part D of Article 110 in Article 490 will improve the organization and user-friendliness of the Code.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel agrees with the submitter that this material is more appropriate for CMP-13. CMP-1 recognizes that relocating Part D. Tunnel Installations Over 600 Volts, Nominal is under the purview of the TCC. Refer to CMP-13 for comment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #672)

1- 309 - (110-51(a), FPN (New)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add a fine print note to 110-51(a) to read as follows:

FPN: See Section 90-2(b)(2) for installatons not covered by this code.

SUBSTANTIATION: Editorial. Code users may easily overlook the provisions of Section 90-2(b)(2) where focused on this section.

PANEL ACTION: Reject.

PANEL STATEMENT: There are many locations in the Code where a reference to the scope might be made. However, the value added by such references is minimal for the "trained person" contemplated in Section 90-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #7)

1- 310 - (110-58): Accept in Principle

NOTE: The following proposal consists of Comment 1-295 on Proposal 1-271 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 1-271 was:

The Technical Correlating Committee has agreed that this proposal be submitted to the panel as a public proposal.

A. Move the following text from Article 710 into Article 110, Part B and place as appropriate.

~~710 32.~~ 110-XX. Circuit Conductors. [move to Article 110, Part B.]

Circuit conductors shall be permitted to be installed in raceways, in cable trays, as metal-clad cable, as bare wire, cable, and busbars, or as Type MV cables, or conductors as provided in Sections ~~710 4 through 710 6~~ 300-XX through 300-XX. Bare live conductors shall conform with Sections ~~710 33 and 710 34~~ 110-XX and 110-XX.

Insulators, together with their mounting and conductor attachments, where used as supports for wires, single-conductor cables, or busbars, shall be capable of safely withstanding the maximum magnetic forces that would prevail when two or more conductors of a circuit were subjected to short-circuit current.

Open runs of insulated wires and cables having a bare lead sheath or a braided outer covering shall be supported in a manner designed to prevent physical damage to the braid or sheath. Supports for lead-covered cables shall be designed to prevent electrolysis of the sheath.

~~710 33.~~ 110-XX. Minimum Space Separation. [move to Article 110, Part B.]

In field-fabricated installations, the minimum air separation between bare live conductors and between such conductors and adjacent grounded surfaces shall not be less than the values given in Table ~~710 33~~ 110-XX. These values shall not apply to interior portions or exterior terminals of equipment designed, manufactured, and tested in accordance with accepted national standards.

Table ~~710 33.~~ 110-XX. Minimum Clearance of Live Parts*

Nominal Voltage Rating, kV	Impulse Withstand, B.I.L. kV		Minimum Clearance of Live Parts, in Inches			
			Phase-to-Phase		Phase-to-Ground	
	Indoors	Outdoors	Indoors	Outdoors	Indoors	Outdoors
2.4-4.16	60	95	4.5	7	3.0	6
7.2	75	95	5.5	7	4.0	6
13.8	95	110	7.5	12	5.0	7
14.4	110	110	9.0	12	6.5	7
23	125	150	10.5	15	7.5	10
34.5	150	150	12.5	15	9.5	10
46	200	200	18.0	18	13.0	13
69		200		18		13
115		250		21		17
138		250		21		17
161		350		31		25
230		550		53		42
		550		53		42
		650		63		50
		650		63		50
		750		72		58
		750		72		58
		900		89		71
		1050		105		83

For SI units: 1 in. = 25.4 mm.

*The values given are the minimum clearance for rigid parts and bare conductors under favorable service conditions. They shall be increased for conductor movement or under unfavorable service conditions or wherever space limitations permit. The selection of the associated impulse withstand voltage for a particular system voltage is determined by the characteristics of the surge protective equipment.

B. Move the following text from Article 710, Part F into Article 110, as a new Part and place as appropriate.

~~F.~~ X. Tunnel Installations, Over 600 Volts, Nominal

~~710-51.~~ 110-XX. General.

(a) Covered. The provisions of this part shall apply to installation and use of high-voltage power distribution and utilization equipment that is portable and/or mobile, such as substations, trailers, or cars, mobile shovels, draglines, hoists, drills, dredges, compressors, pumps, conveyors, underground excavators, and the like.

(b) Other Articles. The requirements of this part shall be additional to, or amendatory of, those prescribed in Articles 100 through ~~710~~ 490 of this Code. Special attention shall be paid to Article 250.

(c) Protection Against Physical Damage. Conductors and cables in tunnels shall be located above the tunnel floor and so placed or guarded to protect them from physical damage.

~~710-52.~~ 110-XX. Overcurrent Protection.

Motor-operated equipment shall be protected from overcurrent in accordance with Article 430. Transformers shall be protected from overcurrent in accordance with Article 450.

~~710-53.~~ 110-XX. Conductors.

High-voltage conductors in tunnels shall be installed in (1) metal conduit or other metal raceway, (2) Type MC cable, or (3) other approved multiconductor cable. Multiconductor portable cable shall be permitted to supply mobile equipment.

~~710-54.~~ 110-XX. Bonding and Equipment Grounding Conductor.

(a) Grounded and Bonded. All noncurrent-carrying metal parts of electric equipment and all metal raceways and cable sheaths shall be effectively grounded and bonded to all metal pipes and rails at the portal and at intervals not exceeding 1000 ft (305 m) throughout the tunnel.

(b) Equipment Grounding Conductor. An equipment grounding conductor shall be run with circuit conductors inside the metal raceway or inside the multiconductor cable jacket. The equipment grounding conductor shall be permitted to be insulated or bare.

~~710-55.~~ 110-XX. Transformers, Switches, and Electric Equipment.

All transformers, switches, motor controllers, motors, rectifiers, and other equipment installed below ground shall be protected from physical damage by location or guarding.

~~710-56.~~ 110-XX. Energized Parts.

Bare terminals of transformers, switches, motor controllers, and other equipment shall be enclosed to prevent accidental contact with energized parts.

~~710-57.~~ 110-XX. Ventilation System Controls.

Electrical controls for the ventilation system shall be so arranged that the airflow can be reversed.

~~710-58.~~ 110-XX. Disconnecting Means.

A switching device meeting the requirements of Article 430 or 450 shall be installed at each transformer or motor location for disconnecting the transformer or motor. The switching device shall open all ungrounded conductors of a circuit simultaneously.

~~710-59.~~ 110-XX. Enclosures.

Enclosures for use in tunnels shall be dripproof, weatherproof, or submersible as required by the environmental conditions. Switch or contactor enclosures shall not be used as junction boxes or raceways for conductors feeding through or tapping off to other switches, unless special designs are used to provide adequate space for this purpose.

~~710-60.~~ 110-XX. Grounding.

Tunnel equipment shall be grounded in accordance with Article 250.

SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in principle revised as follows:

110-58. Disconnecting Means. A ~~switching device meeting the requirements of Articles 430 or 450~~ switch or circuit breaker that simultaneously opens all ungrounded conductors of the circuit shall be installed at each transformer or motor location for disconnecting the transformer or motor. The switching device shall open all ungrounded conductors of a circuit simultaneously. The switch or circuit breaker for a motor shall comply with the requirements of Article 430. The switch or circuit breaker for a transformer shall have an ampere rating not less than the ampacity of the transformer supply conductors.

SUBSTANTIATION: Editorial. Article 450 does not appear to have requirements for transformer primary disconnecting means. This comment indicates switches and circuit breakers in case the Panel intent is not to include all types of switching devices such as contactors.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that the action on Proposal 1-311 meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #673)

1- 311 - (110-58): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Disconnecting Means. A ~~switching device~~ switch or circuit breaker which simultaneously opens all ungrounded conductors of the circuit ~~meeting the requirements of Article 430 or 450~~ shall be installed (within sight of) (immediately adjacent to) each transformer or motor location for disconnecting the transformer or motor. The switch or circuit breaker for a transformer shall have an ampere rating not less than the ampacity of the transformer supply conductors. The switch or circuit breaker for a motor shall comply with the applicable requirements of Article 430. ~~The switching device shall open all ungrounded conductors of a circuit simultaneously.~~ (alternate choices in parenthesis.)

SUBSTANTIATION: A switch or circuit breaker is proposed as the switching device as they can normally be operated at their location, whereas a switching device such as a contactor remotely controlled can literally comply. Article 450 does not appear to have requirements for transformer primary disconnecting means.
PANEL ACTION: Accept in Principle.
Revise to read as follows:

Disconnecting Means. A ~~switching device~~ switch or circuit breaker which simultaneously opens all ungrounded conductors of the circuit ~~meeting the requirements of Article 430 or 450~~ shall be installed within sight of each transformer or motor location for disconnecting the transformer or motor. The switch or circuit breaker for a transformer shall have an ampere rating not less than the ampacity of the transformer supply conductors. The switch or circuit breaker for a motor shall comply with the applicable requirements of Article 430. ~~The switching device shall open all ungrounded conductors of a circuit simultaneously.~~"

PANEL STATEMENT: The panel chose the language "within sight of" as the prefered language from the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2762)

1- 312 - (110 Part E (New)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Relocate Part D from Article 370 to become a new Part E in Article 110.
SUBSTANTIATION: This information should be in Article 110, instead of Article 370.
PANEL ACTION: Reject.
PANEL STATEMENT: The subject material is more appropriate in Article 370 than in Article 110.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

ARTICLE 200 — USE AND IDENTIFICATION OF GROUNDED CONDUCTORS

(Log #2560)

5- 3 - (200): Reject
SUBMITTER: Fred W. Brown, HI Electron
RECOMMENDATION: Delete the phrase "natural gray."
SUBSTANTIATION: The color "natural gray" is not available as an insulation color from any electrical conductor manufacturer. The use of the phase "natural gray" gives the false impression that the color "gray" is acceptable for a grounded conductor identification. The use of a gray colored conductor, in parts of the United States, is for ungrounded conductor identification. The phrase "natural gray" in the 1999 NEC presents an electrical safety hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not intend to prohibit the use of gray as a grounded conductor. The panel recognizes that natural gray is not defined and that gray colored insulated conductors are commonly used to identify grounded conductors. Also, see panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #3005)

5- 4 - (200): Reject
SUBMITTER: Rea Hamilton, Abbott Labs
RECOMMENDATION: Replace all references to the words ~~grounded~~ conductor with the words neutral conductor.
SUBSTANTIATION: Grounding is a very complex, misunderstood subject and the overuse of the word ground only adds to the confusion. Terminology clarification is needed to make the code more understandable.
PANEL ACTION: Reject.
PANEL STATEMENT: Conductors are defined based on where they are connected to the electrical supply system and their function. A neutral conductor is understood to be connected to the neutral or common point of an electrical supply system. Some systems such as a delta do not have a physical neutral connection point. The corner of a delta system (connection of two phase windings) may be grounded but is not a neutral point. The grounded conductor of a 2-wire circuit is also not a neutral conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #3160)

5- 5 - (200): Reject
SUBMITTER: Fred W. Brown, HI Electron
RECOMMENDATION: "~~natural gray~~"
Delete the phrase "natural gray."
SUBSTANTIATION: The color "natural gray" is not available as an insulation color from any electrical conductor manufacturer. The use of the phrase "natural gray" gives the false impression that the color "gray" is acceptable for a grounded conductor identification. The use of a gray colored conductor, in parts of the United States, is for ungrounded conductor identification. The phrase "natural gray" in the 1999 NEC presents an electrical safety hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1745)

5- 6 - (200-1): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise to read as follows:
200-1. Scope
This article provides requirements for the following:
1. Identification of terminals and conductors.
SUBSTANTIATION: To clarify that the scope of this article cover the use and identification of white, white with three stripes and natural gray conductor used as grounded as well as ungrounded conductor. An example is for the white conductor used as the supply (hot ungrounded conductor) in a cable as permitted in 200-7 (c) (2).
PANEL ACTION: Reject.
PANEL STATEMENT: The scope already covers conductors as items two and three in the list.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #4300)

5- 7 - (200-4 (New)): Reject
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Add new text to read as follows:
"For the purposes of grounded conductor identification, the color gray shall be defined as having a neutral coloration on the Munsell color scale of not less than 4.5 and not greater than 7.0 with 6.0 being the ideal median."
SUBSTANTIATION: The color "natural gray" is not defined by any product standard nor color standard and therefore to establish this as a suitable color for grounded circuit identification is impossible to enforce. For over 30 years the electrical industry has specified and used "gray" colored wire as the alternate identifier to white to comply with Article 200 requirements. There are literally 1000s of installations made with gray colored wire used for this purpose. Surveys of inspectors and installers across the Untied States have identified very few that use gray for other than a grounded conductor. In previous code cycles the issue of defining gray so that it was not too light to be confused with white and not too dark gray to be confused with black prevented resolution of this issue. ANSI/EIA Standard 359A is used by the electrical industry as the basis for color coding of wire and to establish the neutral base, hue and chroma that defines the color. The basis for this color scale is the Munsell color standard. NEMA uses this Munsell system for its definition of NEMA gray such as is used for receptacles colored gray. That color is defined by Munsell as N6. ANSI gray as typically found for painted electrical enclosures is Munsell N6.1 (commonly referred to as ASA 61). By establishing the limitations using a known color system for the gray to be used for the grounded conductor identification, then the potential confusion with white and black is eliminated. The NEMA manufacturing standards and UL wire and cable standards also then have a basis for determining compliance. Lastly, the electrical inspector will have a basis to determine if an installation of gray used for this purpose meets the requirements by using a readily available color scale if needed. With the limitations in Section 200-7, gray could not be used for any other purpose. This change will provide for the continuation of what has been a long standing industry practice and resolve the difficulties with enforcement.
PANEL ACTION: Reject.
PANEL STATEMENT: By providing a very specific color range for gray, a user could install a darker or lighter color gray as an ungrounded conductor. It is the panels intent that all grays are to be used only as a grounded conductor. See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1049)

5- 8 - (200-6): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 200-6 as follows:
200-6(a) - change "No. 6" to "6 AWG" in two places.
200-6(b) - change "No. 6" to "6 AWG" in two places.
200-6(c) - change "No. 4" to "4 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
COMMENT ON AFFIRMATIVE:
DOBROWSKY: The AWG designation should also be added to the NEC Style Manual.

(Log #2107)

5- 9 - (200-6): Accept in Principle

NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 5-10, 5-11, 5-12, 5-16, 5-17, 5-19, 5-21, 5-23, 5-28, 5-31, 5-33, 5-35, 5-37, 5-47, 5-49, and 5-52. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 6 in sections 310-12(c) and 400-22, Code-Making Panel 7 in Section 363-19, and Code-Making Panel 15 in section 520-53(h)(2) for action.

This action will be considered by the Panel as a Public Comment by all Code-Making Panels mentioned in this Note.

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Delete the word "natural" from Section 200-6 and where similarly used in the NEC.

SUBSTANTIATION: Natural gray is no longer manufactured. Basic colors not shades or gradation of color are typically used for identification means. The present language could be interpreted as allowing a conductor having light gray colored insulation to be used as an ungrounded conductor, creating a more dangerous condition.

PANEL ACTION: Accept in Principle.

Additionally, add a new FPN to each section wherever the term "natural gray" is changed to "gray". This new FPN is to read as follows:

"FPN: The color gray may have been used in the past as an ungrounded conductor. Care should be taken when working on existing systems."

PANEL STATEMENT: The panel recognizes that natural gray is not defined and that gray colored insulated conductors are commonly used to identify grounded conductors. The panel also recognizes that gray has also been used as an ungrounded conductor. Therefore the panel is adding a FPN to caution the user. Refer to CMP's 6, 7, and 15 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DIAZ: The term "natural gray" is outdated and not really applicable to modern wiring systems. Having first appeared in the 1923 NEC, the term was probably used to describe unbleached cotton, which was permitted as insulation to identify a grounded conductor. The color of unpigmented pvc or rubber would probably best describe natural gray in modern wiring systems, however, this is rarely, if ever, used today. The need for a unique but obtainable wire for the grounded conductor of a second system when more than one voltage system is used in a building can be appreciated. However, this proposal would permit the use of gray to identify the grounded conductor where only a single system exists. To permit such a widespread use of gray as a grounded conductor can become a serious safety concern, especially when gray has previously been permitted for identification of an ungrounded conductor. To prevent that from occurring, gray should be added only in Section 200-6(d) as an alternate method to using white with a readily distinguishable different colored stripe. Proposal 5-26 accomplishes this accepting gray to identify a grounded conductor for systems exceeding 150V, where two or more voltage systems are used in the same building. This would eliminate the potential for confusion over gray conductors in residential dwellings and similar installations where untrained professionals may be attempting electrical repairs or circuit additions. Having gray specified in the code in this manner would not permit it to become the color identifying the grounded conductor in a single system installation, such as a home.

COMMENT ON AFFIRMATIVE:

MELLO: The issue of "gray" and "natural gray" has existed to some degree for over 40 years and has been an issue for at least three Code cycles. The advent of plastic insulation in the 1960's permitted more and better coloring of these insulating materials. Although the actual source of the color "natural gray" is not precisely known, it is known that it is not defined by any product standard and does not exist in today' s products. For many reasons gray insulated wire has been used all over the United States to identify a grounded conductor. Although this was technically incorrect as a substitute for "natural gray", the practice has been long and widespread. Gray colored insulated wire has also properly been used as an ungrounded conductor. Based on show-of-hands surveys conducted at many meetings with a broad spectrum of electrical people all over the country, the use of gray over the last 30 years as a grounded conductor was substantially higher than its use as an ungrounded conductor was. The Panel had three choices to resolve this issue. First, they could do nothing, which would only perpetuate potentially hazardous conditions with mixed use because of the lack of application of a defined color. Second, delete "natural gray" and effectively "gray" for use as a grounded conductor. The result of this could create a hazard for all those existing installations where gray had been used to identify the grounded conductor. Third, delete only the word "natural" and recognize what has been a widespread industry practice but also to acknowledge the hazard, believed to be limited, where gray wire had been previously used for an ungrounded conductor. This Panel Action appears to cause the least impact while the addition of the Fine Print Note alerts personnel to the potential hazard. The Fine Print Note should be considered good practice for anyone commencing work on existing circuit - understand the circuit and what the purpose of each conductor is even beyond any assumptions based on colors of the insulation.

(Log #3672)

5- 10 - (200-6): Accept in Principle

SUBMITTER: George Ferguson, Eastern Michigan Univ.

RECOMMENDATION: Revise text as follows:

200-6(a) Sizes No. 6 or Smaller. An insulated grounded conductor of No. 6 or smaller shall be identified by a continuous white or ~~natural~~ gray outer finish... Wires that have their outer covering finished to show a white or ~~natural~~ gray color...

SUBSTANTIATION: There is a widespread use of brown, orange, yellow (boy) for 460/277 volt three phase wiring, with a THHN gray conductor for the grounded neutral. It should be time for the NEC to coordinate with industry practice. The arguments I have heard against dropping the "natural" have just as good an argument that this can be dealt with reasonably.

1) "That is it difficult to distinguish between black and gray."

(a) Anyone who has worked with a grounded white and an ungrounded yellow in anything but bright light knows this is as difficult to distinguish.

(b) Often the Code requires items that are not yet available on the market (i.e., conductors with "three or more continuous white stripes) [200-6(a)] or "arc-fault circuit-interrupter" [210-12]. In this case I believe that the wire manufacturers can develop a suitable gray.

2) The "natural" gray referred to in the NEC is not really a readily available item for common use anymore. Keep the Code current with today's standard. If gray THHN were to be widely used as ungrounded, there would be much confusion and danger where the gray THHN has been used as a grounded conductor.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 5-9.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3823)

5- 11 - (200-6): Accept in Principle

SUBMITTER: Bob Friedel, Riviera Electric

RECOMMENDATION: As in Article 200 and various other places, the grounded conductor shall be white or "natural" gray. I propose that the word "natural" should be deleted.

SUBSTANTIATION: What in the world is "natural" gray? I believe the word "natural" cause some confusion.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 5-9.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #4284)

5- 12 - (200-6): Accept in Principle in Part

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Revise to read as follows:

(a) Sizes No. 6 or Smaller. An insulated grounded conductor of No. 6 or smaller shall be identified by a continuous white or ~~natural~~ gray outer finish or by three continuous white stripes on other than green insulation along its entire length. Wires that have their outer

covering finished to show a white or ~~natural~~ gray color but have colored tracer threads in the braid identifying the source of manufacture shall be considered as meeting the provisions of this section. Insulated grounded conductors shall also be permitted to be identified as follows:

(1) The grounded conductor of a mineral-insulated, metal-sheathed cable shall be identified at the time of installation by distinctive marking at its terminations.

(2) A single-conductor, sunlight-resistant, outdoor rated cable used as a grounded conductor in photovoltaic power systems as permitted in Section 690-31 shall be identified at the time of installation by distinctive white marking at all terminations.

(3) Fixture wire shall comply with the requirements for grounded conductor identification as specified in Section 402-8.

(4) For aerial cable, the identification shall be as above, or by means of a ridge located on the cable so as to identify it.

(b) Sizes Larger than No. 6. An insulated grounded conductor larger than No. 6 shall be identified either by a white or ~~natural~~ gray outer finish or by three continuous white stripes on other than green installations along its entire lengthor at the time of installation by a distinctive white marking at its terminations. This marking shall encircle the conductor or insulation.

(c) Flexible Cords. An insulated conductor that is intended for use as a grounded conductor, where contained within a flexible cord, shall be identified by a white or ~~natural~~ gray outer finish or by three continuous white stripes on other than green insualtion or by methods permitted by Section 400.22.

(d) Grounded Conductors of Different Systems. Where grounded conductors of different systems are installed in the same raceway, cable, box, auxiliary gutter, or other type enclosure, one system grounded conductor ~~if required,~~ shall have an outer covering conforming to Section 200.6(a) or 200.6(b). Each other system grounded conductor shall have an outer covering of white with readily distinguishable stripes (not green) running along the insulation, or other and different means of identification as allowed by Section 200-6 (a) or (b) that will distinguish each system grounded conductor.

(e) Grounded Conductors in Multiconductor Cables. The insulated grounded conductors in a multiconductor cable, shall be identified by a continuous white or ~~natural~~ gray outer finish or by three continuous white stripes on other than green insulation along its entire length. Multiconductor flat cable No. 4 or larger shall be permitted to employ an external ridge in the grounded conductor.

SUBSTANTIATION: Delete the word natural since the color natural gray is not defined and in fact does not exist as a specified color for wire insulation. This proposal goes with the definition of gray within a specified range of color per the Munsell color system as used by industry for wire color coding. The definition of the gray is provided in another proposal.

PANEL ACTION: Accept in Principle in Part.

Accept the deletion of "natural".

Reject the deletion of "if required"

PANEL STATEMENT: See panel action and statement on Proposal 5-9. The panel concludes that "if required" is important and there is no technical substantiation to remove this phrase.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #674)

5- 13 - (200-6(a)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(a) Sizes No. 6 or Smaller. An insulated grounded conductor of No. 6 or smaller shall be identified by a continuous white ~~or natural gray~~ outer finish or by three continuous white stripes on other than green insulation along its entire length. Wires that have their outer covering finished to show a white ~~or natural gray~~ color but have colored tracer threads in the braid identifying the source of manufacture shall be considered as meeting the provisions of this section. Insulated grounded conductors shall also be permitted to be identified as follows:

(1) The grounded conductor of a mineral-insulated, metal-sheathed cable shall be permitted to be identified at the time of installation by a durable and distinctive white marking that shall encircle the insulating sleeve at its terminations.

(2) A single-conductor, sunlight-resistant, ~~outdoor rated~~ Type SE, UF, or USE cable used as a grounded conductor in solar photovoltaic power systems as permitted in Section 690-31 shall be permitted to be identified at the time of installation by a durable and distinctive white marking that shall encircle the insulation at all terminations.

(3) Fixture wire shall be permitted ~~comply~~ to be identified in accordance with the requirements for grounded conductor identification as specified in Section 402-8.

(4) For multiconductor aerial cable the identification shall be permitted ~~as above or~~ by means of a ridge located on the cable so as to identify ~~it~~ the grounded conductor.

(b) Sizes Larger than No. 6. An insulated grounded conductor larger than No. 6 shall be identified in accordance with (a) above, ~~either by a white or natural gray outer finish or by three continuous white stripes along its entire length~~ or at the time of installation by a durable distinctive white color marking at ~~its termination~~ each termination, at each junction point except conduit bodies that do not contain splices or unused hubs, and at intervals not exceeding 6 ft (1.83 m), with not less than one such marking, where the conductor is installed in a wireway, auxiliary gutter or cable tray. This marking shall encircle the conductor insulation.

(c) No change.

(d) Grounded Conductors of Different Systems. Where grounded conductors of different systems are installed in the same raceway, cablebus, cable, box, cable tray, auxiliary gutter, or other type enclosure, one system grounded conductor ~~if required,~~ shall have an outer covering conforming to Section 200-6(a) or 200-6(b). Each other system grounded conductor shall have an outer covering of white with three readily distinguishable stripes (not green) running along the insulation, ~~or other and different means of identification as allowed by Section 200 (a) or (b) that will distinguish each system grounded conductor.~~ Where acceptable to the authority having jurisdiction, where one conductor larger than No. 6 is identified at the time of installation in accordance with (b) above, additional grounded conductors larger than No. 6 shall be permitted to be identified at the time of installation in accordance with (b) above, except that durable and permanent tagging in lieu of color shall distinguish the additional grounded conductors.

(e) Grounded Conductors in Multiconductor Cables. The insulated grounded conductors in a multiconductor cable, other than Type MI, shall be identified by a continuous white ~~or natural gray~~ outer finish or by three continuous white stripes on other than green insulation along its entire length. Multiconductor flat cable No. 4 or larger shall be permitted to employ an external ridge in the grounded conductor.

Exception No. 1: Where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, grounded conductors in multiconductor cables shall be permitted to be permanently identified at their terminations at the time of installation by a durable and distinctive white marking that shall encircle the conductor insulation, or other equally effective means.

Exception No. 2: The grounded conductor of a multiconductor varnished-cloth-insulated cable shall be permitted to be identified at its terminations at the time of installation by a durable and distinctive white marking that shall encircle the conductor insulation, or other equally effective means.

SUBSTANTIATION: Natural gray is deleted due to widespread disagreement about its use. Section (a)(2), (b), and (e) exceptions do not specify natural gray, nor does (b) for field marking.

For editorial consistency "permitted" should be used in (a)(1), (2), (3) since those provisions are permitted by the first paragraph and the wording of (2) can infer white insulation is not permitted.

The present (a)(1) does not specify color of the "distinctive" marking.

The proposal requirement to encircle the conductor insulation should be applied to all field-marked conductors as it is a good requirement but only specified in (b).

The proposal for (b) includes marking at junction points where the conductor runs through boxes, contactors, switch enclosures, wireways, gutters, and cable trays without a splice (termination). Present wording does not require marking and differs from Sections 230-56 and 250-119(a) which require marking at junction points and where accessible.

An insulated grounded conductor larger than No. 6 run through a conduit body without splices or unused hubs does not appear to warrant identification.

The latter part of the proposal for (d) would cover a (perhaps rare) condition where multiple larger than No. 6 field-marked conductors are commingled, apparently permitted by reference to (b), but which only provides for white color marking.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 5-3. This rewrite does not add clarity to the section. The 6 feet addition is not substantiated.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2509)

5- 14 - (200-6(a)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(a) Sizes No. 6 or Smaller. An insulated grounded conductor of No. 6 or smaller shall be identified by a continuous white ~~or natural gray outer finish~~ or by three continuous white stripes on other than green insulation along its entire length. Wires that have their outer covering finished to show a white ~~or natural gray~~ color but have colored tracer threads in the braid identifying the source of manufacture shall be considered as meeting the provisions of this section. Insulated grounded conductors shall also be permitted to be identified as follows.
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3318)

5- 15 - (200-6(a) and (b)): Reject
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Revise as follows:
200-6(a)
Sizes No. ~~6~~ 10 smaller.
An insulated grounded conductor of No. ~~6~~ 10 or smaller shall be identified...
200-6(b)
Sizes larger than No. ~~6~~ 10
An insulated grounded conductor larger than No. ~~6~~ 10 shall be identified...
SUBSTANTIATION: Change the provisions of 200-6(a) and (b) to allow identification of the grounded conductor at the time of installation by distinctive white markings at its terminations to include sizes No. 8 and No. 6.
Not all suppliers stock No. 8 and/or No. 6 in white. This change would assist the contractor by requiring less conductor colors in the larger sizes and would expedite installation.
PANEL ACTION: Reject.
PANEL STATEMENT: The lack of availability by some electrical suppliers is not technical substantiation for a change. Suppliers will stock materials where there is a demand for it.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: This proposal should be accepted. Conductors with white or gray insulation in sizes larger than 6 AWG could also be manufactured and stocked. Conductors in size 10 AWG and smaller are most commonly used for branch circuits and are readily available with colored insulation. If termination marking is acceptable and considered safe for 4 AWG and larger why not in sizes 6 AWG and 8 AWG.

(Log #3319)

5- 16 - (200-6(a), (b), (c), and (e)): Accept in Principle
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Revise as follows:
(a) An insulated grounded conductor of No. 6 or smaller shall be identified by a continuous white or ~~natural~~ grey outer finish...
(b) ... continuous white or ~~natural~~ grey...
(c)... by a white or ~~natural~~ grey
SUBSTANTIATION: Delete the word "natural" from references to the grounded identification in this and all subsequent appropriate sections of this code. The word as used is archaic - probably dating back to when the outer covering of an insulated conductor was fabric (unbleached cotton).
Plastic-insulated conductors are grey when grey and the word natural has no significance and therefore tends to add confusion to an already difficult document.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3430)

5- 17 - (200-6(a)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text to read as follows:
(a) Sizes No. 6 or Smaller. An insulated grounded conductor of No. 6 or smaller shall be identified by a continuous white or ~~natural~~ gray outer finish or by three continuous white stripes on other than green insulation along its entire length. Wires that have their outer covering finished to show a white or ~~natural~~ gray color but have colored tracer threads in the braid identifying the source of manufacture shall be considered as meeting the provisions of this section. Insulated grounded conductors shall also be permitted to be identified as follows.
SUBSTANTIATION: The term "natural gray" specifies a particular shade of gray which few electricians actually know what that color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

Note: Sequence no. 5-18 now follows 5-28

(Log #399)

5- 19 - (200-6(b)): Accept in Principle
SUBMITTER: Mark Lee Bryant, RPA Assoc., Inc.
RECOMMENDATION: Revise 200-6(b) to read as follows:
(b) Sizes Larger than No. 6. An insulated grounded conductor larger than No. 6 shall be identified either by a continuous white or natural gray outer finish or by three continuous white stripes on other than green insulation along its entire length or at the time of installation by a distinctive white or natural gray color marking at its terminations. This marking shall encircle the conductor or insulation.
SUBSTANTIATION: Add natural gray color for termination marking to be consistent with other sections of code where white and gray are acceptable for grounded conductor color. See Sections 200-6(a), 200-6(c), 200-6(e), 200-7(a), 200-7(b) and 200-7(c).
PANEL ACTION: Accept in Principle.
Revise 200-6(b) to read as follows:
(b) Sizes Larger than No. 6. An insulated grounded conductor larger than No. 6 shall be identified either by a continuous white or natural gray outer finish or by three continuous white stripes on other than green insulation along its entire length or at the time of installation by a distinctive white or gray color marking at its terminations. This marking shall encircle the conductor or insulation.

FPN: The color gray may have been used in the past as an ungrounded conductor. Care should be taken when working on existing systems.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #2510)

5- 20 - (200-6(b)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(b) Sizes Larger than No. 6. An insulated grounded conductor larger than No. 6 shall be identified either by a continuous white ~~or natural gray outer finish~~ or by three continuous white stripes on other than green insulation along its entire length or at the time of installation by a distinctive white marking at its terminations. This marking shall encircle the conductor or insulation.
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3431)

5- 21 - (200-6(b)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text to read as follows:
(b) Sizes Larger than No. 6. An insulated grounded conductor larger than No. 6 shall be identified either by a continuous white or ~~natural~~ gray outer finish or by three continuous white stripes on other than green insulation along its entire length or at the time of installation by a distinctive white marking at its terminations. This marking shall encircle the conductor or insulation.
SUBSTANTIATION: The term "natural gray" specifies a particular shade of gray which few electricians actually know what the color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #2511)

5- 22 - (200-6(c)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(c) Flexible Cords. An insulated conductor that is intended for use as a grounded conductor, where contained within a flexible cord, shall be identified by a white ~~or natural gray outer finish~~ or by three continuous white stripes on other than green insulation or by methods permitted by Section 400-22.
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3432)

5- 23 - (200-6(c)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text to read as follows:
(c) Flexible Cords. An insulated conductor that is intended for use as a grounded conductor, where contained within a flexible cord, shall be identified by a white or ~~natural~~ gray outer finish or by three continuous white stripes on other than green insulation or by methods permitted by Section 400-22.
SUBSTANTIATION: The term "natural gray" specifies a particular shade of gray which few electricians actually know what the color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #2159)

5- 24 - (200-6(d)): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Each other system grounded conductor shall have an outer covering of white with a readily distinguishable different colored stripe other than green ~~(not green)~~ running along the insulation,...
SUBSTANTIATION: The exclusion of green in this rule is not parenthetical. It is part of the basic rule. The phrase "other than green" is used throughout this section [see 200-6(a), 200-6(b), and 200-6(e)] in a similar way. The elimination of parenthesis will make this rule more precise and explicit; the use of "other than green" will be more consistent with the style in other paragraphs in this section.
The Foreword to the NEC Style Manual states, "It is vitally important that the text be as explicit as possible and that maximum consistency be achieved in the language used in the text."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2879)

5- 25 - (200-6(d)): Reject
SUBMITTER: Gary Wright, Master Electrical Contractors Inc./Rep. Independent Electrical Contractors Assn.
RECOMMENDATION: Add text to read as follows:
The grounded conductor of all premises wiring may be referred to as the neutral conductor. The neutral conductor ~~may~~ shall be marked white or grey with a continuous outer sheath or with tape or other permanent means.
SUBSTANTIATION: The clear and concise approach of the code can and is often confusing concerning the definition of grounded and grounding. The everyday reference of a grounded conductor as the neutral should be recognized in the practical application of the code.
PANEL ACTION: Reject.
PANEL STATEMENT: Not all grounded conductors are neutrals.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #4159)

5- 26 - (200-6(d)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
(d) Grounded Conductors of Different Systems. Where conductors of different systems are installed in the same raceway, cable, box, auxiliary gutter, or other types of enclosure, ~~one system grounded conductor, if required,~~ each grounded conductor shall have an outer covering conforming to Section 200-6(a) or 200-6(b), and shall be identified by system. Where the identification is by color, white shall be used on systems not exceeding 150 volts to ground, and gray shall be used for systems exceeding 150 volts to ground. Where additional systems are present, each other system grounded conductor shall have an outer covering of white with an identifiable colored stripe (not green) running along the insulation, or other and different means of identification as allowed by Section 200-6(a) or (b) that will distinguish each system grounded conductor.
SUBSTANTIATION: This proposal calls for the controlled color gray. If this cannot be distinguished from white (responding to prior CMP 5 rejections), is not yellow subject to the same confusion? The Code must recognize reality. No one is using white wire with stripes, because it is only available on a minimum order of about 40,000 feet. The result is greater confusion, because there is no rule that can be readily enforced. At the time the Massachusetts Electrical Code recognized reality (1993 cycle) and incorporated this rule, we surveyed electrical supply houses across the state and couldn't find a single one with striped wire available.
The Code should represent a consensus of the industry as to what is practicable. There is indeed a consensus, across the country, and it is to do what the proposal calls for. We have discussed this issue with numerous leading wire manufacturers, and they all continue to give the same answers: Yes, we can make striped white wire. No, we can't remember selling any. To be worthwhile, we would have to run (answers vary here between 40,000 to 50,000) feet. The result is arbitrary to virtually nonexistent enforcement of the rules.
The panel should bear in mind that "natural gray" came into the Code in 1923 to reflect uncolored latex and the cotton cloth served around it. At the time it was a reasonable change, but true "natural gray" insulation hasn't been made since the obsolescence of that technology roughly two generations ago. Retention of the term only serves to continue the illusion that gray wire is an option under present rules. Actually, by the literal text, gray wire is fully eligible for use as an ungrounded conductor. The panel continuing inaction on this subject, as duly recognized by its IAEI chair in the last cycle, perpetuates an actual hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no substantiation for requiring white for systems not exceeding 150 volts to ground although that may be common practice. The present wording permits different colors for different systems, but does not specify the colors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: The need for a unique but obtainable wire for the grounded conductor of a second system when more than one voltage system is used in a building can be appreciated. Gray should be added only in Section 200-6(d) as an alternate method to using white with a readily distinguishable different colored stripe. Proposal 5-26 accomplishes this accepting gray to identify a grounded conductor for systems exceeding 150V, where two or more voltage systems are used in the same building. This would eliminate the potential for confusion over gray conductors in residential dwellings and similar installations where untrained professionals may be attempting electrical repairs or circuit additions. See comment for Proposal 5-9.

(Log #2512)

5- 27 - (200-6(e)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(e) Grounded Conductors of Multiconductor Cables. The insulated grounded conductors in a multiconductor cable shall be identified by a continuous white ~~or natural gray outer finish~~ or by three continuous white stripes on other than green insulation along its entire length. Multiconductor flat cable No. 4 or larger shall be permitted to employ an external ridge on the grounded conductor.
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3433)

5- 28 - (200-6(e)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text to read as follows:
(e) Grounded Conductors of Multiconductor Cables. The insulated grounded conductors in a multiconductor cable shall be identified by a continuous white or ~~natural~~ gray outer finish or by three continuous white stripes on other than green insulation along its entire length. Multiconductor flat cable No. 4 or larger shall be permitted to employ an external ridge on the grounded conductor.
SUBSTANTIATION: The term "natural gray" specifies a particular shade of gray which few electricians actually know what the color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #2030)

5- 18 - (200-6(e) Exception No. 3): Reject
SUBMITTER: Daniel Kurelowech, The Scripps Research Inst.
RECOMMENDATION: Delete entire exception.
SUBSTANTIATION: My comment is directed at the topic: Different systems in the same enclosure/raceway.

The NEC Section 210-5(a): Color code for branch ciruits, states that a grounded conductor of a different system is to be identified by a colored stripe on the insulation. NEC Section 200-6(a), Exception No. 3, modifies this obligation for markings at the termination points if only qualified persons will be servicing the electrical installation.

My problems are these:

1. Some contractors take this exception with minimal compliance.
2. Some contractors just tape the hot and neutral of the different system together. (Is this a different system, or a dedicated neutral?)
3. Devices in walls can be clearly marked for panel designation, but circuits pulled through the device box are rarely marked as a different system.
4. Although a facility has qualified electricians on site, nonqualified maintanence personnel may trouble shoot some minor electrical problems.

My request is this:

1. Delete Exception No. 3, of Section 200-6(a).
2. Modify Section 210-5(a)so it cannot be used for general use, such as receptacles, lights, switches, etc.

PANEL ACTION: Reject.
PANEL STATEMENT: The panel is unclear as to the recommendation. Section 200-6(a) contains no exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2022)

5- 29 - (200-6(f)): Reject
SUBMITTER: Jerry Knoerr, Village of Greendale, Village of Mukwonago, WI
RECOMMENDATION: Add new text to read:

"Add in conduit runs that run concealed, when a piece of metal conduit is used to either go in the floor, wall, etc. that would be concealed and PVC conduit is run in between and the other end is also a metal conduit, a label should be added at the panel board, junction box, or switchboard stating that a ground wire is required for circuits or feeders in this conduit run. The label should be permanent and posted at appropriate locations." Recommend that the panel decide where it should be installed.

SUBSTANTIATION: In industrial plants, shopping centers, etc. it is becoming more apparent that they will take a piece of IMC or rigid and go down in the floor or in the wall for protection, and then they run PVC concealed in the area for less cost and labor. I'm very concerned by the fact that a number of contractors may be working on the facility after the initial installation and has no way of knowing ground wire is required.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal appears to deal with an issue on equipment grounding and the necessity to require a conductor (wiring method). The proposed requirement is already required by Section 250-96. The article solely deals with the use and identification of grounded circuit conductors and terminal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
COMMENT ON AFFIRMATIVE:

BRETT: The Panel is correct in rejecting this proposal because the recommended text addition is not appropriate to the section referenced however, I believe it has merit. I do not agree with the Panel Statement that it is currently required by Section 250-96.

I am aware of an incident were an electrician was severely injured. The original electrical contractor installed PVC conduit underground but used steel conduit above ground and for the stub-ups. Because of financial problems, a second contractor was hired to complete the installation. Unaware of the discontinuous ground path, a separate equipment grounding conductor was not installed.

I believe that if a tag or label was placed, as the submitter recommends, at both ends of the circuit this incident may have been avoided.

I believe that if accepted during the ROC meeting the recommended text should be placed in a new Section 250-120(d) or added to Section 250-120(a).

(Log #675)

5- 30 - (200-7): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Use of Insulation of a white ~~or natural gray~~ color or with ~~three~~ continuous white stripes.

(a) The following shall be used only for the grounded circuit conductor, unless otherwise permitted in (b) and (c):

(1) A conductor with continuous white ~~or natural gray~~ insulation ~~covering.~~

(2) A conductor with ~~three~~ continuous white stripes on other than green insulation.

(3) A marking ~~at the termination~~ of white ~~or natural gray color,~~ excluding any marking required by Section 310-11.

(b) Circuits of Less than 50 Volts. A conductor with white ~~or natural gray~~ color insulation or ~~three~~ continuous white stripes, or having a marking of white ~~or natural gray~~ color, excluding any marking required by Section 310-11, shall not be required to be grounded ~~only~~ except as required by Section 250-20(a).

(c) Circuits of 50 Volts or More. The use of insulation that is white ~~or natural gray~~ or that has ~~three~~ continuous white stripes, for other than a grounded conductor shall be permitted only in accordance with (1) and (2) ~~through (3)~~ below.

(1) If part of a cable assembly and where the insulation is permanently reidentified to indicate its use as an ungrounded conductor by ~~painting or other effective means~~ marking other than white that shall encircle the conductor insulation at each termination. ~~and at each location where the conductor is visible and accessible.~~

(2) Delete.

~~(3)~~ (2) Where a flexible cord, having one conductor identified by a white or natural gray outer finish ~~or by three continuous white stripes~~ or by any other means ~~permitted~~ specified by Section 400-22, is used for connecting an appliance or equipment permitted in Section 400-7. ~~This shall apply to flexible cords connected to outlets whether or not the outlet is supplied by a circuit that has a grounded conductor.~~

SUBSTANTIATION: Editorial. Natural gray is deleted due to ongoing controversy of what constitutes this color. It is not permitted as a color for field marking of larger than No. 6 conductors nor as continuous striping color.

While Section 200-6(a) specifies three continuous white stripes for a grounded conductor identification, the number of stripes should not be noted in this section, as it literally does not limit a conductor with one or two white stripes from being used as other than a grounded conductor. An ungrounded conductor with one or two white stripes is an invitation to safety problems. I have seen specialty striping done on conductors after manufacture, and if two stripes, (or one, or four) are not covered by this section, and used as ungrounded conductors, the fine distinction between number of stripes can be lost. Deletion of the word "three" in this section does not alter the requirement for "three" in Section 200-6(a).

In (a)(3) and (b) "the termination" (singular) may infer the load end only; a conductor with white marking in a junction or pull box without splice (termination) should be limited to a grounded conductor. Natural gray is deleted in (a)(3) as a (field) marking; not permitted in Section 200-6(b).

For technical correctness any marking required by Section 310-11 which may be white should be excluded.

Section (c)(1) is revised, to correlate with field marking requirement of Section 200-6(b) to encircle the insulation, which is a good requirement for field marking of all conductors. "Visible and accessible" are two concurrent conditions and is unnecessary since conductor termnations are generally required to be accessible but not visible. Visible is not Code-defined but a reasonable interpretation would be that a conductor above a dropped ceiling or in an enclosure is not visible, but is accessible.

In (c)(2) the prohibition of a white reidentified conductor from the switch to the outlet is a holdover from the previous code when the white conductor if used as the supply was not required to be reidentified... This is in conflict with (c)(1) which doesn't prohibit a reidentified white conductor on the load side of a snap switch, fused switch, circuit breaker, or other device. If two separate cables are installed to a switch of this section (supply and load) there is no switch loop and the white reidentified conductor could be used as a conductor from the switch to the outlet. The provisions of (c)(1) and (2) do not correlate well and indicate or suggest a hazard peculiar to single-pole, 3-way or 4-way switch loops but not switch loops for a 3-pole 3-phase switch.

Section 400-22 has required means of identification, which doesn't seem to include three white stripes in the individual conductor. The last sentence of (c)(3) seems superfluous as the subject of (c) relates to use as ungrounded conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3. This rewrite does not add clarity to the section. The submitter has not provided substantiation that three stripes is a problem. The reference to Section 310-11 is incorrect and has nothing to do with

identification for use, but is for wire markings required for manufacturers.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #4285)

5- 31 - (200-7): Accept in Principle
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
200.7. Use of Insulation of a White or ~~Natural~~ Gray Color or With Three Continuous White Stripes.
(a) General. The following shall be used only for the grounded circuit conductor, unless otherwise permitted in (b) and (c).
1. A conductor with continuous white or ~~natural~~ gray covering
2. A conductor with three continuous white stripes on other than green insulation
3. A marking at the termination of white or ~~natural~~ gray color
(b) Circuits of Less than 50 Volts. A conductor with white or ~~natural~~ gray color insulation or three continuous white stripes or having a marking of white or ~~natural~~ gray at the termination for circuits of less than 50 volts shall be required to be grounded only as required by Section 250.20(a).
(c) Circuits of 50 Volts or More. The use of insulation that is white or ~~natural~~ gray or that has three continuous white stripes for other than a grounded conductor for circuits of 50 volts or more shall be permitted only as in (1) through (3).
1. If part of a cable assembly and where the insulation is permanently re-identified to indicate its use as an ungrounded conductor, by painting or other effective means at its termination, and at each location where the conductor is visible and accessible.
2. Where a cable contains an insulated conductor for single-pole, 3-way, or 4-way switch loops, and the conductor with white or ~~natural~~ gray insulation or a marking of three continuous white stripes is used the supply to the switch, but not as a return conductor from the switch to the switched outlet. In these applications, the conductor with white or ~~natural~~ gray insulation or with three continuous white stripes shall be permanently re-identified to indicate its use by painting or other effective means at its termination's and at each location where the conductor is visible and accessible.
3. Where a flexible cord, having one conductor identified by a white or ~~natural~~ gray outer finish or three continuous white stripes or by any other means permitted by Section 400.22, is used for connecting an appliance or equipment permitted by Section 400.7. This shall apply to flexible cords connected to outlets whether or not the outlet is supplied by a circuit that has a grounded conductor.
SUBSTANTIATION: Delete the word natural since the color natural gray is not defined and in fact does not exist as a specified color for wire insulation. This proposal goes with the definition of gray within a specified range of color per the Munsell color system as used by industry for wire color coding. The definition of the gray is provided in another proposal.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #2513)

5- 32 - (200-7(a)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
200-7. Use of Insulation of a White ~~or Natural Gray Color~~ or with Three Continuous White Stripes
(a) General. The following shall be used only for the grounded circuit conductor, unless otherwise permitted in (b) and (c):
1. A conductor with continuous white ~~or natural gray covering~~
2. A conductor with three continuous white stripes on other than green insulation
3. A marking at the termination of white ~~or natural gray color.~~
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3667)

5- 33 - (200-7(a)(3)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text as follows:
200-7. Use of Insulation of a White or ~~Natural~~ Gray Color or with Three Continuous White Stripes.
(a)(3) A marking at the termination of white or ~~natural~~ gray color.
SUBSTANTIATION: The term natural gray specifies a particular shade of gray which few electricians actually know what that color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #2514)

5- 34 - (200-7(b)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(b) Circuits of Less than 50 Volts. A conductor with white ~~or natural gray color insulation~~ or three continuous white stripes or having a marking of white ~~or natural gray~~ at the termination for circuits of less than 50 volts shall be required to be grounded only as required by Section 250-20(a).
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3669)

5- 35 - (200-7(b)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text as follows:
(b) Circuits of less than 50 Volts. A conductor with white or ~~natural~~ gray color insulation or three continuous white stripes or having a marking of white or ~~natural~~ gray at the termination for circuits of less than 50 volts shall be required to be grounded only as required by Section 250-20(a).
SUBSTANTIATION: The term natural gray specifies a particular shade of gray which few electricians actually know what that color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #2515)

5- 36 - (200-7(c)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(c) Circuits of 50 Volts or More. The use of insulation that is white ~~or natural gray~~ or that has three continuous white stripes for other than a grounded conductor for circuits of 50 volts or more shall be permitted only as in (1) through (3).
1. If part of a cable assembly and where the insulation is permanently reidentified to indicate its use as an ungrounded conductor, by painting or other effective means at its termination, and at each location where the conductor is visible and accessible.
2. Where a cable contains an insulated conductor for single-pole, 3-way, or 4-way switch loops, and the conductor with white ~~or natural gray insulation~~ or a marking of three continuous white stripes is used for the supply to the switch, but not as a return conductor from the switch to the switched outlet. In these applications, the conductor with white ~~or natural gray insulation~~ or with three continuous white stripes shall be permanently reidentified to indicate its use by painting or other effective means at its terminations and at each location where the conductor is visible and accessible.
3. Where a flexible cord, having one conductor identified by a white ~~or natural gray outer finish~~ or three continuous white stripes or by any other means permitted by Section 400-22, is used for connecting an appliance or equipment permitted by Section 400-7. This shall apply to flexible cords connected to outlets whether or not the outlet is supplied by a circuit that has a grounded conductor.
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3668)

5- 37 - (200-7(c)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text as follows:
(c) Circuits of 50 Volts or More. The use of insulation that is white or ~~natural~~ gray or that has three continuous white stripes for other than a grounded conductor for circuits of 50 volts or more shall be permitted only as in (1) through (3).
SUBSTANTIATION: The term natural gray specifies a particular shade of gray which few electricians actually know what that color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3924)

5- 38 - (200-7(c)): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Strike the following as indicated, also replace and or renumber as I have in the text below:
(c) Circuits of 50 Volts or More. The use of insulation that is white or natural gray or that has three continuous white stripes for other than a grounded conductor for circuits of 50 volts or more shall be permitted only as in (1) through (3).
2. Where a cable contains an insulated conductor for single-pole, 3-way, or 4-way switch loops, and the conductor with white or natural gray insulation or a marking of three continuous white stripes is used for the supply to the switch, but not as a return conductor from the switch to the switched outlet. In these applications, ~~the conductor with white or natural gray insulation or with three continuous white stripes shall be required to be permanently re-identified to indicate its sue by painting or other effective means at its terminations and at each location where the conductor is visible and accessible.~~ Re-identification of the conductor with white or natural gray insulation or a marking of three continuous white stripes will not be required.
SUBSTANTIATION: During the last code making process CMP No. 5 extracted the many exceptions to this section and rewrote them into positive text. Through the process one submitter sited electricians and apprentices (A98 ROP 5-30) applying the white wire in switch loops incorrectly and creating a cornucopia of errors throughout North America. Frankly it's not happening! Another proposal indicated remodeling contractors. For the 30 odd years that I've been working in this industry the only people I have encountered that miss apply this color code are nonelectricians and the last time I checked the amateurs refused to spend the $50 bucks for a code book! Simply this practice of using the white wire in a factory assembled cable as a hot leg to the switch, with the unidentified conductor as the return (switch leg) to the load has worked good and lasted a long time, and the beauty was we all knew it! Usually a code panel will refuse to accept a proposal such as the one 1996 without documentation of a safety infraction (CPSC or other reliable source), apparently there was not one available during the last code cycle. Accept the revised text and let the professionals get on with earning a living.
PANEL ACTION: Reject.
PANEL STATEMENT: Field identification is inexpensive, easily accomplished and supports the safety concept of identifying all conductors that are ungrounded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: The original proposal to require reidentification (A98 ROP 5-30) was based upon an instructor who often had to correct Journeymen on the proper wiring of 3-way switch loops. The documentation did not indicate any problems in the field with single pole switches or that the problem with 3 and 4-way switching was related to the fact that there was a white wire. This proposal relates only to cables with a white wire and one or two other colored wires. For single pole switches, there is no confusion with a white

wire at the switch since there are only two wires to connect. For 3 and 4-way switches, I fail to see how reidentifying the white wire helps someone who is unclear on the concept of switching from two or more locations. If the white wire is reidentified "blue", which two colors are the messengers? Is that any different than using the red and white as the messengers and having the black as the return to the luminaire? There are a total of seven proposals to revert back to the pre 1999 wording with documentation that it has not and is not a problem in the field. (Three and 4-way switching may always be a problem with some people.) It seems to me that the change to the 1999 NEC was an attempt to make things uniform and nice rather than base a change on identified field problems.

(Log #3925)

5- 39 - (200-7(c)): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Strike the following as indicated, also replace and or renumber as I have in the text below:
(c) Circuits of 50 Volts or More. The use of insulation that is white or natural gray or that has three continuous white stripes for other than a grounded conductor for circuits of 50 volts or more shall be permitted only as in ~~(1) through (3).~~ Replace with (1) and (2).
1. If part of a cable assembly and where the insulation is permanently re-identified to indicate its use as an ungrounded conductor, by painting or other effective means at its termination, and at each location where the conductor is visible and accessible.
~~2. Where a cable contains an insulated conductor for single pole, 3-way, or 4-way switch loops, and the conductor with white or natural gray insulation or a marking of three continuous white stripes is used for the supply to the switch, but not as a return conductor from the switch to the switched outlet. In these applications, the conductor with white or natural gray insulation or with three continuous white stripes shall be permanently re-identified to indicate its use by painting or other effective means at its terminations and at each location where the conductor is visible and accessible.~~
2. Where a flexible cord, having one conductor identified by a white or natural gray outer finish or three continuous white stripes or by any other means permitted by Section 400.22, is used for connecting an appliance or equipment permitted by Section 400.7. This shall apply to flexible cords connected to outlets whether or not the outlet is supplied by a circuit that has a grounded conductor.
SUBSTANTIATION: The two paragraphs are redundant. Paragraph (1) allows the use of a cable conductor that is marked white or natural gray or has three or more white stripes as a ungrounded circuit conductor if effectively re-identified.
PANEL ACTION: Reject.
PANEL STATEMENT: Although 200-7(c)(2) may appear to be redundant, it adds clarity in that the Code requires single pole, three-way , and four-way switch legs (and travelers) to be reidentified as ungrounded conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: See my Explanation of Negative Vote on Proposal 5-38.

(Log #382)

5- 40 - (200-7(c)(1)): Reject
SUBMITTER: Tom Helbig, Madison Area Technical College/Rep. IBEW Local 159
RECOMMENDATION: Revise 200-7(c)(1) to read as follows:
(1) If part of a cable assembly and where the insulation is permanently reidentified to indicate its use as an ungrounded conductor, by ~~painting or other~~ effective means at its termination, and at each location where the conductor is visible and accessible.
SUBSTANTIATION: There are no paints listed and approved for use on insulation. There are no listed insulations tested for painting.
PANEL ACTION: Reject.
PANEL STATEMENT: No substantiation has been provided to indicate a problem. There is no requirement for paint to be listed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #381)

5- 41 - (200-7(c)(2)): Reject
SUBMITTER: Tom Helbig, Madison Area Technical College/Rep. IBEW Local 159
RECOMMENDATION: Revise to read as follows:
(2) Where a cable contains an insulated conductor for single-pole, 3-way, or 4-way switch loops, and the conductor with white or natural gray insulation or a marking of three continuous white stripes is used for the supply to the switch, but not as a return conductor from the switch to the switched outlet. In these applications, the conductor with white or natural gray insulation or with three continuous white stripes shall be permanently re-identified to indicate its use by ~~painting or other~~ effective means at its terminations and at each location where the conductor is visible and accessible.
SUBSTANTIATION: There are no paints listed and approved for use on insulation. There are no insulations tested for painting.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-40.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #433)

5- 42 - (200-7(c)(2)): Reject
SUBMITTER: Vohn N. Peeler, Faith, NC
RECOMMENDATION: Revise 200-7(c)(2) to read as follows:
Where a cable contains an insulated conductor for single-pole, 3-way, or 4-way switch loops, and the conductor with white or natural gray insulation or a marking of three continuous white stripes is used for the supply to the switch, but not as a return conductor from the switch to the switched outlet, reidentification of these conductors shall not be required. ~~In these applications, the conductor with white or natural gray insulation or with three continuous white stripes shall be permanently re-identified to indicate its use by painting or other effective means at its terminations and at each location where the conductor is visible and accessible.~~
SUBSTANTIATION: This proposal would restore the rule that we had prior to the 1999 NEC. Doing this presents absolutely no problem for people who are knowledgeable about cable wiring and the NEC. The main justification for this change was that "Weekend Warriors" were confused by the use of a white wire to feed a switch. The NEC is not written for untrained people. Putting additional requirements in the NEC will not solve the problem of untrained people (who never look at the NEC anyway) doing hazardous electrical work. Personally, I think the marking tape or painting makes for a more confusing situation.
PANEL ACTION: Reject.
PANEL STATEMENT: See Panel action and statement on Proposal 5-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: See my Explanation of Negative Vote on Proposal 5-38.

(Log #1442)

5- 43 - (200-7(c)(2)): Reject
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Replace the last sentence with the following:
In these applications, reidentification of the conductor with white or natural gray insulation or with three continuous white stripes shall not be required.
SUBSTANTIATION: This proposal essentially changes the "code" back to the way it was for generations. It was changed in 1999 (ROP 5-30) because of one person's concern that "weekend warriors" could get into trouble replacing a switch. Absolutely no evidence

was presented to show that there was any safety hazard with this long standing practice. Do you really think that the "weekend warriors" will bother to reidentify the white conductor on switch loops? They never reidentify the white conductor when they wire up their own 240V water heater. In fact, the average home handyman will not recognize reidentification at all. Most of us use electrical tape to reidentify an ungrounded conductor. That electrical tape has real meaning to the professional (usually a 240V circuit), but has absolutely no meaning to the "weekend warrior". To them it is just some tape (perhaps repairing a damaged wire). As far as training new electricians is concerned, the concept of "switch loops" is really very easy compared to other things that they must learn before they are ready to go out into the field. Any professional electrician immediately recognizes "switch loops" at a glance from three feet away. When we see a single pole switch with a black conductor on one terminal and a white one on the other - we instantly know everything that we need to know about how that switch is wired. While replacing such a switch, there are two wires and there are two screws on the switch - what could be simpler? If they don't know how to wire that switch, then they should call a professional. The "code" is not intended to be an instruction manual for untrained persons. Again, there was absolutely no safety issue here unless the homeowner didn't know enough to turn off the circuit breaker before beginning work. Reidentification won't prevent them from getting a shock. In the case of 3-way or 4-way switches, the worst thing that the homeowner can do is wire the switch in a way that it won't work properly. Reidentification would not help them anyway. They probably don't understand what the common terminal is on a 3-way switch. They won't notice that the screw is a darker color on the common terminal, or if they do they might assume that the reidentified conductor always goes on the common terminal. That would be an incorrect assumption. In some cases (power goes to the light first, then to the first 3-way switch, and then continues on to the other 3-way switch) the white wire would go on the common terminal. In another case (power goes to the light first, then it splits and goes to both switches with two cables) the white wire will be one of the traveler conductors and will not go to the common terminal of that 3-way switch. Reidentification of the white conductor on 3-way and 4-way switches can cause more confusion than it will solve (even for electricians). Reidentification of the white conductor on 240V circuits such as 240V water heaters, pump motors, etc. does serve a safety purpose. Reidentification of the white conductor in this case is usually the way that we immediately discover the voltage of the circuit. A 240V circuit presents a much greater electrocution hazard than a 120V circuit because many older homes still have two plug type fuses supplying 240V loads. In this case, it reminds us that there are two fuses to remove - not one. The entire paragraph of 200-7(c)(2) now says nothing at all. The first sentence has to do with making sure that the white conductor is used for the supply to the switch, and the other one requires reidentification. Reidentification is already covered in part 1. There should be no need to require the white conductor to be used for the supply to the switch, if reidentification is required anyway. It is just a lot of circular words. If you do not accept this proposal, you should at least delete the entire paragraph (see my other alternate proposal).
PANEL ACTION: Reject.
PANEL STATEMENT: See Panel action and statement on Proposal 5-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: See my Explanation of Negative Vote on Proposal 5-38.

(Log #1443)

5- 44 - (200-7(c)(2)): Reject
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Delete the entire paragraph (both sentences).
SUBSTANTIATION: This is an alternate to another proposal that I have submitted. I would very much prefer that you accept the other one instead.

The entire paragraph of 200-7(c)(2) now says almost nothing at all as it is. The first sentence has to do with making sure that the white conductor is used for the supply to the switch, and the other sentence requires reidentification.

There would be no need to require the white conductor to be used for the supply to the switch since reidentification is now required as of 1999. There is no possible situation where an installation would be safer using a reidentified white conductor as the supply to the switch than if the reidentified white conductor was used as the return from the switch. The whole reason for requiring that the white conductor be used as the supply to the switch was that it actually was a reliable way to identify the conductors. It insured that we wouldn't be left with two white wires to connect to the lampholder. Now that is all history. That requirement is now obsolete because of a stricter requirement that requires reidentification of all white conductors. Since the reidentification is already covered in 200-7(c)(2), the entire paragraph should just be deleted.
PANEL ACTION: Reject.
PANEL STATEMENT: See Panel action and statement on Proposal 5-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: See my Explanation of Negative Vote on Proposal 5-38.

(Log #2780)

5- 45 - (200-7(c)(2)): Reject
SUBMITTER: Daniel L. Robertus, State of Montana Electrical Insp. Dept.
RECOMMENDATION: Revise as follows:
"but not as a return conductor from the switch to the switched outlet. ~~In these applications, the conductor with white or natural gray insulation or with three continuous white stripes shall be permanently reidentified to indicate its use by painting or other effective mans at its terminations and at each location where the conductor is visible and accessible.~~
SUBSTANTIATION: It has been common practice and knowledge that the white conductor in romex cable, when used as a switch leg, was not a grounded conductor. This remarking requirement is an attempt to provide protection to a person who is not qualified to work on the installation in the first place. This requirement will be an unnecessary time consuming process for the installer, increasing the costs of the installation, and providing no further protection to the uneducated person who may come in contact with the conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: See Panel action and statement on Proposal 5-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: See my Explanation of Negative Vote on Proposal 5-38.

(Log #3347)

5- 46 - (200-7(c)(2)): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise as follows:
2. Where a cable <u>assembly</u> contains an insulated conductor for single-pole, 3-way, or 4-way switch loops, and the conductor with white or natural gray insulation or a marking of three continuous white stripes is used for the supply to the switch, but not as a return conductor from the switch to the switched outlet. In these applications, the conductor with white or natural gray insulation or with three continuous white stripes shall be permanently reidentified to indicate its use by painting or other effective means at its termination and at each location where the conductor is visible and accessible.
SUBSTANTIATION: The word assembly should be added to be consistent with Section 200-7(c)(1).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #3670)

5- 47 - (200-7(c)(2)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text as follows:
(2) Where a cable contains an insulated conductor for single-pole, 3-way, 4-way switch loops, and the conductor with white or ~~natural~~ gray insulation or a marking of three continuous white stripes is used for the supply to the switch, but not as a return conductor from the switch to the switched outlet. In these applications the conductor with white or ~~natural~~ gray insulation or with three continuous white stripes shall be permanently re-identified to indicate its use by painting or other effective means at its terminations and at each location where the conductor is visible and accessible.
SUBSTANTIATION: The term natural gray specifies a particular shade of gray which few electricians actually know what that color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #4160)

5- 48 - (200-7(c)(2)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./ Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
(2) Where a cable contains an insulated conductor for single-pole, 3-way, or 4-way switch loops, and the conductor with white or natural gray insulation or a marking of three continuous white stripes is used for the supply to the switch, but not as a return conductor from the switch to the switched outlet. In these applica-tions, reidentification of the conductor with white or natural gray insulation or with three continuous white stripes shall not be required. ~~be permanently re-identified to indicate its use by painting or other effective means at its terminations and at each location where the conductor is visible and accessible.~~
SUBSTANTIATION: The only substantiation for this change in the 1999 NEC addressed wiring practice by an unqualified in-dividual. By doing so, CMP 5 started down a dangerous path without any end, namely, to try to write this Code for the benefit of untrained persons, in contravention of Sec. 90-1(c). Generations of electricians have been trained in how to wire switch legs. It's a subject every first year apprentice learns. The NEC should re-turn to the 1996 principle, which had been in the NEC since before the 1937 Code. The people who use this Code won't be confused by a switch leg, and the people who don't use this Code won't know the signifi-cance of white vs. black anyway. By this proposal, Massachusetts gives notice that it has continued the old practice without incident.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-38.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: See my Explanation of Negative Vote on Proposal 5-38.

(Log #3671)

5- 49 - (200-7(c)(3)): Accept in Principle
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text as follows:
(3) Where a flexible cord, having one conductor identified by a white or ~~natural~~ gray outer finish or three continuous white stripes or by any other means permitted by Section 400-22, is used for connecting an appliance or equipment permitted by Section 400-7. This shall apply to flexible cords connected to outlets whether or not the outlet is supplied by a circuit that has a grounded conductor.
SUBSTANTIATION: The term natural gray specifies a particular shade of gray which few electricians actually know what that color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #676)

5- 50 - (200-10(a)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) All devices, excluding ~~lighting and appliance branch circuit~~ panelboards, provided with terminals for the attachment of conductors ... (remainder unchanged).
SUBSTANTIATION: Editorial. As presently worded a panelboard designated as a power panelboard is required to have terminals marked. Since the designation as to type of panel may be unknown until overcurrent devices and circuits are installed, is field marking intended?
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2507)

5- 51 - (200-10(d)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(d) Screw Shell Devices with Leads. For screw shell devices with attached leads, the conductor attached to the screw shell shall have a white ~~or natural gray finish.~~ The outer finish of the other conductor shall be of a solid color that will not be confused with the white ~~or natural gray finish~~ used to identify the grounded conductor.
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: See Panel action and statement on Proposal 5-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #4283)

5- 52 - (200-10(d)): Accept in Principle
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
(d) Screw Shell Devices with Leads. For screw shell devices with attached leads, the conductor attached to the screw shell shall have a white or ~~natural~~ gray finish. The outer finish of the other conductor shall be of a solid color that will not be confused with the white or ~~natural~~ gray finish used to identify the grounded conductor.

SUBSTANTIATION: Delete the word natural since the color natural gray is not defined and in fact does not exist as a specified color for insulation. This proposal goes with the definition of gray within a specified range of color per the Mensell color system as used by industry for wire color coding. The definition of the gray is provided in another proposal.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Panel action and statement on Proposal 5-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DIAZ: See my Explanation of Negative Vote on Proposal 5-9.

(Log #3825)

5- 53 - (200-10(f)): Reject
SUBMITTER: Harley Kilgore, Riviera Electric
RECOMMENDATION: My proposal is for the NEC to enact a measure to protect people from neutral hazards by creating a neutral panel schedule to put with CB Schedule.
SUBSTANTIATION: There is no way of knowing what ungrounded conductor is paired with what branch circuit(s). It creates an electrical hazard for all involved on the ungrounded conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no specific recommendation made by the submitter in the proposal. Section 4.3.3(c) of the Regulations Governing Committee Projects requires proposals to include proposed text, including the wording to be added, revised (and/or) revise, or deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

ARTICLE 210 — BRANCH CIRCUITS

(Log #450)

2- 3 - (210): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 210-6(d)(1)(a), replace "22 ft. (6.71 m)" with "6.7 m (22 ft)".
2. In Section 210-6(d)(1)(b), replace "18 ft. (5.49 m)" with "5.5 m (18 ft)".
3. In Section 210-8(a)(7), replace "6 ft. (1.83 m)" with "1.8 m (6 ft)".
4. In Section 210-19(d), Exception No. 1(a), replace "18 in. (457 mm)" with "450 mm (18 in.)".
5. In Section 210-19(d), Exception No. 1(c), replace "18 in. (457 mm)" with "450 mm (18 in.)".
6. In Section 210-50(c), replace "6 ft. (1.83 m)" with "1.8 m (6 ft)".
7. In Section 210-52, replace "5 1/2 ft. (1.68 m)" with "1.7 m (5 1/2 ft)".
8. In Section 210-52(a)(1), replace "6 ft. (1.83 m)" with "1.8 m (6 ft)".
9. In Section 210-52(a)(2)(a), replace "2 ft. (610 mm)" with "600 mm (2 ft)".
10. In Section 210-52(a)(3), replace "18 in. (457 mm)" with "450 mm (18 in.)".
11. In Section 210-52(c)(1), replace "12 in. (305 mm)" with "300 mm (12 in.)".
12. In Section 210-52(c)(1), replace "24 in. (610 mm)" with "600 mm (24 in.)".
13. In Section 210-52(c)(2), replace "24 in. (610 mm)" with "600 mm (24 in.)".
14. In Section 210-52(c)(2), replace "12 in. (305 mm)" with "300 mm (12 in.)".
15. In Section 210-52(c)(3), replace "24 in. (610 mm)" with "600 mm (24 in.)".
16. In Section 210-52(c)(3), replace "12 in. (305 mm)" with "300 mm (12 in.)".
17. In Section 210-52(c)(5), replace "18 in. (458 mm)" with "450 mm (18 in.)".
18. In Section 210-52(c)(5), Exception, replace "12 in. (305 mm)" with "300 mm (12 in.)".
19. In Section 210-52(c)(5), Exception, replace "6 in. (153 mm)" with "150 mm (12 in.)".
20. In Section 210-52(c)(5) Exception (b), replace "18 in. (458 mm)" with "450 mm (18 in.)".
21. In Section 210-52(d), replace "36 in. (914 mm)" with "900 mm (3 ft)".
22. In Section 210-52(e), replace "6 1/2 ft (1.98 m)" with "2.0 m (6 1/2 ft)."
23. In Section 210-52(h), replace "10 ft (3.05 m)" with "3.0 m (10 ft)".
24. In Section 210-62, replace "12 linear ft (3.66 m)" with "3.7 linear m (12 ft)".
25. In Section 210-63, replace "25 ft (7.62 m)" with "7.5 m (25 ft)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show the SI units as the preferred and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
In item 19 of the proposal, change "(12 in.)" to "(6 in.)".
PANEL STATEMENT: The panel accepts the concept, however, has corrected what is believed to be a typographical error in Item 19.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BROWN: The use of "hard Conversions" should be reevaluated. The proposed metric measurements do not correlate with the respective English measurements as used in such documents as model building codes, and standards such as ANSI A117.1. The Technical Correlating Committee should correlate all of these metric changes in the NEC with those dimensions already accepted throughout the industry.

(Log #1151)

2- 4 - (210): Reject
SUBMITTER: Don R. Fowlkes, City of Chattanooga, TN
RECOMMENDATION: Possible wording:
"Somewhere in Article 210 or 300 needs heading "Complete Wiring System".
SUBSTANTIATION: Before an electrical wiring system can be considered complete, it must form proper connections between the power source and the final outlet and/or load.
As an inspector, I am required to refer to a code reference to disapprove any code violation. At present, there is no code reference stating when wiring is incomplete (namely branch circuits). It would help the inspectors to be able to cite a code reference when wiring is not complete. Any wording to this effect would be very helpful.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided specific proposed code text in accordance with Section 4-3.3 of the Regulations Governing Committee Projects. The submitter's intent was not clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2933a)

2- 5 - (210, 220): Accept in Principle

Note: See the Technical Correlating Committee Note on Proposal 2-1.

SUBMITTER: Bernard J. Mezger, American Lighting Association

RECOMMENDATION: Incorporate "luminaire" into the 2002 NEC:

(a) To incorporate the use of the inclusive wording "luminaire" throughout the Code wherever the ambiguous wording "fixture" or "lighting fixture" is used an the intent and meaning is a complete lighting unit consisting of a fixture and the lamp(s), called a "luminaire".

(b) Add the definition of "luminaire" to Article 100-1 as follows:

Luminaire. A complete lighting unit consisting of a lamp, or lamps, and a ballast (when applicable), together with the parts designed to distribute the light, to position the lamp(s), and connect the lamp(s) to the power supply.

(c) Delete the FPN from Article 410-1 (and identical definition).

SUBSTANTIATION: Clarify the true meaning and intent of the item described as a "fixture", or a "lighting fixture", by providing the proper wording for a complete lighting unit. A luminaire consists of a fixture plus lamp(s). The definition and use proposed is consistent with that published and used by IESNA and NEMA.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 2-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #677)

2- 6 - (210-3, Exception): Accept in Principle in Part

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Exception: Multioutlet branch circuits <u>rated higher</u> ~~greater~~ than 50-amperes shall be permitted to supply nonlighting loads on ~~industrial~~ premises where maintenance and supervision <u>ensure</u> ~~indicate~~ that <u>only</u> qualified persons will service equipment the installation.

SUBSTANTIATION: The type of occupancy should not be a prime criterion for safety. Since "industrial" is not Code-defined the exception can be interpreted as not applying to premises such as institutional, airports, sewage treatment plants, government facilities, and other nonindustrial installations where it would be useful, even where maintenance and supervision are by qualified persons. The condition of qualified persons should be "ensured" not "indicated" which is a weaker term. "Ensured" is the term used in similar exceptions. "Only" qualified persons should be indicated; present wording does not exclude others.

PANEL ACTION: Accept in Principle in Part.

The panel accepts the portion of the proposal relative to the use of the term "ensure" and "only", so that the Exception reads as follows:

"Exception: Multioutlet branch circuits greater than 50 amperes shall be permitted to supply nonlighting outlet loads on industrial premises where conditions of maintenance and supervision ensure that only qualified persons will service the equipment."

The panel rejects the remainder of the proposal.

PANEL STATEMENT: The panel notes that the term "greater" conveys the appropriate meaning. The panel does not accept the deletion of "industrial" since the original exception was designed specifically for those installations and the submitter has not presented any substantiation to expand the locations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #3652)

2- 7 - (210-4): Reject

SUBMITTER: Mahlon Davenport, Rep. Commonwealth Code Inspection Service Inc.

RECOMMENDATION: Revise text to read as follows:

"All <u>ungrounded conductors of multi-wire circuits, with common neutral, must open simultaneously and</u> shall originate from the same panelboard."

SUBSTANTIATION: Neutral may overload if common trip breakers are not used to assure circuit wires are not on same phase.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirements for common trip circuit breakers are covered by Section 240-20(b). If the ungrounded circuit conductors do not originate on separate phases, the circuit would not be a multiwire branch circuit by definition and Section 210-4 would not apply.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #429)

2- 8 - (210-4(a) and 210-4(c) FPN): Reject

SUBMITTER: Vohn N. Peeler, Faith, NC

RECOMMENDATION: Remove the FPN under 210-4(c) and put that information in 210-4(a) as follows:

Drop the period after "panelboard" and add the following: <u>and all grounded device connections must comply with Section 300-13(b).</u>

SUBSTANTIATION: This eliminates an FPN and puts the reference in the text where it is easier to notice.

PANEL ACTION: Reject.

PANEL STATEMENT: The text that indicates the panelboard in question is where the branch circuit originated provides clarity to the section. Moving the Fine Print Note into the mandatory text is unnecessary, since Section 300-13(b) would already be mandatory because it is in Article 300.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #678)

2- 9 - (210-4(b), (d)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(b) Dwelling Units. In dwelling units a multiwire branch circuit supplying more than one device or equipment on the same yoke shall be provided with a means to disconnect simultaneously all ungrounded conductors at the panelboard <u>or other device</u> where the branch circuit originated.

(d) Identification of Ungrounded Conductors. Where more than one nominal voltage system, <u>or systems with different characteristics or systems supplied by different services</u> exists in a building <u>or other structure,</u> the ungrounded conductors of a multiwire ~~branch~~ circuit shall be <u>distinctly</u> identified by phase and system. The means of identification shall be permanently posted at each ~~branch circuit~~ <u>panelboard, switchboard, other circuit supply point.</u>

SUBSTANTIATION: Multiwire circuits may be supplied by ac and dc systems with the same voltage such as 120/240-volts for which identification is not required. Likewise, multiwire circuits of the same voltage may be supplied by different services. These circuits may occasionally be installed in the same enclosure. It seems such circuits also warrant distinct identification.

If safety warrants identification for multiwire branch circuits, why not feeders? Some feeders and branch circuits may employ the same size and number of conductors. Since circuits may originate from other than panelboards, such as switchboards, circuit, and fused switches, they are proposed for identification also. The intent is apparently to require identification which will distinguish systems, but this is not explicit, and one should not have to rely on intent.

A dam, oil derrick, or the like may not be considered as buildings, and such other structures should be included.

PANEL ACTION: Reject.

PANEL STATEMENT: Multiwire branch circuits are presently required to originate from the same panelboard and not other devices. Additional text referencing different characteristics or systems is more confusing, as the existing text is sufficient.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #334)

2- 10 - (210-4(d)): Reject

SUBMITTER: Mike Theisen, St. Cloud, MN

RECOMMENDATION: At the end of the last sentence of section 210-4(d) add text to read:

This means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and

shall be permanently posted at each branch-circuit panelboard which contains one or more multiwire branch circuits.
SUBSTANTIATION: This added text may help clarify that the "identification of ungrounded conductors" is not to be retroactive to all existing panelboards in the building, which may not contain multiwire branch circuits, even though more than one nominal voltage exists in the building.
PANEL ACTION: Reject.
PANEL STATEMENT: The additional text does not further clarify the intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1500)

2- 11 - (210-4(d)): Reject
SUBMITTER: Larry D. Wendt, State of Idaho/Rep. I.A.E.I.
RECOMMENDATION: Add the following text:
210-4(d) Identification of Ungrounded Conductors. Where more than one nominal voltage system exists in a building, each ungrounded conductor of a multiwire branch circuit where accessible, shall be identified by phase and system. This means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means and shall be permanently posted at each branch-circuit panelboard. See Section 110-15 for High-Leg Marking.
SUBSTANTIATION: This new sentence will make it clear that the marking required on the high-leg pertains to branch circuits as well as to services, feeders, and switchboards and panelboards. Please coordinate with the proposals on Sections 110-15, 215-8, 384-3(e), and 384-3(f).
PANEL ACTION: Reject.
PANEL STATEMENT: There is no substantiation presented to require that the high-leg be marked for branch circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2019)

2- 12 - (210-4(d)): Reject
SUBMITTER: Jerry Knoerr, Village of Greendale, Village of Mukwonago, WI
RECOMMENDATION: Add new text to read:
"On any new panel or switchboard a provision shall be made in the label of the panel to provide the coding requirements such as blue, red, white, etc. that can be written in the field for the different systems in the building."
SUBSTANTIATION: It would be very helpful at this location so that everyone who looked in the panel could determine if there was any marking showing different voltages in the building.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements in 210-4(d) are to provide an identification means for multiwire branch circuits where more than one nominal voltage system exists in the building. There is no requirement for general color coding as indicated in the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2523)

2- 13 - (210-4(d)): Reject
SUBMITTER: Richard P. Owen, City of St. Paul, MN
RECOMMENDATION: Revise as follows:
(d) Identification of Ungrounded Conductors. Where more than one nominal voltage system exists in a building, each ungrounded conductor of a ~~multiwire~~ branch circuit, where accessible, shall be identified by phase and system...
SUBSTANTIATION: Since the intent of this Section would seem to be to allow identification of differing systems within the same building, why should this now be required only for multiwire branch circuits? Identification of either single-phase or three-phase circuits, which could occupy the same raceway, trough, etc. as the multiwire circuits should be required for the qualified person to maintain the system after installation.
PANEL ACTION: Reject.
PANEL STATEMENT: The intent of the identification of ungrounded conductors in this section applies specifically to multiwire branch circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3829)

2- 14 - (210-4(d)): Reject
SUBMITTER: Jasmin Dzabic, Rick Berajen, Riviera Electric
RECOMMENDATION: To standardize undergrounded conductors coloring for high and low voltages. The standard colors most widely used are: black, red, blue and white for low voltages and brown, orange, yellow and gray for high voltages.
SUBSTANTIATION: There are no standards for ungrounded conductors colors which can cause confusion and possible hazards.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided specific proposed code text in accordance with Section 4-3.3 of the Regulations Governing Committee Projects. There are methods to provide the identification required by this section other than color coding.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3164)

2- 15 - (210-4(e) (New)): Reject
SUBMITTER: Michael L. Last, Na'alehu, HI
RECOMMENDATION: Add the following text:
(e) Identification of Conductors. All grounded and ungrounded conductors of each multiwire branch circuit shall be identified as part of each particular multiwire branch circuit. Identification shall be at the origination panelboard and at all other locations where conductors, both grounded and ungrounded, are present. The means of identification shall be permanent.
SUBSTANTIATION: It is in the interest of safety that multiwire branch circuits be permanently identified to insure that all (two or three) ungrounded conductors originate from different lines (phases). Additionally, the continuity of the grounded conductor must always be maintained. If two or more ungrounded conductors of a multiwire branch circuit originate from the same line (phase), there exists the possibility that the current in the grounded conductor will exceed its capacity. If there is a loss of integrity in the grounded conductor while the ungrounded conductors are intact, a condition of severe voltage unbalance could result. The requirements of Section 300-13(b) do NOT ensure against these hazards. The submitter (in his capacity as an electrical professional) has documented instances in which the absence of this proposal contributed to numerous occurrences of serious consequences and the compromising of the safety of personnel and equipment. This proposal will greatly reduce the hazards associated with multiwire branch circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation. His substantiation refers to something other than a multiwire branch circuit. Refer to the definition of multiwire branch circuit in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2381)

2- 16 - (210-6): Accept in Principle in Part
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise Section 210-6 as shown below:
210-6. Branch-Circuit Voltage Limitations. The nominal voltage of branch circuits shall not exceed the values permitted by (a) through (e) below.
[(a) through (d) unchanged]
(e) Over 600 volts Between Conductors. Branch circuits exceeding 600 volts, nominal, between conductors shall be permitted to supply

utilization equipment, other than lighting equipment, that is supervised and maintained by qualified persons.
SUBSTANTIATION: The voltage limitation for lighting units and cord- and plug-connected loads of 1440 va or less in dwelling units and guest rooms of hotels, etc., is properly established under Section 210-6(a). The permissive language of (b) through (d), interpreted literally, does not prohibit higher nominal voltages than those stated for branch circuits supplying other loads. For example, it is not a violation of Section 210-6(c)(4) to supply lighting fixtures equipped with "lampholders, other than the screw-shell type, applied within their voltage ratings" from branch circuits of more than 277 volts. Stating that 277 volts "shall be permitted" is not synonymous with stating that 600 volts, for example, is not permitted.
If it is erroneously assumed that the present language permits only those voltages that "shall be permitted," and prohibits higher voltages, nominal branch-circuit voltages of more than 600 volts are prohibited for industrial/commercial utilization equipment because "cord- and plug-connected or permanently connected utilization equipment" is specifically covered under present (b) through (d), which do not permit higher voltages. The proposed changes eliminate this anomaly, which resulted from editorial changes in the 1987 Code.
PANEL ACTION: Accept in Principle in Part.
Revise the proposed wording to read as follows:
"The nominal voltage of branch circuits shall not exceed the values permitted by (a) through (e)".
Add a new (e) to read as follows:
"(e) Over 600 Volts Between Conductors. Circuits exceeding 600 volts nominal between conductors shall be permitted to supply utilization equipment in installations where conditions of maintenance and supervision ensure that only qualified persons will service the installation."
PANEL STATEMENT: The revised wording meets the intent of the submitter, and provides clarity. The panel did not accept the exclusion of lighting equipment, as there are applications for specialized lighting systems in the over 600 volt category.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BECKER: This proposal appears to be unnecessary. The substantiation states that "if it is erroneously assumed..." that voltages over 600 volts are prohibited, there may be a problem. It should be clear that items that are not specifically "included" are not, therefore "excluded". This proposal, if accepted, would establish a dangerous precedent for other Code Articles.
SIDHOM: I agree with Mr. Becker's Explanation of Negative Vote.

(Log #CP203)

2- 17a - (210-7): Accept
SUBMITTER: CMP 2
RECOMMENDATION: In the submitter's recommendation on Proposal 2-18, add the following subdivision titles to (d) (1-3) to read as follows:
"(1) Grounding Type Receptacles.
(2) Ground-Fault Circuit-Interrupters.
(3) Nongrounding-Type Receptacles."
SUBSTANTIATION: To comply with 2.1.5.2 of the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #597)

2- 17 - (210-7): Reject
SUBMITTER: Martin Sallach, Lincoln Electric
RECOMMENDATION: Article 210-7, new section to be inserted between section (c) and (d):
Method of Wiring. Where connected to a branch circuit supplying two or more receptacles or outlets, and where the device has terminals that are intended to receive two or more wires, both the incoming and outgoing circuit conductors may be terminated directly at the device.
SUBSTANTIATION: Many local municipalities continue to require that only one pair of conductors be terminated at the receptacle. This requires the use of wire nuts to make the splice on the box. If the wrong size of wire nut is selected or does not adequately grab all of the wires a poor connection is created. Additionally, the receptacle box begins to become overcrowded. The majority of the commercially available receptacles are designed and tested to accommodate terminating both the incoming and outgoing conductors. Inserting this paragraph into the code will establish a wiring method that provides a more secure termination.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: This method of wiring is already allowed for approved devices listed for this purpose.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #635)

2- 18 - (210-7): Accept in Principle
NOTE: The Technical Correlating Committee advises that placement of Articles is the responsibility of the Technical Correlating Committee, and the Technical Correlating Committee assigns Article 406 as the proposed new Article. Final responsibility for the Article will reside with Code-Making Panel 18 upon completion of the NEC 2002 Code cycle. The Technical Correlating Committee directs that this Proposal be referred to Code-Making Panel 18 for information.
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Relocate Section 210-7 to proposed new Article 420 as Section 420-3 titled General Installation Requirements and add a new general statement.
420-3~~210-7~~. General Installation Requirements. Receptacle outlets shall be located in branch circuits in accordance with Part C of Article 210. General installation requirements shall be in accordance with (a) through (f) below:
(a) Grounding Type. Receptacles installed on 15- and 20-ampere branch circuits shall be of the grounding type. Grounding-type receptacles shall be installed only on circuits of the voltage class and current for which they are rated, except as provided in Tables 210-21(b)(2) and (b)(3).
Exception: Nongrounding-type receptacles installed in accordance with Section ~~210-7~~ 420-3(d).
(b) To Be Grounded. Receptacles and cord connectors that have grounding contacts shall have those contacts effectively grounded.
Exception No. 1: Receptacles mounted on portable and vehicle-mounted generators in accordance with Section 250-34.
Exception No. 2: Replacement receptacles as permitted by Section ~~210-7~~420-3(d).
(c) Method of Grounding. The grounding contacts of receptacles and cord connectors shall be grounded by connection to the equipment grounding conductor of the circuit supplying the receptacle or cord connector.
FPN: For installation requirements for the reduction of electrical noise, see Section 250-146(d). The branch-circuit wiring method shall include or provide an equipment grounding conductor to which the grounding contacts of the receptacle or cord connector shall be connected.
FPN No. 1: Section 250-118 describes acceptable grounding means.
FPN No. 2: For extensions of existing branch circuits, see Section 250-130.
(d) Replacements. Replacement of receptacles shall comply with (1), (2), and (3) as applicable.
(1) Where a grounding means exists in the receptacle enclosure or a grounding conductor is installed in accordance with Section 250-130(c), grounding-type receptacles shall be used and shall be connected to the grounding conductor in accordance with Sections ~~210-7~~420-3(c) or 250-130(c).
(2) Ground-fault circuit-interrupter protected receptacles shall be provided where replacements are made at receptacle outlets that are required to be so protected elsewhere in this code.
(3) Where a grounding means does not exist in the receptacle enclosure, the installation shall comply with (a), (b), or (c).
(a) A nongrounding-type receptacle(s) shall be permitted to be replaced with another nongrounding-type receptacle(s).
(b) A nongrounding-type receptacle(s) shall be permitted to be replaced with a ground-fault circuit interrupter-type receptacle(s). These receptacles shall be marked "No Equipment Ground." An

equipment grounding conductor shall not be connected from the ground-fault circuit interrupter-type receptacle to any outlet supplied from the ground-fault circuit interrupter receptacle.

(c) A nongrounding-type receptacle(s) shall be permitted to be replaced with a grounding-type receptacle(s) where supplied through a ground-fault circuit interrupter. Grounding-type receptacles supplied through the ground-fault circuit interrupter shall be marked "GFCI Protected" and "No Equipment Ground." An equipment grounding conductor shall not be connected between the grounding-type receptacles.

(e) Cord- and Plug-Connected Equipment. The installation of grounding-type receptacles shall not be used as a requirement that all cord- and plug-connected equipment be of the grounded type.

FPN: See Section 250-114 for types of cord- and plug-connected equipment to be grounded.

(f) Non-interchangeable Types. Receptacles connected to circuits that have different voltages, frequencies, or types of current (ac or dc) on the same premises shall be of such design that the attachment plugs used on these circuits are not interchangeable.

SUBSTANTIATION: These are general installation requirements. They are more in line with the scope of proposed Article 420 than the scope of Article 210. Over many Code cycles the general installation and construction requirements for receptacles, attachment plugs and cord connectors have been adopted in various sections of the Code. The intent of this proposal is to locate the general installation requirements for receptacles and cord connectors to the new Article 420. New Article 420 covers requirements for installation, mounting, grounding and non-interchangeability. This proposal brings the related requirements into a single article thereby making it easier for the code user to locate them.

Article 420 establishes general requirements for how receptacles are to be installed. Article 210 appropriately establishes where receptacle outlets are to be installed. The proposed new general statement directs the user to Article 210 for receptacle outlet location requirements.

This proposal was developed by a Task Group of CMP 18 appointed by the chairman to consider separating 1999 NEC Article 410 into two articles, one covering fixtures and the other covering receptacles, attachment plugs and cord connectors. This Task Group was appointed in response to Proposal 18-55 for the revision of the 1996 NEC.

PANEL ACTION: Accept in Principle.

The panel accepts the submitter's recommendation to relocate the material in 210-7 into a new Chapter 4 article.

In addition, create a new 210-7 to read as follows:

"210-7 Branch Circuit Receptacle Requirements. Receptacle outlets shall be located in branch circuits in accordance with Part C of Article 210. Specific requirements for receptacles are covered in Article 420."

PANEL STATEMENT: The panel has approved the relocation and has developed a new 210-7 to cover the requirements specific to branch circuits in Article 210.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #639)

2- 19 - (210-7): Accept in Principle

SUBMITTER: Jack Wells, Pass & Seymour/Legrand

RECOMMENDATION: Add Section 210-7, changing only the appropriate section references within the text, to proposed new Article 420 as Section 420-3 titled General Installation Requirements.

~~420-3~~210-7. General Installation Requirements. Receptacle outlets shall be located in branch circuits in accordance with Part C of Article 210. General installation requirements shall be in accordance with (a) through (f) below:

(a) Grounding Type. Receptacles installed on 15- and 20-ampere branch circuits shall be of the grounding type. Grounding-type receptacles shall be installed only on circuits of the voltage class and current for which they are rated, except as provided in Tables 210-21(b)(2) and (b)(3).

Exception: Nongrounding-type receptacles installed in accordance with Section ~~210-7~~ 420-3(d).

(b) To Be Grounded . Receptacles and cord connectors that have grounding contacts shall have those contacts effectively grounded.

Exception No. 1: Receptacles mounted on portable and vehicle-mounted generators in accordance with Section 250-34.

Exception No. 2: Replacement receptacles as permitted by Section ~~210-7~~ 420-3(d).

(c) Methods of Grounding. The grounding contacts of receptacles and cord connectors shall be grounded by connection to the equipment grounding conductor of the circuit supplying the receptacle or cord connector.

FPN No. 1: For installation requirements for the reduction of electrical noise, see Section 250-146(d). The branch-circuit wiring method shall include or provide an equipment grounding conductor to which the grounding contacts of the receptacle or cord connector shall be connected.

FPN No. 2: Section 250-118 describes acceptable grounding means.

FPN No. 3: For extensions of existing branch circuits, see Section 250-130.

(d) Replacements. Replacement of receptacles shall comply with (1), (2), and (3) as applicable.

(1) Where a grounding means exists in the receptacle enclosure or a grounding conductor is installed in accordance with Section 250-130(c), grounding-type receptacles shall be used and shall be connected to the grounding conductor in accordance with Sections ~~210-7~~ 420-3(c) or 250-130(c).

(2) Ground-fault circuit-interrupter protected receptacles shall be provided where replacements are made at receptacle outlets that are required to be so protected elsewhere in this code.

(3) Where a grounding means does not exist in the receptacle enclosure, the installation shall comply with (a), (b), or (c).

(a) A nongrounding-type receptacle(s) shall be permitted to be replaced with another nongrounding-type receptacle(s).

(b) A nongrounding-type receptacle(s) shall be permitted to be replaced with a ground-fault circuit interrupter-type of receptacle(s). These receptacles shall be marked "No Equipment Ground." An equipment grounding conductor shall not be connected from the ground-fault circuit-interrupter-type receptacle to any outlet supplied from the ground-fault circuit-interrupter receptacle.

(c) A nongrounding-type receptacle(s) shall be permitted to be replaced with a grounding-type receptacle(s) where supplied through a ground-fault circuit interrupter. Grounding-type receptacles supplied through the ground-fault circuit interrupter shall be marked "GFCI Protected" and "No Equipment Ground". An equipment grounding conductor shall not be connected between the grounding-type receptacles.

(e) Cord- and Plug-Connected Equipment. The installation of grounding-type receptacles shall not be used as a requirement that all cord- and plug-connected equipment be of the grounded type.

FPN: See Section 250-114 for types of cord- and plug-connected equipment to be grounded.

(f) Non-interchangeable Types. Receptacles connected to circuits that have different voltages, frequencies, or types of current (ac or dc) on the same premises shall be of such design that the attachment plugs used on these circuits are not interchangeable.

SUBSTANTIATION: These are general installation requirements. They are more in line with the scope of proposed Article 420 than the scope of Article 210. Over many Code cycles the general installation and construction requirements for receptacles, attachment plugs and cord connectors have been adopted in various sections of the code. The intent of this proposal is to locate the general installation requirements for receptacles and cord connectors to the new Article 420. New Article 420 covers requirements for installation, mounting, grounding and noninterchangeability. This proposal brings the related requirements into a single article thereby making it easier for the code user to locate them.

This proposal was developed by a Task Group of CMP 18 appointed by the chairman to consider separating 1999 NEC Article 410 into two articles, one covering fixtures and the other covering receptacles, attachment plugs and cord connectors. This Task Group was appointed in response to Proposal 18-55 for the revision of the 1996 NEC.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 2-18.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #4469)

2- 20 - (210-7(a)(1)): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for information.

SUBMITTER: Gordon E. Berg, W. St. Paul, MN

RECOMMENDATION: Add new text to read:
"The ungrounded screws on 15- and 20-amp receptacles shall be covered or protected before receptacles are installed in a metal box."
SUBSTANTIATION: The ungrounded receptacle screws on 15- and 20-amp receptacles should be covered before securing them in a metal electrical box. This additional protection would prohibit loose unused screws, strands of wire or a uncentered receptacle from coming in contact with the grounded edge of an electrical box and also avoid the danger of exposed screws should the plates ever come off or break.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter describes a workmanship issue that is not properly addressed by the recommendation. Receptacles and boxes designed and installed in accordance with existing standards should not encounter this problem. The panel requests the Technical Correlating Committee forward this proposal to Code-Making Panel 18 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4452)

2- 21 - (210-7(d)(3)(a)): Reject
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
RECOMMENDATION: Revise text to read as follows:
"...permitted to be replaced with another nongrounding-type receptacle. Such a receptacle shall be marked, by a means integral to the receptacle, "no equipment ground."
SUBSTANTIATION: A two-prong receptacle as replacement may well be, and very commonly is, used with a three-prong adapter; this marking should dissuade some users from doing so. In every second or third older house I look at I find three-prong adapters that rely on receptacles cover screws for grounding. To the best of my recollection, over the twenty-some years I have been contracting and consulting in older homes, none of these have been tested to confirm the presence, of ground until I happened on them.
Where are the bodies? We protect the public by grounding three-prong equipment; we consider this need to be substantiated by adequate evidence. There always will be people who willfully defeat safety measures; this proposal is not about protecting them, but about protecting the vast majority of people who are threatened due to ignorance. Section 230(c)(3)(b) and (c) service the same function. This will not address existing nongrounding type receptacles, but the Code cannot require retrofitting parts of the electrical system that are not being worked on. The phrasing,"permanently and durably.0" presently is construed to mean, "having a paper label taped on." This arguably is acceptable in the case of GFCI protection precisely because in large measure GFCI coverage protects life whether users are aware of it or not, whether integral grounding is present or not. However, every inspector and every installer is aware that these are peeled off and painted over. If integral to devices, say embossing, these are more likely to remain visible — in part because they are less likely to be unattractive. This does not force the hand of ANSI committees, as authorities having jurisdiction do not require the use of products that are not on the market. However, it does make the statement that this protection is important to life safety. I have submitted the relevant part of a page from the instructions for utilization equipment that explicitly warn against the use of such adapters. I have many others that warn against defeating grounding. Why include such instructions except for the fact that adapters so commonly do constitute "cheaters." Explicit, integral wording is likely to cut down on such practices.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Marking by a means integral to the receptacle would be of little value to the user given the limited space available on the receptacle face.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1163)

2- 22 - (210-7(d)(3)b): Reject
SUBMITTER: Richard E. Manrod, Mesa, AZ
RECOMMENDATION: Revise text to read:
210-7(d)(3)b. A non-grounding-type receptacle(s) shall be permitted to be replaced with a listed ground-fault circuit-interrupter-type (GFCI) of receptacle(s). These receptacles shall have the ground pin opening, but without the ability to connect to ground. They shall be marked "NO EQUIPMENT GROUND." An equipment grounding conductor shall not be connected from the ground-fault circuit-interrupter-type receptacle to any outlet supplied from the ground-fault circuit-interrupter receptacle.
SUBSTANTIATION: Many of the homes wired before the early 1960's were wired using either two wire Nonmetallic-Sheathed Cable (Romex) or Knob and Tube wiring. Most of these installations used a metal box.
There is a good possibility that the older insulation (RR, RHW, TW, etc.) on those solid wires, could crack with age or may have been nicked during installation. When a GFCI receptacle is installed in those single gang metal boxes, there is a possibility of the hot conductor touching the metal box.
The GFCI receptacle's ground pin is connected to the metal box through the mounting screw and strap. A live connection from the box may then be made to the GFCIs ground pin. The outer case or housing of any equipment (i.e., drill motor, kitchen appliance, etc.) connected to the GFCI will become energized thus creating a shock hazard with possible injury or death.
A special GFCI receptacle, marked "FOR NON-GROUNDED APPLICATIONS ONLY" should be used where a ground is not available. This special GFCI should not have the ground pin brought out for connection.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has described a theoretical situation that could also occur with a two wire receptable used with a ground adapter. The GFCI does provide for improved safety above what was in the original installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3666)

2- 23 - (210-7(d)(3)(b) and (c)): Reject
SUBMITTER: James M. Naughton, Boston Globe
RECOMMENDATION: Delete (b) and (c) in its entirety.
SUBSTANTIATION: The practice of replacing nongrounding type receptacles has been a controversial issue since the time GFCI receptacles were introduced in the early 1970s.
The receptacle being replaced is fed by a two wire ungrounded system that in most cases is at least fifty years old.
The consumer does not think of the wiring system being used, that's our responsibility. To label or mark a ground-fault circuit interrupter receptacle in reality does not last. Receptacles and covers are painted, wallpapered and blocked making it unreadable.
Two wire ungrounded systems have served their purpose. This is the time we should update the circuit to a grounded system.
PANEL ACTION: Reject.
PANEL STATEMENT: The GFCI provides a method to replace older two wire receptacles with a method that improves safety for the user.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1043)

2- 24 - (210-7(g)): Reject
SUBMITTER: Randall S. Bell, Greenwood, IN
RECOMMENDATION: I would like to propose that Receptacles have to be ground up.
SUBSTANTIATION: I have looked and studied that it would be safer for people. I think it would be a very good thing for the NEC to adopt this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no evidence to support a required orientation of the ground pin for a receptacle outlet. The panel notes that receptacles have been installed with the ground pin up,

down, and horizontally for many years with no established trend of one orientation being safer than the other.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1896)

2- 25 - (210-7(g) (New)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Add a new paragraph (g) to read:
(g) Multiple Receptacles. Where more than one receptacle is mounted on the same yoke means shall be provided to disconnect simultaneously all ungrounded conductors feeding these receptacles at the panelboard where the branch circuit(s) originate.
SUBSTANTIATION: As presently written Section 210-4(b) refers to multi-wire circuits in dwelling units. The protection intended by that section should not be limited to dwelling units. Extending that protection to other than dwelling units would be justifiably within the purpose of the National Electrical Code.
Limiting the protection intended to only multi-wire circuits allows the installer to remove the break off tabs from both the ungrounded and the grounded terminals on the receptacle and feed the two separate receptacles on the same yoke with separate ungrounded and separate grounded conductors (not a multi-wire circuit) in any type of occupancy and circumvent the intended protection of Section 210-4(b). The listing as shown in the UL White Book refers only to the removal of tabs from these receptacles for their use in multi-wire circuits but does not expressly state that this is a requirement. The fact that the tabs are present on the grounded terminal of the receptacles indicates their use is anticipated.
Prohibiting the manufacture of receptacles with break off tabs on the grounded terminal would be the best answer to prevent persons from unintentionally working on energized circuits they had thought were disconnected. This of course would not help the person in other than dwelling units and this is an important consideration.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concern is noted, however, the submitter relates the proposal to multiwire branch circuits but does not provide substantiation that the proposal presents the same hazard as multiwire branch circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3865)

2- 26 - (210-7(g) (New)): Accept in Principle
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Add a new Section 210-7(g) to read as follows:
"Receptacle Outlet Position. Receptacle outlets in dwelling units shall not be installed in a face-up position in the work surfaces or countertops."
SUBSTANTIATION: At the present time, similar or identical wording is found in three locations in Article 210.
Section 210-8(a)(7) where the subject is GFCI protection, not location of the receptacle outlet.
Section 210-52(c)(5) which covers the location requirements for receptacle outlets in dwelling unit kitchens and dining rooms.
Section 210-52(d) for location of receptacle outlets for dwelling unit bathrooms.
It seems that locating the requirement in one location will suffice and correct the improper wording in Section 210-8(a)(7).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 2-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4353)

2- 27 - (210-7(g) (New)): Reject
SUBMITTER: R. Gerald Irvine, Suffern, NY
RECOMMENDATION: Add new text to read as follows:
210-7(g) Methods of Installation. Receptacles installed on 15- and 20-ampere branch circuits shall be installed as follows:
(1) Vertically installed receptacles shall be oriented with the ground pin up.
(2) Horizontally installed receptacles shall be oriented with the neutral conductor uppermost.
SUBSTANTIATION: Recommendations from Crouse Hinds, Eagle Electric, General Electric, and Power CET Corp. provide these reasons: (a) Compliance with UL requirements; (b) In the event a metallic object were to fall against the plug blades while the plug was not fully inserted, such an object would hit the harmless grounding prong rather than short-circuit against the hot and neutral conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 2-24.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #410)

2- 28 - (210-8): Reject
SUBMITTER: Randy L. Smith, Las Vegas, NV
RECOMMENDATION: Add new text as follows:
Where self-contained ground-fault circuit-interrupter receptacles are used to meet the requirements of 210-8(4), receptacles shall be marked for personnel protection as provided in Article 110, to identify the branch circuit panelboard, and branch circuit disconnecting means.
SUBSTANTIATION: In the last 5 years, I have changed out approximately 50 of these receptacles in open areas. In each case the receptacle was deadfront, and the line side branch circuit was energized. The only way to determine this is to remove the receptacle. In areas such as in Article 680 G, this is clearly a potentially hazardous removal. In the last 6 months, I have seen 250 of these receptacles installed for the associated equipment of Article 680 G, and in each area there is probability of water, and grounded metal conditions. Each of these installations were inspected and passed.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's intent is not clear as to what is proposed to be marked and what GFCI is in question.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2925)

2- 29 - (210-8): Reject
SUBMITTER: Frank Pologruto, Rep. IBEW L.U. 98
RECOMMENDATION: Add to Section 210-8:
"All 20 ampere, 125 volt receptacles in commercial kitchens shall have GFCI protection."
SUBSTANTIATION: The GFCI protection has protected people for over twenty years, and has expanded to areas like garages, outdoors, basement, etc., however, commercial kitchens are not mentioned in the code.
In commercial kitchens 20 ampere, 125 volt receptacles are constantly in use for small kitchen appliances, that are exposed to metal sinks, stoves, etc., that are conductive and should be GFCI protected.
Shouldn't commercial kitchen personnel be protected by the same GFCI protection that residential kitchens have?
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter relates the requirement to dwelling units but has provided no substantiation to show that the same potential hazard exists for nondwelling units. The original substantiation for GFCI protection on kitchen and wet bar receptacles is related to dwelling unit applications.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3942)

2- 30 - (210-8): Reject
SUBMITTER: Jim Crocker, Insp. Div, City of Chattanooga, TN
RECOMMENDATION: Revise text to read as follows:
210.8 Ground Fault Circuit-Interrupter Protection for Personnel
(b) Other than Dwelling Units. All 125-volt, single phase 15- and 20-ampere receptacles installed in the locations specified below shall have ground-fault circuit-interruption protection of personnel.
(1) Bathrooms;
(2) Roof tops;
(3) in wash down areas;
(4) within 6 ft of all sinks;
SUBSTANTIATION: In fast food restaurants and other businesses where mop sinks, handwash sinks, etc. and where floors require washing down and outlets are present, employees may use for radios, fans, small heat units, etc., GFCI is needed.
PANEL ACTION: Reject.
PANEL STATEMENT: Insufficient substantiation has been presented to show that the receptacles around all sinks and washdown areas present the same potential hazard. Receptacle covers or other means are available to provide the protection contemplated by the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4463)

2- 31 - (210-8): Reject
SUBMITTER: Charles M. Williams, Stealth Electric
RECOMMENDATION: This article should be changed to include a requirement that a circuit supplying switches for lights, fans, etc., in a bathroom of a dwelling be protected by a GFCI, if located within 5 ft of a tub or shower.
SUBSTANTIATION: It is not unusual in a small bathroom to have these switches placed within 5 ft of a tub or shower enclosure, due to lack of any other wall location that is suitable. GFCI protection of these circuits can only enhance safety, in the event these switches can be reached from a tub or shower.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any evidence of a hazard relating to a properly installed switch in proximity to a tub or shower.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3685)

2- 32 - (210-8(3)): Reject
SUBMITTER: Steve Campolo, Leviton Manufacturing Co., Inc.
RECOMMENDATION: Revise text to read as follows:
210.8. Ground-Fault Circuit-Interrupter Protection for Personnel.
(a) Dwelling Units...
(3) Outdoors. The device(s) providing ground-fault circuit-interrupter protection for personnel shall incorporate features that render the device incapable of being reset unless its proper operation is verified by the successful completion of the built-in in supervisory test.
SUBSTANTIATION: Data available from the files of the U.S. Consumer Product Safety Commission (CPSC) and Underwriters Laboratory (UL) indicate that a significant number of ground-fault circuit-interrupter (GFCI) devices installed in the field are inoperative. Current product is capable of restoring power when the GFCI no longer provides personal protection. Analysis has shown that GFCI(s) could be damaged by nearby lightning strikes and voltage surges. High voltage surges can cause GFCI(s) to trip in the process of damaging various electronic components. This proposal would prevent a nonfunctioning GFCI from being reset and restoring unprotected power, as can presently occur.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: With the support of Underwriters Laboratories Inc., the GFCI manufacturers of the National Electrical Manufacturers Association are in the process of conducting a comprehensive national survey to evaluate the performance of GFCIs installed in the electrical infrastructure. The panel understands that UL will issue a bulletin stating that no action will be taken regarding revision of the GFCI standard, UL943, until the data from the GFCI survey is compiled and analyzed.
The submitter proposes a design change that may or may not be supported by the outcome of the GFCI survey. It is the understanding of the panel that UL will take the necessary action to revise the product standard to accommodate any GFCI changes that may be indicated by an analysis of the GFCI survey data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
NISSEN: The concept of utilizing advancements in product technology to enhance the effectiveness of personnel protection devices should be encouraged, as well as the efforts of the National Electrical Manufacturers Association to study the state of GFCI units in the field, learn if units are non-operational, and if so, to determine the extent and cause of their non-operation. If as a result of this study, additional product requirements are deemed necessary, these changes more appropriately belong in the product safety standard, and not in the NEC.

(Log #3834)

2- 33 - (210-8(3)): Reject
SUBMITTER: Buck Chavarrios, Riviera Electric
RECOMMENDATION: Revise text to read as follows:
210-8(3) Other than Dwelling Unit. All 125 volt single phase 15- and 20-ampere receptacles installed in locations specified below shall have ground-fault-circuit interrupters protection for personnel.
(1) Bathrooms
(2) Rooftops
(3) Outdoors.
SUBSTANTIATION: To reduce the risk of any electrical hazards to the general public or commercial building personnel to prevent any lawsuits that could come from these risks.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation to show that the potential hazards exist through the use of outdoor receptacles for nondwelling applications. Some proposals received on this topic suggest that GFCI protection on all outdoor receptacles is necessary because it is provided for dwelling units. However, it was how those receptacles were used at dwelling units that resulted in the requirement. The original data that justified dwelling unit applications is not directly applicable to nondwelling unit applications.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
PAULEY: NEMA acknowledges the Panel Statement, but recognizes that safety would be enhanced if all 125V, 15 and 20A outdoor receptacles were protected by a GFCI. NEMA encourages public comments with supporting data.

(Log #388)

2- 34 - (210-8(a)): Reject
SUBMITTER: Mitchell R. Iles, City of Rogers Insp. Division, AR
RECOMMENDATION: Add receptacles within 6 ft of water source require GFCI protection (residential).
SUBSTANTIATION: In laundry rooms with sinks no provision is specified. They are not bar sinks. Slop sinks may also be included.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1912)

2- 35 - (210-8(a)): Reject
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
210-8. Ground-Fault Circuit-Interrupter Protection for Personnel
FPN: See Section 215-9 for ground-fault circuit-interrupter protection for personnel on feeders.

(a) ~~Dwelling Units.~~ All Occupancies. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified below shall have ground-fault circuit-interrupter protection for personnel.

1. Bathrooms.
2. Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use.

Exception No. 1: Receptacles that are not readily accessible.

Exception No. 2: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another, and that is cord-and plug-connected in accordance with Section 400-7(a)(6), (a)(7), or (a)(8).

Receptacles installed under the exceptions to Section 210-8(a)(2) shall not be considered as meeting the requirements of Section 210-52(g).

3. Outdoors.

Exception: Receptacles that are not readily accessible and are supplied by a dedicated branch circuit for electric snow-melting or deicing equipment shall be permitted to be installed in accordance with the applicable provisions of Article 426.

4. Crawl spaces. Where the crawl space is at or below grade level.
5. Unfinished basements. For purposes of this section, unfinished basements are defined as portions or areas of the basement not intended as habitable rooms and limited to storage areas, work areas, and the like.

Exception No. 1: Receptacles that are not readily accessible.

Exception No. 2: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another, and that is cord-and plug-connected in accordance with Section 400-7(a)(6), (a)(7), or (a)(8).

Receptacles installed under the exceptions to Section 210-8(a)(5) shall not be considered as meeting the requirements of Section 210-52(g).

6. Kitchens. Where the receptacles are installed to serve the countertop surfaces.
7. Wet bar sinks. Where the receptacles are installed to serve the countertop surfaces and are located within 6 ft (1.83 m) of the outside edge of the wet bar sink. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops.

SUBSTANTIATION: The requirement for GFCI receptacles should not be different for a kitchen, bathroom, crawl space, outdoor, unfinished basement, garages, storage-work area, and wet bar sink in commercial building since the degree of hazard is the same. People service babies, make coffee, do all cooking the same in a dwelling. Servicing equipment is the same in all occupancies. What makes other than dwelling units locations less hazardous? It should only make sense to apply the same requirements to all locations. Personnel safety should be the first consideration in evaluating this proposal. The receptacles in these locations named in this section should all be afforded the protection of GFCI. They provide the same protection whether it's commercial occupancy or residential.

PANEL ACTION: Reject.

PANEL STATEMENT: Insufficient substantiation has been presented to extend all of the GFCI requirements to all occupancies. The original substantiation to add the requirements outlined in Section 210-8(a) is based on data provided for dwelling unit applications.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #2891)

2- 36 - (210-8(a) and (b)): Reject

SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI

RECOMMENDATION: Revise Section 210-8 (a) as follows:

Changing Dwelling Units to All Occupancies and add new section (8) to read as follows:

(8) Within 6 ft (1.83 m) of any sink, wash basin, tub, or shower.

Delete Section (b).

SUBSTANTIATION: The requirement for GFCI protection of receptacles should be no different for kitchens, bathrooms, crawl spaces, outdoors, unfinished basements, garages, storage work areas or wet bar sinks in commercial buildings since the same degree of hazard exists.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has presented insufficient substantiation to show that the receptacles around other sinks in dwelling units and in other than dwelling units, such as laundry sinks, tubs, basins or showers, are used in similar fashion as kitchen sinks and wet bar sinks in dwelling units, and present the same potential hazard.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #3848)

2- 37 - (210-8(a) and (b)): Reject

SUBMITTER: Lanny McMahill, Phoenix, AZ

RECOMMENDATION: Change Subsection (a), "Dwelling Units" to "All Occupancies."

Delete Subsection (b), "Other than Dwelling Units."

SUBSTANTIATION: The requirements for ground-fault circuit-interrupter protection for personnel should apply consistently in the Code. The hazards are the same for all occupancies.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 2-35.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #4467)

2- 38 - (210-8(a) and (b)): Reject

SUBMITTER: David Skeen, Nugent Electric

RECOMMENDATION: Add text:

"That any receptacles within 6 ft of any sink, shower, bathtub be GFCI protected."

SUBSTANTIATION: None.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 2-36.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1686)

2- 39 - (210-8(a)(1)): Reject

SUBMITTER: Harold R. Endean, III, Township of Montville, NJ

RECOMMENDATION: After the following word... "Bathrooms", add "See Section 210-52(d)."

SUBSTANTIATION: I feel that when an inspector is out in the field trying to answer questions or looking up in the code book it is very easy to overlook Section 250-52(d).

PANEL ACTION: Reject.

PANEL STATEMENT: Section 210-8 deals with GFCI requirements. The proposed reference would not add any clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #2750)

2- 40 - (210-8(a)(2)): Reject

SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.

RECOMMENDATION: Revise as follows:

(2) Garages, and accessory buildings that have a floor located at or below grade level (~~not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use.~~)

SUBSTANTIATION: During Hurricane Floyd, while working as an electrical inspector as part of a FEMA advance team, I noted that buildings of the above said article had been flooded. Occupants in their haste to remove water and humidity were forced to use non-GFCI receptacles for pumps, dehumidifiers and fans. Although the areas were finished as the code states, these areas pose significant danger to occupants and should be GFI protected. If an area not suitable for habitable use is protected, all the more an area that is suitable for habitable use.

PANEL ACTION: Reject.
PANEL STATEMENT: The submitter is requesting a change based on a hazard during a natural disaster such as a flood. The hazards under such conditions can be numerous and cannot be anticipated by the NEC rules.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3944)

2- 41 - (210-8(a)(2)): Reject
SUBMITTER: William J. Richert, Atlas, MI
RECOMMENDATION: Delete all of sentence after the word garages. Make a new paragraph (3) as follows:
(3) General use receptacles serving a floor at or below grade level of accessory building supplies power from a dwelling and not used for farm or commercial purposes or intended as habital rooms and limited to storage areas, work areas and areas of similar use.
SUBSTANTIATION: Accessory buildings are frequently installed to serve farm and commercial enterprises and there is also a dwelling on the property confusion arises as to whether small buildings or these properties fall under this rule.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 547 covers specific requirements for buildings used in agricultural installations and would prevail over the requirements for accessory buildings in 210-8. The submitters' reference to "commercial enterprise" is not clear. If there were a commercial building (business, etc.) that is also on dwelling property, then the building would not be an accessory building to a dwelling unit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4437)

2- 42 - (210-8(a)(2)): Reject
SUBMITTER: Mark Dolan, Cuppertino Electric
RECOMMENDATION: Revise text to read as follows:
"Garages, and also accessory buildings ~~that have a floor located at or below grade level~~ not intended as habitable rooms and limited to storage areas, and areas of similar use."
SUBSTANTIATION: My understanding as told and interpreted by inspectors is that above ground level garages and accessory buildings require GFCI protection. This change would clarify this interpretation.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the present text which requires GFCI protection in all dwelling unit garages and accessory buildings at or below grade level is clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2261)

2- 43 - (210-8(a)(3) (New)): Reject
SUBMITTER: Steve Campolo, Leviton Manufacturing Co., Inc.
RECOMMENDATION: Add the following text:
210-8. Ground-Fault Circuit-Interrupter Protection for Personnel.
(a) Dwelling Units...
(3) Outdoors. The device(s) providing ground-fault circuit-interrupter protection for personnel shall incorporate features that render the device incapable of being reset unless its proper operation is verified by the successful completion of the built in supervisory test.
SUBSTANTIATION: Data available from the files of the U.S. Consumer Product Safety Commission (CPSC) and Underwriters Laboratories (UL) indicate that a significant number of ground-fault circuit-interrupter (GFCI) devices installed in the field are inoperative. Current product is capable of restoring power when the GFCI no longer provides personal protection. Analysis has shown that GFCI(s) could be damaged by nearby lightning strikes and voltage surges. High voltage surges can cause GFCI(s) to trip in the process of damaging various electronic components. This proposal would prevent a nonfunctioning GFCI from being reset and restoring unprotected power, as can presently occur.
Note: Supporting material available for review from NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 2-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
NISSEN: See my Comment on Affirmative on Proposal 2-32.

(Log #2454)

2- 44 - (210-8(a)(3)): Reject
SUBMITTER: William H. King, Jr., U.S. Consumer Product Safety Comm.
RECOMMENDATION: Revise as follows:
210-8. Ground-Fault Circuit-Interrupter Protection for Personnel.
(a) Dwelling Units....
(3) Outdoors. The device(s) providing ground-fault circuit-interrupter protection for personnel shall remove the power normally available for the loads at protected receptacles, and not restore this power, if the protection device fails to operate as intended in the test mode.
SUBSTANTIATION: Data available from the files of the U.S. Consumer Product Safety Commission (CPSC) and Underwriters Laboratories (UL) indicate that a significant number of ground-fault circuit-interrupter (GFCI) devices installed in the field are inoperative. Until recently, the only GFCI devices that were available did not remove electrical power to loads when the device failed to operate as intended in the test mode. For example, when a GFCI test button was pushed and the reset button did not actuate, the GFCI still permitted the delivery of electrical power. Now, however, GFCIs are available that prevent the restoration of electrical power when the device is tested and fails the test. Such enhanced GFCIs should be used, as a minimum, to protect outdoor receptacles, because outdoor receptacles are considered to be high risk locations with many grounded surfaces.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 2-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
NISSEN: See my Comment on Affirmative on Proposal 2-32.

(Log #2553)

2- 45 - (210-8(a)(5)): Reject
SUBMITTER: James B. Mahoney, D&D Electrical Cont., Inc.
RECOMMENDATION: Revise as follows:
Unfinished or finished below grade basements where standing water may collect from water piping, drains, forced hot water piping for heat or ground water shall require GFI protection for all receptacles within the walls of the below grade basement. GFI protection shall be required in all below grade dwelling areas unfinished or habitable for all receptacle circuits dedicated or not.
SUBSTANTIATION: I am requesting this life saving change be made in memory of my only brother (name deleted) who died under the stated conditions above. He was entering his basement level bedroom in my parent's home (constructed a finished basement in the 70's) on June 13th 1998. The basement had been flooded with approximately 3 inches of water from a rain storm. As he entered the room he slipped and fell, knocking over a table lamp causing his electrocution and death. Please make this change.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel recognizes the benefits provided by GFCI and has dealt diligently over the years to require GFCIs in areas where hazards can be foreseen. The incident referenced by the submitter occurred during flooding which can introduce many electrical (as well as other) hazards.
Although the submitter indicates a specific incident involving a basement, an occurrence such as flooding could happen at any level of the dwelling unit. The NEC cannot add general installation rules attempting to anticipate such hazards as may occur during a flood.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2751)

2- 46 - (210-8(a)(5)): Reject
SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.
RECOMMENDATION: Delete text:
(5) ~~(Unfinished)~~ Basements. ~~(For the purposes of this section, unfinished basements are defined as portions or areas of the basement not intended as habitable rooms and limited to storage areas, work areas and the like.~~
SUBSTANTIATION: During Hurricane Floyd, while working as an electrical inspector as part of a FEMA Advance team, I noted that basements of the above said article had been flooded. Occupants in their haste to remove water and humidity were forced to use non-GFI receptacles for portable pumps, dehumidifiers, and fans. Although these areas were finished as the code states, these areas pose a significant danger to occupants and should be GFI protected. If an area not suitable for habitable use is protected, all the more an area that is suitable for habitable use.
PANEL ACTION: Reject.
PANEL STATEMENT: Insufficient substantiation has been presented to extend the GFCI requirements to all finished basements at or below grade. Also, see panel action and statement on Proposal 2-40.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2863)

2- 47 - (210-8(a)(5)): Reject
SUBMITTER: Neil Vilders, Vilders Electric
RECOMMENDATION: None.
SUBSTANTIATION: In situations where the basement is finished - but the floor is either painted, partially printed and/or. The paint is coming up/off - there needs to be BFI protection.
Some wording needs to be in place to safeguard against people getting shocked due to the concrete floor in "finished basements".
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has made no recommendation in accordance with the requirements of Section 4-3.3 in the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4161)

2- 48 - (210-8(a)(5) Exception No. 3): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Insert a new Exception No. 3 as follows:
Exception No. 3: A receptacle supplying a permanently installed fire alarm or burglar alarm system.
SUBSTANTIATION: The panel justified rejection of this proposal in the prior cycle by saying such receptacles were covered under Exception No. 1. In order to qualify under that exception, the receptacle would have to not be readily accessible. That would mean reachable without resort to climbing over obstacles or resorting to ladders or step stools or the like. Most receptacles installed in dwelling basements don't meet these criteria, and therefore don't qualify under the exception.
A single energized receptacle installed for this purpose doesn't present any shock hazard, and unplugging the system to access the receptacle for other purposes would be extremely unlikely given the service receptacle already required by Section 210-52(e) and the fact that unplugging the system would send it immediately into an audible trouble condition. Acceptance of this proposal would assist installers in meeting the performance requirements of the rewritten household fire warning chapter in the 1999 NFPA 72.
Note that system transformers can still be used under the provisions of this change. If the installer uses a single receptacle, a No. 6 fender washer placed under one of the cover mounting screws secures the transformer. Alternatively, a conventional duplex receptacle could be used if the connecting tabs on both sides were broken out, allowing only one of the two receptacles to be energized.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no substantiation that fire or burglar alarm systems have been a concern in tripping GFCIs. The panel notes that this requirement is not found in the rewrite of Chapter 8 of the 1999 National Fire Alarm Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BROWN: An appliance, in this case the control panel for a fire alarm system, could be installed under Exception No. 2, thus meeting the submitter's concerns.

(Log #1455)

2- 49 - (210-8(a)(6)): Reject
SUBMITTER: Jeff J. Eilers, Bright Electric
RECOMMENDATION: None.
SUBSTANTIATION: If a kitchen counter and/or cabinets extend pass a dividing door way and/or desk is adjoining. At what point is the (code 210-8(a)(6)) to be GFCI or is the desk area at a different height (of counter) not consider kitchen?
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has made no recommendation in accordance with the requirements of 4-3.3 of the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2286)

2- 50 - (210-8(a)(6)): Reject
SUBMITTER: Arthur A. Baron, Winthrop, MA
RECOMMENDATION: Revise text to read as follows:
"Kitchen counter receptacles that require GFIs be fed with GFIs in panel not be GFI receptacles."
SUBSTANTIATION: In the event that GFI receptacles in counter plug have to be replaced homeowner will replace with the much cheaper non-GFI receptacle.
PANEL ACTION: Reject.
PANEL STATEMENT: The Code does not specify the type of device used to provide the GFCI protection. GFCI receptacles have been in use for years with excellent success in the field. The NEC cannot anticipate all future code violations that might be created by a user.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2752)

2- 51 - (210-8(a)(6)): Reject
SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.
RECOMMENDATION: Revise as follows:
(6) Kitchens. Where the receptacles are installed to serve the countertop surfaces. (<u>Any outlet installed in adjacent areas within 6 ft of the kitchen sink.</u>)
SUBSTANTIATION: While inspecting, I came across a kitchen with a window passage into an adjoining living room. The widow sill was built large enough to accommodate an appliance and receptacles were installed on the living room side. This was not countertop space and was not in the kitchen, but GFI protection was needed. The window passage was directly in front of the sink 4 inches about the countertop.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has presented a specific construction instance that would be subject to interpretation by the Authority Having Jurisdiction. The panel intends this requirement to provide GFCI protection for receptacles that serve kitchen countertop surfaces, regardless of the location of the receptacle.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2856)

2- 52 - (210-8(a)(6) and (7)): Reject
SUBMITTER: Bill F. Neitzel, Madison, WI
RECOMMENDATION: Combine Sections 210-8(a)(6) and 210-8(a)(7) to read as follows:
(6) Kitchens and Wet Bar Areas. Where the receptacles are installed to serve the countertop surfaces. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops.

SUBSTANTIATION: Wet bar areas offer the same hazards as kitchen countertops. Typically the same type of appliances are utilized, causing the same potential problems. Combining these articles will treat these areas similarly regarding GFCI protection.
PANEL ACTION: Reject.
PANEL STATEMENT: There is insufficient substantiation to show that wet bar sinks present the same potential hazard as kitchen countertops. Because of the wide and varying use and arrangement of wet bars, the panel believes that the 6-foot minimum is necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #637)

2- 53 - (210-8(a)(7)): Accept in Principle in Part
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for information.
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Add the second sentence of Section 210-8(a)(7) to proposed new Article 420 as Section 420-4(e) titled Receptacles in Work Surfaces or Countertops.

420-4. Receptacle Mounting. Receptacles shall be mounted in boxes, or assemblies designed for the purpose, and such boxes or assemblies shall be securely fastened in place.

(a) Receptacles mounted in boxes that are set back of the wall surface, as permitted in Section 370-20, shall be installed so that the mounting yoke or strap of the receptacle is held rigidly at the surface of the wall.

(b) Receptacles mounted in boxes that are flush with the wall surface,or project therefrom shall be installed so that the mounting yoke or strap of the receptacle is held rigidly against the box or raised box cover.

(c) Receptacles Mounted on Covers. Receptacles mounted to and supported by a cover shall be held rigidly against the cover by more than one screw.

Exception: Receptacles shall be permitted to be mounted to and supported by a device assembly or box cover listed and identified for rigidly securing receptacles by a single screw or by other means.

(d) Position of Receptacle Faces. After installation, receptacle faces shall be flush with or project from faceplates of insulating material and shall project a minimum of 0.015 in. (0.381 mm) from metal faceplates.

(e) ~~7.~~ Receptacles in Work Surfaces and Counter tops. ~~Wet bar sinks. Where the receptacles are installed to serve the countertop surfaces and are located within 6 ft (1.83 m) of the outside edge of the wet bar sink.~~ Receptacles ~~outlets~~ shall not be installed in a face-up position in the work surfaces or countertops.

(f) Exposed Terminals. Receptacles shall be enclosed so that the live wiring terminals are not exposed to contact.

SUBSTANTIATION: This is a general installation requirement. It is more in line with the scope of proposed Article 420 than the scope of Article 210. Over many code cycles the general installation and construction requirements for receptacles, attachment plugs and cord connectors have been adopted in various sections of the code. The intent of this proposal is to locate the general installation requirements for receptacles and cord connectors to the new Article 420. New Article 420 covers requirements for installation, mounting grounding and non-interchangeability. This proposal brings the related requirements into a single Article thereby making it easier for the code user to locate them.

This proposal was developed by a Task Group of CMP 18 appointed by the chairman to consider separating 1999 NEC Article 410 into two articles, one covering fixtures and the other covering receptacles, attachment plugs and cord connectors. This Task Group was appointed in response to Proposal 18-55 for the revision of the 1996 NEC.
PANEL ACTION: Accept in Principle in Part.
Revise (e) of the proposal to read as follows:
"(e) Receptacles in Countertops and Similar Work Surfaces in Dwelling Units. Receptacles shall not be installed in a face-up position in countertops or similar work surfaces."
PANEL STATEMENT: The panel accepts the relocation of the material from Article 210 to Chapter 4. The panel does not accept the expansion of the requirement beyond dwelling units because the necessity has not been substantiated.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #638)

2- 54 - (210-8(a)(7)): Accept in Principle
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Relocate the second sentence of Section 210-8(a)(7) to proposed new Article 420 as Section 420-4(e) titled Receptacles in Work Surfaces or Countertops. Revise 210-8(a)(7) by deleting the second sentence.

210-8(a)(7) Wet bar sinks. Where the receptacles are installed to serve the countertop surfaces and are located within 6 ft (1.83 m) of the outside edge of the wet bar sink. ~~Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops.~~

420-4(e)~~(a)7.~~ Receptacles in Work Surfaces and Countertops. ~~Wet bar sinks. Where the receptacles are installed to serve the countertop surfaces and are located within 6 ft (1.83 m) of the outside edge of the wet bar sink.~~ Receptacles ~~outlets~~ shall not be installed in a face-up position in the work surfaces or countertops.

SUBSTANTIATION: This is a general installation requirement. It is more in line with the scope of proposed Article 420 than the scope of Article 210. Over many Code cycles the general installation and construction requirements for receptacles, attachment plugs and cord connectors have been adopted in various sections of the code. The intent of this proposal is to locate the general installation requirements for receptacles and cord connectors to the new Article 420. New Article 420 covers requirements for installation, mounting, grounding and non-interchangeability. This proposal brings the related requirements into a single article thereby making it easier for the code user to locate them.

The Task Group recognizes that by moving this requirement, the application is expanded from receptacles mounted adjacent to wet bars to a general requirement wherever receptacles are mounted in work surfaces or countertops. The task group believes a safety hazard exists wherever receptacles are mounted face up because foreign materials are likely to enter the receptacle and come in contact with current carrying parts.

This proposal was developed by a Task Group of CMP 18 appointed by the chairman to consider separating 1999 NEC Article 410 into two articles, one covering fixtures and the other covering receptacles, attachment plugs and cord connectors. This Task Group was appointed in response to Proposal 18-55 for the revision of the 1996 NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 2-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3866)

2- 55 - (210-8(a)(7)): Accept
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise text to read as follows:

(7) Wet Bar Sinks. Where the receptacles are installed to serve the countertop surfaces and are located within 6 ft (1.83 m) of the outside edge of the wet bar sink. ~~Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops.~~

SUBSTANTIATION: This is a companion proposal to one that intends to locate this requirement in Section 210-7 so it will apply to all dwelling unit receptacle outlets.

In reality, the orientation of the receptacle has nothing to do with whether GFCI protection should be required but its proximity to the wet bar sink.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel actions and statements on Proposals 2-53 and 2-54.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4462)

2- 56 - (210-8(a)(7)): Reject
SUBMITTER: Charles M. Williams, Stealth Electric
RECOMMENDATION: This article should be changed to include any sink area.
SUBSTANTIATION: Currently, break-room sinks, utility and laundry sinks are not covered. GFCI protection can only enhance safety.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #440)

2- 57 - (210-8(a)(8) (New)): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 19 for information
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Add new 210-8(a)(8) to read as follows:
(8) Boathouses.
SUBSTANTIATION: This proposal adds back to 210-8(a) the requirement for GFCI protection in residential boathouses that was removed in the 1996 edition and relocated to Article 555. A proposal has been submitted to CMP 19 (recognizing that the TCC has jurisdiction over scope requirements) that would remove single-family private residential docking facilities from the scope of Article 555. If this proposal is accepted, outlets installed in those locations would be exempt from the GFCI requirements. Since they would not be technically considered outdoor outlets on residential property, the requirement needs to be added here. Outlets in boathouses at other than single-family docking facilities would be required to have GFCI protection by Article 555 and this protection should be afforded to these areas at single-family facilities as well.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel's action is contingent upon Code-Making Panel 19's acceptance of the proposal to change the scope of Article 555.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1685)

2- 58 - (210-8(a)(8) (New)): Reject
SUBMITTER: Kevin M. Weigman, Northeast Wisconsin Technical College
RECOMMENDATION: Add a new Section 210-8(a)(8) to read as follows:
(8) Vanities with sinks located in bedrooms. Where receptacles are installed to serve countertop surfaces and are located within 6 ft (1.83 m) of the outside edge of the vanity sink. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertop.
SUBSTANTIATION: It is becoming a common practice in homes to have a dressing table/vanity with a sink located in the master bedroom. The same electrical shock hazards would exist at the vanity with a sink located in the bedroom as a sink located in the bathroom.
PANEL ACTION: Reject.
PANEL STATEMENT: The definition of "bathroom" states that it is an "area including...". This provides the authority having jurisdiction the ability to determine if such sinks fall under the requirements of 210-8(a)(1).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3811)

2- 59 - (210-8(a)(8) (New)): Reject
SUBMITTER: Douglas Hansen, Codecheck
RECOMMENDATION: Add a new item (8) to read:
"Laundry Rooms. Where the receptacles are intended to serve laundry countertop surfaces or accessories other than clothes washers."
SUBSTANTIATION: Appliances used around laundry sinks subject users to the same hazards as near kitchen or wet bar sinks.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #296)

2- 60 - (210-8(b)): Reject
SUBMITTER: Ronald Deering, City of Potage, MI
RECOMMENDATION: Revise 210-8(b) to read as follows:
(1) Bathrooms
(2) Rooftops
(3) Kitchens
Exception No. 1: Receptacles that are not readily accessible.
Exception No. 2: Receptacles that are dedicated to serving cord and plug connected appliances in accordance with Section 400-7(a)(6), (a)(8).
(4) Receptacles installed within 6 ft (1.83 m) of the outside edge of a sink or lavatory.
SUBSTANTIATION: Many receptacle locations which would fall under items (3) and (4), are accessible to employees and customers to be used on a regular basis.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statements on Proposals 2-29 and 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #387)

2- 61 - (210-8(b)): Reject
SUBMITTER: Mitchell R. Iles, City of Rogers Insp. Division, AR
RECOMMENDATION: Add GFCI receptacle to kitchen counter and within 6 ft of water source.
SUBSTANTIATION: In commercial occupancies, the protection for personnel need to be in kitchens and close to water sources. Lots of untrained or unsupervised personnel work around water. Most of it is on metal counters with no ground fault provided in schools with counters with sinks in them.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2029)

2- 62 - (210-8(b)): Reject
SUBMITTER: Michael L. Lenon, B&D Electric
RECOMMENDATION: Revise text to read:
"Other than Dwelling Units. All 125 volt single-phase 15 and 20-ampere receptacles installed in the location specified below shall have ground fault circuit interrupter protection for personnel (1) bathrooms (2) rooftops (3) all outside receptacles."
SUBSTANTIATION: Schools, offices, and churches, etc. have unprotected outside receptacles. All receptacles must have GFCI protection outside. This will save people from getting electrocuted and shocked.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: I vote no on Panel Action. I agree with the submitter. Logic suggests that the hazards with respect to receptacles located outdoors are similar whether associated with dwelling units or other types of structures.

(Log #2834)

2- 63 - (210-8(b)): Reject
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Add a new bullet to include kitchens as (2) and renumber rooftops to (3), so it would read:
(b) Other than Dwelling Units. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified below shall have ground-fault circuit-interrupter protection for personnel.
(1) Bathrooms
(2) Kitchens
(3) Rooftops.
SUBSTANTIATION: It is recognized that areas where water and other liquids are used when food is prepared in kitchens of restaurants, school food services, institutional facilities and the like pose electrical shock hazards. At present it is necessary to rely upon the general "Wet Location" definition in Article 100, which does not always provide adequate guidance as to its applicability in these locations, and there is no specific ground-fault circuit interrupter protection required. In addition, not all food is prepared at a sink-counter-top arrangement such in a dwelling but generally takes place at metal counter- or tabletops scattered around the room which are electrically conductive under normal conditions. These tops may not be near the sink itself but still use pans and basins for part of the process. The normal high-speed activity associated with preparing hundreds and sometimes a thousand or more meals at a time create many opportunities for liquids to get into the electrical outlets and on the floor creating hazard currents paths.
Another problem is the provided receptacle outlets may be on differing phases so the shock exposure may involve line-to-line as well as line-to-neutral and line-to-equipment and neutral to equipment. Many procedures involve soaking vegetables and fruits in pans and basins, running and splashing water over some items, and allowing meats, fruits and vegetables to thaw with liquids standing on the working tops as well as accidental spillage on the floor until such time as it can be cleaned up.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statements on Proposals 2-29 and 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2911)

2- 64 - (210-8(b)): Reject
SUBMITTER: Donald A. Ganiere, Ottawa, IL
RECOMMENDATION: Revise text as follows:
(b) Other than Dwelling Units. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified below shall have ground-fault circuit-interrupter protection for personnel.
1. Bathrooms
2. ~~Rooftops~~ Outdoors
SUBSTANTIATION: The same type of equipment is used and the same hazards are present in nondwelling occupancies as in dwelling occupancies. If the use of non-GFCI protected outlets is not safe outdoors at dwelling units it is not safe at other occupancies either.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: See my Explanation of Negative on Proposal 2-62.

(Log #3131)

2- 65 - (210-8(b)): Reject
SUBMITTER: James O'Driscoll, Larry C. McCrae Inc.
RECOMMENDATION: Revise as follows:
GFCI Protection.
(b) Other than Dwelling Units. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified below shall have ground-fault circuit-interrupter protection for personnel.
(1) Bathrooms
(2) Rooftops
(3) Outdoors. Where the receptacles are readily accessible to the public.
SUBSTANTIATION: Non-GFCI receptacles I have installed in these other than dwelling unit buildings are being used for a variety of purposes. Working in and out of these buildings I have not yet seen anyone injured, but there exists a lot of potential hazard. I have seen a landscaper use an electric hedge trimmer around a working lawn sprinkler system. Varieties of people are plugging in cordsets with skinned outer jackets. I even witnessed a plumbing contractor unstop a drain with his electric snake plugged into an outdoor receptacle with no GFCI protection. This is a personnel hazard which can be reduced by providing GFCI protection at these outlets. As an electrical contractor I recommend to building owners and maintenance personnel to install GFCI receptacles at all of these outdoor locations mentioned above.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: See my Explanation of Negative on Proposal 2-62.

(Log #3317)

2- 66 - (210-8(b)): Reject
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Revise as follows:
(b) Other than dwelling units.
(1) Bathrooms
(2) Rooftops
Exception to (2)
(3) See index under Ground Fault Circuit Interrupters for other requirements.
SUBSTANTIATION: As written, 210-8(b) appears to tell us that in other than dwelling units GFCI protection is required only in bathrooms and rooftops, whereas there are several occupancies and/or situations that require this specific protection for personnel. Referencing the index by either a new (3) or a fine print note would direct one to these other required situations.
PANEL ACTION: Reject.
PANEL STATEMENT: There is insufficient substantiation to warrant including the additional text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3842)

2- 67 - (210-8(b)): Reject
SUBMITTER: Thomas Anderson, Riviera Electric
RECOMMENDATION: Revise text to read as follows:
210.8(b). Other than dwelling units all 125 volt single phase 15- and 20-amp receptacle installed in the locations specified below shall have GFCI protection for personnel.
(1) Bathrooms
(2) Rooftops.
SUBSTANTIATION: Revised to include GFCIs to be used around break room sinks, wet bars and other locations where there are means to come in contact with water such as janitors, closets.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1873)

2- 68 - (210-8(b)(1)): Reject
SUBMITTER: Ric Thomson, Candler Hospital, Engr Dept.
RECOMMENDATION: Revise as follows:
(1) Bathrooms.
(a) Receptacles located within 6 ft of basin, tub, toilets or shower shall be GFI protected, not all receptacles.

SUBSTANTIATION: Because of vague definition of a "bathroom", and no definition of "area," you could wind up with a whole room of GFI protected receptacles, especially in a hospital patient room, which is not a good idea, because of nuisance tripping and medical equipment.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation to exclude the GFCI requirement for all bathroom receptacles other than those receptacles located within the six foot rule in other than dwelling units. GFCI receptacles in hosptial patient rooms are covered by Section 517-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1932)

2- 69 - (210-8(b)(2)): Reject
SUBMITTER: Warren Kohm, Briner Electric
RECOMMENDATION: Revise as follows:
210-8. Ground-Fault Circuit-Interrupter Protection for Personnel.
(b) Other than Dwelling Units.
~~(2) Rooftops~~
SUBSTANTIATION: Ground-Fault Circuit-Interrupter Protection for Personnel is not required for other than dwelling units outside at grade level. The hazards requiring ground-fault protection are no greater on the roof than they are on the ground. If Ground-Fault Circuit-Interrupter Protection for Personnel is not required outside at grade level, then it should not be required on the roof.
PANEL ACTION: Reject.
PANEL STATEMENT: Insufficient substantiation has been provided to delete the requirement for GFCI protection of receptacles on rooftops. The submitter has not provided any information that indicates the original substantiation for this requirement is not valid.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #305)

2- 70 - (210-8(b)(3) (New)): Reject
SUBMITTER: James A. Popma, Engineering Design Assoc., Inc.
RECOMMENDATION: Insert the following wording after (2) Rooftops:
(3) Countertop sinks. Where the receptacles are installed to serve the countertop surfaces and are located within 6 ft (1.83 m) of the outside edge of the sink.
SUBSTANTIATION: Personnel should have ground-fault protection near all countertop sinks, not just in dwelling units. Many local inspectors already require this.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #408)

2- 71 - (210-8(b)(3) (New)): Reject
SUBMITTER: Terry Clark, Hunter Brothers Electrical Corp.
RECOMMENDATION: I have found something that is not in the National Electrical Code, and I feel very strongly about it. Our company does quite a few schools. In the 1996 code book, page 70-57, 210-8(b) Ground Fault Circuit-Interrupter Protection for Personnel, Other than dwelling units this addition needs to be made:
(3) Any outlet within 6 ft of a sink located in a classroom or classroom laboratory, or home economics classroom shall be ground fault protected.
SUBSTANTIATION: I believe this is very important. It should be in effect from preschool to adult classrooms. Most of the engineers call for ground fault outlets in the drawings, but occasionally they do not. If any of the numerous inspectors do not require it, there is the possibility of this getting overlooked. Please let me know if you concur.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1515)

2- 72 - (210-8(b)(3) (New)): Reject
SUBMITTER: Russel LeBlanc, Peterson School of Engineering/Rep. Helco Engineering, Inc.
RECOMMENDATION: Add the following text:
(3) Kitchens or wet bar sinks where receptacles are installed to serve the countertop surfaces, and are located within 6 ft of the outside edge of a sink.
SUBSTANTIATION: It is common practice to install kitchen areas in office spaces. Currently the NEC does not require GFCI protection for countertop receptacles in these kitchens, yet the same dangers exist here as in a dwelling unit kitchen. The 6 ft limit would provide greater protection, yet not be too restrictive.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1530)

2- 73 - (210-8(b)(3) (New)): Reject
SUBMITTER: Jeffrey G. Gholson, Hillsboro, OR
RECOMMENDATION: Add new paragraph 210-8(b)(3) to read as follows:
(3) Outdoor receptacles for ac units.
SUBSTANTIATION: Section 210-8(b)(2) requires plugs for rooftop air conditioning units be located within 25 feet, and GFI protected many times ac units are installed at ground level or on second floor balconies. For protection of personnel working on refrigeration and ac units (sometimes in rain) GFCI receptacles should be used.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1688)

2- 74 - (210-8(b)(3) (New)): Reject
SUBMITTER: Harold R. Endean, III, Township of Montville, NJ
RECOMMENDATION: Add a new section after (2) Rooftop. The new section would be:
(3) Garages and grade-level portions of unfinished accessory buildings used for storage or work areas.
SUBSTANTIATION: I feel that there should be ground fault protection in accessory buildings in commercial dwellings just like we have in residential buildings. The same safety issues are there just like in a residential home. People will be using regular receptacles outside and inside garages where maintenance of equipment could be going on. The same exceptions in 210-8(a)(2) can still be left in the new 210-8(b)(3) section. This new section will help to cover those buildings that fall between dwelling garages and commercial garages.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter relates the requirements to dwelling units, however, the submitter presents insufficient substantiation specific to nondwelling units. The original data that justified dwelling unit applications is not directly applicable to nondwelling unit applications.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1819)

2- 75 - (210-8(b)(3) (New)): Reject
SUBMITTER: David G. Wilson, County of Eaton, MI
RECOMMENDATION: Add a new paragraph (3) to read as follows:
(3) Kitchens. Where the receptacles are installed to serve the countertop surfaces.
SUBSTANTIATION: Past CMPs have decided that all outlets serving the countertop surfaces in kitchens of dwelling units (with no exceptions) must be GFCI protected. The addition of GFCI protection in "other than dwelling units" would provide the same protection users are required to have in their homes.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2046)

2- 76 - (210-8(b)(3) (New)): Reject
SUBMITTER: Lucinda Mallalieu, Newell Electrical
RECOMMENDATION: Add new text to read:
210-8 Ground Fault Circuit Interrupter Protection for Personnel.
(b) Other than Dwelling Units.
(3) Outside.
SUBSTANTIATION: While many of the outside receptacles on buildings other than dwelling units are used for fixed appliances, such as vending machines, many are not. A lot of them are used for outdoor maintenance and landscape equipment. A majority of the time this equipment is used with extension cords. As we know, many electricity-related injuries, deaths, and fires involve the use of faulty extension cords.
Furthermore, when additions and renovations are made to the buildings, often the nearest outside receptacle is used for temporary construction power. In many areas labor codes require the use of GFCI receptacles for construction equipment.
I believe that GFCI receptacles should be required for receptacles outside buildings other than dwelling units for the safety of personnel using them in the course of their daily work.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: See my Explanation of Negative on Proposal 2-62.

(Log #2469)

2- 77 - (210-8(b)(3) (New)): Reject
SUBMITTER: Andrew Schmid, Goldhorn Electrical Construction
RECOMMENDATION: Add new text to read as follows:
210-8 Ground Fault Circuit Interrupter Protection for Personnel
(b) Other Than Dwelling Units.
(1) Bathrooms
(2) Rooftops
(3) Outdoors — Receptacles installed outdoors and readily accessible or subject to use for maintenance personnel or seasonal maintenance equipment.
SUBSTANTIATION: A custodian at the industrial plant, in which I work, while using an electric snow blower to clear a walkway, received an electrical shock. Although not severe, it should have been easily preventable with (required) GFCI protection.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: See my Explanation of Negative on Proposal 2-62.

(Log #2753)

2- 78 - (210-8(b)(3), (4), (5), (6), (7), and (8) (New)): Reject
SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.
RECOMMENDATION: Add new text to read:
(3) Garages and also accessory buildings that have a floor located at or below grade level.
(4) Outdoors.
(5) Crawl Spaces. When the crawl space is at or below grade level.
(6) Basements.
(7) Kitchens. Where the receptacles are installed to serve the countertop surfaces and any outlet installed in adjacent areas within 6 ft of the sink.
(8) Wet Bar Sinks. Where the outlets are installed to serve the countertop surface and are located within 6 ft of the outside edge of the wet bar sink.
SUBSTANTIATION: It seems as though the code is saying it is not okay to be hurt or killed in a dwelling unit. Although if you are not in a dwelling unit it is okay to be hurt or killed. In todays efforts of safety on the job do not we owe protection to our workers and our families!
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter relates the requirement to dwelling units, however, the submitter has presented no substantiation specifc to nondwelling units. Also, see panel statements on Proposals 2-33 and 2-60.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3224)

2- 79 - (210-8(b)(3) (New)): Reject
SUBMITTER: Mike Weitzel, City of Wenatchee, WA
RECOMMENDATION: Add the following text:
(3) Outdoors where readily accessible to the public.
SUBSTANTIATION: An electrical shock hazard exists in public places where earth, dirt, concrete, wet grass, etc. is all around and electrical power is used. Temporary wiring and carnivals are already included in the Code but parks .
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: See my Explanation of Negative on Proposal 2-62.

(Log #4162)

2- 80 - (210-8(b)(3)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add a third item to the list as follows:
(3) Outdoors, if installed as required by Section 210-63.
SUBSTANTIATION: This is a companion proposal to one offered to require HRAC service receptacles near this equipment if located outdoors. The hazards are comparable or even more severe as for similar exposures on rooftops. This is not a generic requirement for GFCI protection on all commercial and industrial outdoor receptacles; it only covers those that would be installed for the same purposes as now required for GFCI protection on rooftops at similar occupancies.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: See my Explanation of Negative on Proposal 2-62.

(Log #4400)

2- 81 - (210-8(b)(3) (New)): Reject
SUBMITTER: Monte R. Ewing, State of Wisconsin
RECOMMENDATION: Add new text to read as follows:
(3) Repair or storage areas of garages where located readily accessible at or below grade level.
SUBSTANTIATION: A similar requirement is found in Section 210-8(a)(2) and Section 511-10. The problem is 210-8(a)(2) only applies to dwelling unit related garages and 511-10 only applies to commercial garages where repairing or storing self propelled motor vehicles which utilize volatile flammable liquids. Neither of the existing Sections apply to repair or storage garages used for diesel fuel (combustible liquid) motor vehicles. The same hazard exists here as covered in the existing two sections, however, these types of occupancies were overlooked due to the Scope of Article 511. The State of Wisconsin has created a code to cover these occupancies and I feel this needs to be addressed in the National Electrical Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-74.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4405)

2- 82 - (210-8(b)(3) (New)): Reject
SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services
RECOMMENDATION: Add a new subparagraph (3) and two Exceptions as follows:
"All general purpose 125 volt, single phase 15- or 20-ampere rated receptacles installed outdoors shall have GFCI protection for personnel.
Exception No. 1: Receptacle outlets not readily accessible.
Exception No. 2: Single receptacles of the NEMA L-5 15R or 20R type installed for a specific use. These receptacles shall also comply with Section 410.57.
SUBSTANTIATION: Section 210-8(a) requires GFCI protection for general purpose receptacle outlets installed outdoors-dwelling units. Section 305-6 requires GFCI protection for receptacle outlets installed or used for temporary wiring. Section 210-63 FPN references back to 210-8 which requires GFCI protection for these outlets if they are installed or located on rooftops or in crawl spaces if the crawl space is located at or below grade level.
I am aware that the GFCI requirements of 210-8 for dwelling unit arose because of the manner in which receptacles installed in locations listed in 210-8(a) were/are used. However, in other than dwelling units outdoor general purpose receptacle outlets are not required. If an outdoor receptacle outlet is installed in these locations for a specific use and GFCI protection would be a problem then Exception No. 2 could be applied. If an outdoor receptacle outlet is installed for general purpose use, this receptacle outlet would be used for temporary power or lighting the same or very similar conditions that necessitated the GFCI protection mandated in Sections 210-63 and 305-6 (temporary use of power or lighting during installation, maintenance, or repair of equipment or grounds) would be present during the use of this outdoor general purpose receptacle outlet(s) in other than dwelling units. The same substantiation used to include GFCI protection in Sections 210-63 and 305-6 would be applicable to this new subparagraph and Exceptions.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: See my Explanation of Negative on Proposal 2-62.

(Log #424)

2- 83 - (210-8(c) (New)): Reject
SUBMITTER: Tim Hughes/Craig Guest, Upper Bucks County Area Vocational Technical School
RECOMMENDATION: Add a new 210-8(c) to read as follows:
Laundry receptacles, as required by 210-52(f), shall have ground fault circuit interrupter protection for personnel.
SUBSTANTIATION: Laundry areas frequently contain a utility sink adjacent to laundry appliances. The presence of water in this area presents a potential shock hazard. The additional possibility of a malfunction in an appliance increases the potential for a shock hazard to be present. For this reason, the receptacle outlet required by Section 210-52(f) should be provided with ground fault circuit interrupter protection.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #451)

2- 84 - (210-11(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Replace the first sentence of Section 210-11(b) with the following sentence:
"Where the load is computed on a volt-ampere/square meter or square foot ~~(0.93m^2)~~ basis, the wiring system up to and including the branch-circuit panelboard(s) shall be provided to serve not less than the calculated load."
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., show the SI units as the preferred and the inch-pound units immediately following in parenthesis. Specific values of measurement are not shown since they are not necessary in this section. The proposed revision of Table 220-3(a) includes both volt-ampere loads per square meter and per square foot.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #679)

2- 85 - (210-11(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Load Evenly Proportioned Among Branch Circuits. ~~Where the load is computed on a volt-ampere per square foot (0.093 sq m) basis the~~ The wiring system up to and including the branch-circuit panelboard(s) shall be provided to serve not less than the ~~calculated~~ computed load. Where the load is computed on a volt-amepre per square foot (0.093 sq m) basis or volt-ampere per circuit basis this load shall be evenly proportioned insofar as practicable, among multioutlet branch circuits within the panelboard(s), except the branch circuit(s) required in (c)(3) below. Branch-circuit overcurrent devices ~~and circuits~~ need only be provided ~~installed to serve the connected load~~ for circuits installed.
SUBSTANTIATION: The requirement for an adequate wiring system to and including panelboards should not be limited to loads computed on a va/sq ft basis. Volt-ampere per circuit loads such as small appliance circuits, laundry circuits, and sign outlet circuits seem to be reasonable included with the va/sq ft computed load. It is impractical to require the load (in essence the square foot area) to be exactly the same for each circuit, and this is apparently not vigorously enforced. The bathroom branch circuit(s) is included in the va/sq ft computation and unless excluded would normally be the determinant as to how many sq feet could be served by each va/sq ft circuit. Likewise, any "extra" general lighting circuits which may serve a small sq ft area.
The requirement for branch-circuit overcurrent devices and circuits for connected loads is flawed; a branch circuit serving only general-use receptacles or small appliance circuit receptacles has no connected load, only computed load. Present wording indicates such circuits need not be installed, even though required by other Code rules.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's assertion is incorrect. The small appliances, laundry circuits and sign outlet circuits are not included in the volt-ampere/square foot calculated load.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2160)

2- 86 - (210-11(b)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Branch-circuit overcurrent devices and current devices and circuits shall only be required to ~~need only~~ be installed to serve the connected load.
SUBSTANTIATION: This is a permissive rule that should follow the rule in the NEC Section 90-5(b). The only difference here is using the phrase shall only be required instead of shall not be required. The intent of the rule is being followed.
The phrase "need only" is used no where else in the Code except in Appendix D, Example No. D3.
Also, the Foreword to the NEC Style Manual states, "It is vitally important that the text be as explicit as possible and that maximum consistency be achieved in the language used in the text."
PANEL ACTION: Accept in Principle.
Revise the proposed wording to read as follows:
"Branch-circuit overcurrent devices and circuits shall only be required to be installed to serve the connected load."
PANEL STATEMENT: The revisions meet the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3817)

2- 87 - (210-11(c)(1)): Reject
SUBMITTER: Roy Smith, Riviera Electric
RECOMMENDATION: Move 210-11(c)(1) and combine it with 220-16(a) so you don't have to keep jumping from 220-16(a) to 210-11(c)(1).
SUBSTANTIATION: Combine them.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel's intent is keep the requirements for required branch circuits separate from the requirements for calculating loads, which is covered by the scope of Article 220.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4412)

2- 88 - (210-11(c)(1)): Accept in Principle
SUBMITTER: Joseph Andre, City of Bellevue, WA
RECOMMENDATION: Add the phrase "125 volt," between the words "more" and "20-ampere".
The revised text of the sentence will read:
"In addition to the number of branch circuits required by other parts of this section, two or more 125 volt, 20-ampere small appliance branch circuits shall be provided for all receptacle outlets specified by Section 210.52(b)."
SUBSTANTIATION: Foreign appliances are increasingly finding their way into homes in the United States, many of which operate at different voltages and frequencies than is the conventional standard. This revised wording will make it clear that any small appliance receptacles installed for other than 125 volt equipment will not meet the requirements of 210-11(c)(1).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 2-153a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2280)

2- 89 - (210-11(c)(2)): Reject
SUBMITTER: Micheal L. Talley, Star Service Co.
RECOMMENDATION: Delete text as follows:
In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet~~(s)~~ required by Section 210-52(f). This circuit shall have no other outlets.
SUBSTANTIATION: With the loads now required for modern homes no other outlets should be allowed on the outlet required for the washer. There are too many electrical appliances available to be used in the laundry room and to eliminate overloads.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation that the present laundry circuit rules are leading to hazards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2872)

2- 90 - (210-11(c)(2)): Reject
SUBMITTER: Patrick R. Hooker, JCON Inc.
RECOMMENDATION: Add text to read as follows:
(2) Laundry Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s) required by Section 210-52(f). This circuit shall have no other outlets. (Any additional receptacles in the laundry area shall have GFCI protection.
SUBSTANTIATION: If a sink is located in the same area of the laundry room, a receptacle near this sink would now be protected by a GFCI circuit and therefore help protect against personal injury.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4413)

2- 91 - (210-11(c)(2) and (c)(3)): Accept in Principle
SUBMITTER: Joseph Andre, City of Bellevue, WA
RECOMMENDATION: Add the phrase "125 volt," in front 20-ampere in each of the referenced sections.
SUBSTANTIATION: Foreign appliances are increasingly finding their way into homes in the United States, many of which operate at different voltages and frequencies than is the conventional standard. This revised wording will make it clear that any small appliance receptacles installed for other than 125 volt equipment will not meet the requirements of 210-11(c)(2) or (c)(3).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 2-153a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #312)

2- 92 - (210-11(c)(3)): Reject
SUBMITTER: Victor V. Timpanaro, Rep. Municipal Electrical Inspectors Assoc. of NJ, Inc.
RECOMMENDATION: Revise 210-11(c)(3) to read as follows:
(3) Bathroom Branch Circuits. In addition to the number of branch circuits required by other parts of this section, ~~at least~~ one 20-amp branch circuit shall be provided to supply the bathroom receptacle outlet(s) in each bathroom.
SUBSTANTIATION: Todays dwelling units have several bathrooms that are used at the same time with hair dryers rated 1500-1758 VA @ 120 volts, they will draw 12-15 amps. Average family today shows both spouses work and use dryers at same time. Providing individual circuit for each bathroom serving basin area would prevent overloading of circuit and the possibility of homeowner using extension cord on second hair dryer supplied by a non-GFCI protected bedroom or hall receptacle outlet.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide sufficient technical substantiation to show that additional circuits are required. Additional circuits are not prohibited.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2883)

2- 93 - (210-11(c)(3)): Reject
SUBMITTER: Joe Delallo, Jr., Bldg Dept. Ridgefield, CT
RECOMMENDATION: Add text to read as follows:
In addition to the number of a branch circuits required by other parts of this section, at least one 20 ampere branch circuit shall be provided for <u>each bathroom</u> to supply the bathroom receptacle outlets. Such circuits shall have no other outlets.
SUBSTANTIATION: If the same 20 amp branch circuit can be used for multiple bathrooms, the use of hair dryers, curling irons, etc. at the same time could cause a circuit fault. To clarify the code to require a separate 20 amp receptacle circuit for each bath room.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 2-92.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2957)

2- 94 - (210-11(c)(3)): Reject
SUBMITTER: Dick Murray, Randolph, MA
RECOMMENDATION: Revise as follows:
(3) Bathroom Branch Circuits. In addition to the number of branch circuits required by other parts of this section at least one 20-ampere branch circuit shall be provided to supply the bathroom receptacle outlet(s). ~~Such circuits shall have no other outlets.~~
~~Exception:~~ Where the 20-ampere circuit supplies a single bathroom, outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with Section 210-23(a).
SUBSTANTIATION: To eliminate the exception and clarify the requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: The present exception is a clearly stated exception to the rule. Moving the exception into the main text reduces clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3665)

2- 95 - (210-11(c)(3)): Reject
SUBMITTER: Gary A. Boughton, Bldg Dept., Town of Ridgefield, CT
RECOMMENDATION: Revise text to read as follows:
(3) Bathroom Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the bathroom<u>(s)</u> receptacle outlet(s). Such circuits shall have no other outlets.
SUBSTANTIATION: Add (s) after the word bathroom to clarify that the circuit can be used to supply the receptacle outlets in more than one bathroom.
PANEL ACTION: Reject.
PANEL STATEMENT: The present text is clear that receptacle outlets in more than one bathroom can be supplied by this one 20 amp circuit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #629)

2- 96 - (210-11(c)(3), Exception): Reject
SUBMITTER: Bob K. Middleton, State of Idaho
RECOMMENDATION: Revise as follows:
Outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with Section 210-23(a), but the lighting fixtures shall not be on the load side of the GFCI device.
SUBSTANTIATION: If the lighting is on the load side of the GFCI device and if it trips then you are in the dark.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a design consideration, not a safety requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2484)

2- 97 - (210-11(c)(3), Exception): Reject
SUBMITTER: James M. Imlah, City of Hillsboro, OR
RECOMMENDATION: Delete the following:
~~Exception: Where the 20 ampere circuit supplies a single bathroom, outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with Section 210-23(a).~~
SUBSTANTIATION: Please delete the exception! By allowing other equipment within the bathroom room to be connected to the receptacle 20-amepre circuit there may not be enough capacity to handle equipment that may be plugged in the receptacle. It is possible with a heat-fan, heat-fan-light, and an appliance like a hair dryer, curling iron or other types of appliance to cause the circuit to trip and in effect causing an overload condition. The overload condition can also cause heating effects that could cause looseness of connections and creating arcing problems on the line side of the receptacle. I have seen loading problems occur in some bathroom remodels in our local area. The heating effect on conductors is bad and can be compounded with some of the older type conductors found in remodels. Even with loading calculations as per NEC 210-23, there can still be circuit-overloading problems, when these type of appliances are used. I realize we are not to design or plan for future loads, but in this case we have to do something to stop overloading issues. Please keep the 20 amp circuit receptacle for the bathroom appliances and not allow other loads to be piggybacked on.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception was added during the 1999 NEC Cycle to address proposals and comments from submitters indicating that some degree of balance on the 20 amp requirement is necessary. The panel maintains that same position.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4128)

2- 98 - (210-11(d) (New)): Reject
SUBMITTER: David T. Brender, Cooper Development Assn. Inc.
RECOMMENDATION: Add text to read as follows:
<u>(d) Dwelling Garage and Outdoor Receptacles. Branch-circuit conductors shall not be smaller than 12 AWG to the garage receptacle outlet(s).</u>
SUBSTANTIATION: The USA has experienced an increased usage of outdoor electrical appliances and the use of longer extension cords which, even when sized correctly, pose a risk of fire due to motor overheating and failing due to excessive voltage drop. As homes continue to be built larger and larger, as panelboards are located more often at the end of the house, with an increase in the number of electrical appliances in a typical home, and with appliances having increased power consumption, the risk of overloaded conductors has dramatically increased. Just as the minimum conductor size for bathrooms was increased due to the change in the type of appliances used on the bathroom circuit, the minimum conductor size for branch circuits should be increased to 12 AWG. The increase in minimum size will increase safety by reducing the risk of overloaded circuits and the need to rewire existing circuits. The increase to 12 AWG will also decrease the cable impedance, which will cause the overcurrent device to operate more quickly for long runs of cable found in larger dwellings. The overcurrent device ampacity is not intended to be changed by this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: No. 14 AWG is the Code recognized minimum branch circuit size copper conductor. The proposal does not provide sufficient substantiation to require a larger size for these outlets. Voltage drop is a design consideration that must be dealt with by the installer / designer for each installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4129)

2- 99 - (210-11(d) (New)): Reject
SUBMITTER: David T. Brender, Cooper Development Assn. Inc.
RECOMMENDATION: Add text to read as follows:
(d) Dwelling Unit - Habitable Room Branch Circuits. Branch-circuit conductors shall not be smaller than 12 AWG.
SUBSTANTIATION: As reported in the Eleventh Edition of "Fire in the United States 1987-1996," published by United States Fire Administration National Fire Data Center, fires caused by electrical distribution are the 4th most common cause of fire. The areas where fires most often occur are in the sleeping rooms, lounge areas (living rooms) and kitchens. 20 amp circuits are required in the kitchen, bathroom, and laundry room to address the risk of fire. As homes continue to be built larger and larger, as panelboards are located more often at the end of the house, with an increase in the number of electrical appliances in a typical home, and with appliances having increased power consumption and more stringent power quality demands, the risk of overloaded conductors and occurrence of unacceptable circuit voltage drops have dramatically increased. Recent research (International Telework Association and Council-report released October 27, 1999) indicates that 19.2 million people, or 10 percent of the U.S. workforce, now telecommute, supporting the growing residential use of the computers, printers, fax machines, copiers, etc. In fact, 55 percent of all U.S. households now have one or more computers (Parts Associates, Forum99, October 1999), and this is expected to grow further to 75-80 percent within the next 10 years. Just as the minimum conductor size for bathrooms was increased due to the change in the type of appliances used on the bathroom circuit, the minimum conductor size for all branch circuits should be increased to 12 AWG. The increase in minimum size will increase safety by reducing the risk of overloaded circuits and the need to rewire existing circuits to meet the needs of heavily loaded circuits and sensitive electronic equipment. The increase to 12 AWG will decrease the cable impedance which will cause the overcurrent device to operate more quickly for long runs of cable found in larger dwellings. The overcurrent device ampacity is not intended to be changed by this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4130)

2- 100 - (210-11(d) (New)): Reject
SUBMITTER: David T. Brender, Cooper Development Assn. Inc.
RECOMMENDATION: Add text to read as follows:
(d) Commercial Installations. Branch-circuit conductors shall not be smaller than 12 AWG.
SUBSTANTIATION: The fine print notes let the user know to check the conductor's ampacity rating, temperature limit, and voltage drop. Ampacity rating and temperature limits are addressed in the NEC but are not generally applied. Voltage drop is only addressed through the fine print. As commercial installations continue with an increase in the quantity of electrical equipment and with equipment having increased power consumption and more stringent power quality demands, the risk of overloaded conductors and occurrence of unacceptable circuit voltage drops have dramatically increased. Just as the minimum conductor size for bathrooms was increased due to the change in the type of appliances used on the bathroom circuit, the minimum conductor size for all branch circuits in commercial installations should be increased to 12 AWG. The increase in minimum size will increase safety by reducing the risk of overloaded circuits and the need to rewire existing circuits to meet the needs of heavily loaded circuits, increased harmonic loads and sensitive electronic equipment. As reported in the Eleventh Edition of "Fire in the United States 1987-1996," published by United States Fire Administration National Fire Data Center, the leading causes of 1996 nonresidential structure fires in stores, offices, and basic industry are attributed to electrical distribution. The overcurrent device ampacity is not intended to be changed by this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-98.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2032)

2- 101 - (210-12): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Delete.
SUBSTANTIATION: These devices need real-world testing not Greek-alphabet testing. Only sprinklers put fires out.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-106.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BROWN: This proposal should be accepted. See my comment on Proposal 2-106.

(Log #2744)

2- 102 - (210-12): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for further consideration in Article 517. This will be considered as a public comment.
SUBMITTER: A. Dan Chisholm, Healthcare Circuit News
RECOMMENDATION: Revise as follows:
(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere ~~receptacle~~ outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s). This requirement shall become effective January 1, 2002.
(c) Limited Care Facility Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in limited care facility bedrooms shall be protected by an arc-fault circuit interrupter(s).
SUBSTANTIATION: The 1999 National Electrical Code mandates the protection of the branch circuits that supply the receptacle outlets installed in dwelling unit bedrooms. I can agree that bedroom circuits need to be protected, but I cannot understand the restriction to "receptacle outlets." The objective of the 1999 code change was to increase the fire protection of bedrooms, and in that case all of the bedroom outlets should be protected. Here I note that the code defines an outlet as "A point on the wiring system at which current is taken to supply utilization equipment." Further, utilization equipment is code defined as "Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar outlets."
I am proposing that the word "receptacle" be deleted from the present code language. This would then mandate protection, for example, of the permanently installed lighting fixture-outlets within a bedroom.
With respect to my proposed new requirement for AFCI protection of the branch circuits associated with the bedrooms of Limited Care Facilities, I am convinced that these devices will serve a vital fire-protection function. As defined in 517-3, a Limited Care Facility is "A building or part thereof used on a 24-hour basis for the housing of four or more persons who are incapable of self-preservation because of age, physical limitation due to accident or illness, or mental limitations, such as mental retardation/developmental disability, mental illness, or chemical dependency". These facilities, with occupants who are incapable of self preservation, deserve the very finest of fire-mitigating technology. AFCIs, with their demonstrated capability of detecting arcing faults and interrupting these faults, represent such technology and should be mandated for the branch circuits supplying the bedroom outlets of these facilities.
PANEL ACTION: Accept in Part.
The panel accepts the deletion of "receptacle" in (b) of the proposal, and rejects the remainder of the proposal.
PANEL STATEMENT: The limited care facility issue is outside the scope of Code-Making Panel 2 and recommends that the Technical Correlating Committee forward this item to Code-Making Panel 17 for action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BROWN: This "Accepted in Part" proposal, in essence adding supposed AFCI protection for any permanently mounted lighting, should be rejected. During an emergency situation, or nuisance tripping of the AFCI device, one would want this type of area lighting to be available to rectify any problems

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(Log #2847)

2- 103 - (210-12): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for further consideration in Article 517. This will be considered as a Public Comment.

SUBMITTER: Robert J. Clarey, Cutler-Hammer, Inc.

RECOMMENDATION: Revise text as follows:

(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere ~~receptacle~~ outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s). This requirement shall become effective January 1, 2002.

(c) Dwelling Unit Living Areas. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling units living areas shall be protected by an arc-fault circuit interrupter(s).

FPN: A dwelling unit living area is any space, that can be normally occupied, other than bedrooms, bathrooms, toilet compartments, kitchens, closets, halls, storage, garage or utility spaces.

(d) Guest Rooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in guest rooms in hotels, motels, and similar occupancies shall be protected by an arc-fault circuit interrupter(s) in accordance with the requirements for dwelling units in 210-12(b) and 210-12(c).

(e) Limited Care Facility Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in limited care facility bedrooms shall be protected by an arc-fault circuit interrupter(s).

SUBSTANTIATION: The 1999 National Electrical Code mandates the protection of all branch circuits that supply receptacle outlets installed in dwelling unit bedrooms. This Code wording was influenced, in part, by Comments during the 1999 Code Cycle, such as Comment 2-65 (1). That Comment addresses the enhanced safety provided by AFCIs in sleeping and living areas; areas that were identified as being most prone to electrical fires as a result of low voltage arcing. The present proposal is aimed at broadening the protection of AFCIs to the branch circuits supplying all bedroom outlets in dwelling units, in guest rooms and in limited care facilities. It is also aimed at broadening the protection of AFCIs to the branch circuits of living areas in dwelling units and in guest rooms.

During the last Code Cycle, Comment 2-65 was Accepted in Principle, and the present Code text in 210-12 of the 1999 National Electrical Code reflects the Panel Action wording on Comment 2-65. The associated Panel Statement (1) reads:

"The Panel has limited the requirements to dwelling unit bedrooms to permit these new devices to be introduced into the public domain on a gradual basis.

The panel also notes that this does not prohibit their use in other circuits throughout dwelling units. An effective date of January 1, 2002 was established to allow industry to accommodate the new requirement and to allow a transition period".

The substantiation for the present proposal is as follows:

With respect to 210-12(b), the present restriction to bedroom receptacle outlets only partially satisfies the intended protection of the circuits supplying dwelling unit bedrooms. These rooms are also associated with lighting outlets, and the branch circuits supplying these lighting outlets should also be protected. The proposal, therefore, is to delete the word "receptacle" in order to provide AFCI protection to the circuits supplying all bedroom outlets.

With respect to 210-12(c), the proposal is the extend AFCI fire protection to the circuits supplying dwelling unit living areas. This change, in conjunction with 210-12(b), would provide AFCI protection to the circuits supplying outlets in all dwelling unit rooms with the exception of bathrooms, toilet compartments, kitchens, closets, halls, storage, garage or utility spaces.

With respect to 210-12(d), the intent is to extend the enhanced safety benefits of AFCIs in dwelling units to comparable occupancy locations (bedrooms and living areas) in the guest rooms (210-60) of hotels, motels and similar occupancies.

With respect to 210-12(e), the intent is to extend the enhanced safety benefits of AFCIs to the bedrooms of Limited Care Facilities as defined in 517-3. These facilities cater to persons who are incapable of self-preservation or who suffer from some form of mental limitation. These handicaps complicate the rapid exiting of buildings, and fire safety needs to be increased by the addition of AFCIs.

This overall Code proposal is justified on the basis of enhanced safety. The U.S. Consumer Product Safety Commission has published (2), for example, 1996 Residential Fire Loss Estimates. CPSC provides estimates of the fires losses, in residential structures, for the total electrical distribution system. For 1996 the estimate is 41600 fires, 370 civilian deaths, 1430 civilian injuries, and $682.5M in property losses. Many of these fires and much of this loss of life could have been prevented by AFCIs. But for AFCIs to be effective, it is necessary to provide arc fault detection and protection to as many dwelling-unit supply-circuits as possible. The Code proposal is also justified by the changes, since the last Code cycle, which demonstrate that industry has indeed accommodated to the new requirements.

First, in February 1999, Underwriters Laboratories published the first Edition of UL 1699 "Arc-Fault Circuit-Interrupters" (3). The branch/feeder AFCIs described in that document are substantially identical to the "AFCIs classified for mitigating the effects of arcing faults" that were available during the 1999 Code cycle, and that were previously described in a draft standard. The branch/feeder AFCIs described in UL 1699 protect the installed wiring, and also provide protection against line to neutral and line to ground arcing faults in the cords connected to the outlets. The existence of this standard, and of the associated branch/feeder products, indicates that the products have matured. Second, many circuit breaker manufacturers now offer combination circuit breakers and branch/feeder AFCIs. Thus AFCI devices are readily available. Third, manufacturers have gained hundreds of millions of operating-hours experience with AFCIs. The consumers have benefited from the enhanced arcing fault protection.

Further, consumers have not experienced "nuisance tripping" due to the false identification of circuit waveforms such as the inrush transients to motors, and the normally occurring arcing waveforms associated with devices such as thermostats, motors, and switches.

Fourth, AFCI manufacturers have made numerous AFCI presentations to fire inspectors, electrical inspectors, and other groups concerned with public safety. This has raised awareness of both the technology and the associated safety potential, and the overwhelming response has been both positive and enthusiastic.

Fifth, in 1999 the Consumer Product Safety Commission has made a brief report (4) entitled "Preventing Home Fires: Arc Fault Circuit Interrupters (AFCIs)". This report includes the statement, "Several years ago, a CPSC study identified arc fault detection as a promising new technology. Since then, CPSC electrical engineers have tested the new AFCIs on the market and found these products to be effective". Thus AFCIs have moved from the conceptual stage, as discussed in the 1995 UL Report for CPSC "Technology for Detecting and Monitoring Conditions that Could Cause Electrical Wiring System Fires" to the practical stage. In particular, AFCIs are available on the market and are effective.

In view of the positive changes that have occurred since the last cycle, and the continuing heavy toll in human lives, in human injury, and in property losses occasioned by electrical distribution fires, the Code Panel is urged to adopt this proposal. The objective is to optimize protection for dwelling unit bedrooms, for dwelling unit living area circuits, for the comparable guest rooms of hotels and motels, and for the bedrooms of limited care facilities.

References:

(1) National Electrical Code Committee Report on Comments, Comment 2-65, pages 99-100, 1998.

(2) "1996 Residential Fire Loss Estimates", U.S. Consumer Product Safety Commission Report, 1998.

(3) "Arc-Fault Circuit-Interrupters", Underwriters Laboratories Inc., UL 1699 Standard for Safety, First Edition, February 26, 1999.

(4) "Preventing Home Fires: AFCIs", Consumer Product Safety Review, Volume 4, #1, page 6, Summer 1999.

Note: Supporting material is available upon request at NFPA Headquarters.

PANEL ACTION: Accept in Part.

The panel accepts the deletion of the term "receptacle" in (b) of the proposal. The panel rejects the remainder of the proposal.

PANEL STATEMENT: The panel rejects the submitter's requested expansion of the AFCIs usage beyond the dwelling unit bedroom circuits.

The panel continues to support the introduction of this product, based on the data received and reviewed on this subject, but believes it is prudent to limit the requirement to bedrooms to gain further experience.

The limited care facility issue is outside the scope of Code-Making Panel 2 and recommends that the Technical Correlating Committee forward this item to Code-Making Panel 17 for action.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

BROWN: See my Explanation of Negative Vote on Proposal 2-102.

COMMENT ON AFFIRMATIVE:
MOORE: The EEI/ELP Group continues to support the introduction of this product, but questions the effectiveness due to the pickup level of the two types of AFIs. The parallel device is tested for a minimum pickup level of 75 amperes and the series device is tested for a minimum pickup of five amperes. The series device would require a five ampere load to be energized during operation. Most bedroom circuits would not have a load of that amplitude, especially while the occupant is asleep. Additional data and further product development is needed prior to extended usage.
NISSEN: The increased use of AFCIs as an effective means of reducing arcing-fault fires should be supported. The gaining of experience with these devices in all bedroom circuits is encouraged so that their usage can be expanded to other rooms and facilities that could benefit by the added protection which they would afford.

(Log #3010)

2- 104 - (210-12): Reject
SUBMITTER: Bernard A. Schwartz, Schwartz Fire Specialists/Rep. Nat'l Multi-Family Housing Council
RECOMMENDATION: Revise as follows:
(b) All branch circuits that supply 125-volt, single phase, 15- and 20-ampere receptacle outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s). This requirement shall become effective January 1, 2002. For purposes of this section, the installation of an arc-fault circuit interrupter at the receptacle with all receptacles in the bedroom supplied through that protected receptacle shall be deemed compliant.
SUBSTANTIATION: The available fire data, as well as 30 years of investigating fires and 15 years with the Consumer Product Safety Commission indicates that statistically valid information regarding electrical fires and their causes is lacking and that the number of fires starting inside the walls, in straight runs of cable is insignificant. This belief is also supported by:
a. Comments to Log #2276 in 1998 NEC comments
b. Comments to Log #1820 in 1998 NEC comments
c. Comments to Log #2525 in 1998 NEC comments
d. Comments to Log #2524 in 1998 NEC comments
e. CPSC report dated December 1987 "Residential Electrical Distribution System Fires."
The load center device provides a high level of fault protection for the wires in the wall and a lower level of protection for devices plugged into the receptacle. The receptacle device provides a high level of protection for devices plugged into the receptacle and a lower level of protection for the wiring in the wall. Since neither device is perfect, if one device is to required, than both devices should be allowed to accumulate field experience to demonstrate which is most effective.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel actions and statements on Proposals 2-108 and 2-110. The panel does not agree that the data submitted for the 1999 NEC did not support the present AFCI requirement for branch circuit wiring.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3145)

2- 105 - (210-12): Reject
SUBMITTER: Brent Nurenberg, Pewamo, Mi
RECOMMENDATION: Delete this section.
SUBSTANTIATION: No accident data was ever presented that justified 210-12 in the NEC. Arc-fault interrupters are expensive, which will lead to wiring methods being altered, resulting in fewer circuits serving bedrooms. I have witnessed a series load arc-fault test which resulted in a fire, without the arc-fault interrupter opening the circuit.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-106.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BROWN: Please read the substantiation submitted by the submitter. This proposal should be accepted. Also, see my comment on proposal 2-106

(Log #4348)

2- 106 - (210-12): Reject
SUBMITTER: Lawrence Brown, Nat'l Assn. of Home Builders
RECOMMENDATION: Delete Section 210-12 in its entirety.
SUBSTANTIATION: The acceptance of this requirement during the 1999 NEC development cycle was based on a CPSC study that was too limited in the scope of its analysis of losses in residential dwelling environments. Fire damage resulting from arc-fault causes is only a very small percentage of total residential property losses. The data should have included losses from all perils including other causes of fire losses (cooking, arson, etc.) and natural disaster-related damage from wind, earthquake, and flooding. The percentage and actual dollar losses from fires that originates in electrical wiring within the walls is substantially lower than originally perceived. Further, the data did not address the issue of whether the lack of a working smoke alarm contributed to the death.
Also missing is data that relates directly to the year the dwelling was built. This should be shown in relationship to the percentage of related electrical fires from all yearly periods. This directly relates to the wiring methods (open wiring, loom, cloth covered NM Cable) associated with each fire. This also relates to the edition of the building, fire and electrical codes in force at that time. Complete data would show that the Nonmetallic Sheathed Cable within the walls of buildings constructed to today's standards and codes is extremely low compared to the type of electrical wiring installed ten or twenty years ago. It would seem from the proposals submitted during the 1999 cycle that all of the electrical wiring materials manufactured, sold and installed today is defective. This is not true.
Another basic problem is that the technology used for the AFCI breaker will only detect an arc in the wiring up to, and possibly including the receptacle. The receptacle and any equipment pluged into the receptacle are unprotected by the breaker. The installation of an AFCI breaker seems to be only a partial fix to a very small percentage of all residential fires. With this requirement being applied only to bedrooms, the percentage is even smaller.
The cost-benefit to society of installing these breakers should also be considered. The committee was told these breakers would cost the same as a GFCI breaker. This is not true. The wholesale cost is approximately $85.00. It may be that society ends up spending $5.00 to save $1.00. Society may be better served, and save more lives, if this money was spent to upgrade smoke alarms in all existing dwellings.
All told, there are many problems with this new requirement. Incomplete and inaccurate data should not be the basis for an NEC code change. Before complete and accurate data is analyzed, and the electrical manufacturing industry addresses all of the technical problems to produce a more complete device, this requirement should be removed from the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: AFCIs Listed to UL 1699 are available, and the standard addresses efficacy, unwanted (nuisance) operation and operation inhibition. Cost should not be an issue for the panel to resolve. The panel reviewed a large amount of data, heard presentations on various positions on AFCIs, and received public comment on the topic. Upon that review, the panel arrived at the requirements in the 1999 NEC and continues to support that established position.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BROWN: This proposal should be accepted. Wrong. It was wrong for the Panel to accept this requirement during the 1999 NEC ROC. To have a better understanding of the many basic problems, you need to read the negative comments on the original proposal. These can be found on pages 111 through 116 of the 1998 Annual Meeting, National Electrical Code Committee Report on Proposals.
These comments, pointing out the fundamental problems with the device, still hold truth today. The standard by which they are developed and tested, the CPSC and other studies used by the proponents to force this product into the NEC are still of concern. Though, most important is the fact that this device will NOT solve the problems the manuacturer's stated was the real intent of pushing these devices into the marketplace through a mandate in the NEC.
It was the engineer from Underwriters Laboratories who showed the panel the basic techncal problems with the device. It will not be able to detect all arcs that may produce a fire. Asked if the device will detect and trip all arcs between the breaker and the first outlet the answer was NO! The same held true for the area of the device,

the area from the device to the appliance, and of the appliance itself. Asked what percentage of arcs may be detected, and the answer is they do not know.

This could partly be caused by the inability for manufacturers to produce a product that solves all of the problems as shown in the UL study performed for CPSC. UL developed 14 test methods for the devices to pass to be reliable. These tests were developed based on identifiable causes of residential electrical wiring fires. The UL standard used to manufacture and test this product is only over a year old. It was rushed through development only to satisfy the needs of the manufacturers as it relates to their specific product. As it turns out, the devices can pass only 4 of the tests. Not the full 14 test methods needed for this product to protect residential occupancies as outlined in the UL-CPSC study. More to the point, the tests only use nonmetallic sheathed cable with a grounding conductor. Not the common single conductor concealed wiring method installed on older dwellings.

Another problem with the CPSC study is the inability of the data to accurately ascertain the specific area of origin of the electrical fire. The study also did not indicate the actural type of wiring method, or the age of the dwelling. If all of this information is known, it would better indicate where the real problem exists. It would be hard to believe that the nonmetallic sheathed cable - ROMEX - being installed today is the overwhelming cause of residential electrical fires. The CPSC study did reach the conclusion that further testing needed to be performed. So we now have a mandate for a product that is unreliable in its ability to protect.

The high cost of this product is also a concern. The manufacturers repeatedly stated at the ROC meeting that the cost of this product would be the same as a GFCI device. This is not true. The manufacturer's catalog lists the devices at around $160.00 each. A check of the wholesale price was approximately $95.00.

So now we have an unreliable product at a high price.

Then we have the manufacturers statements on losses due to concealed electrical wiring. Square-D in their product brochure states "CPSC estimates electrical equipment causes 155,100 or 34 percent of the 451,000 fires in residential structures." This is very misleading. Using current NFPA estimates based in the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS), the total residential fire losses due to all electrical causes is only 13.75 percent of the total residential fire losses. Now, using the same data, the losses due to electrical wirng within the walls is only 5.49 percent of the total residential fire losses. This is not the 34 percent insinuated by the manufacturers.

Now, we have an unreliable product, at a very high price compared to the losses it may save.

Using the NFPA data and the 1999 NEC requirements, if the devices were 100 percet reliable, consumers will spend $240,000,000 to cover losses of ony $30,900,000. Well over seven (7) times the total losses. If this product is expanded to include all circuits in a dwelling, the public would spend over $2,400,000,000 to prevent losses of $253,600,000. This is approximately 9.5 times the actual loss. And, this is based on 100 percent effectiveness. As noted, above, UL cannot determine the effectiveness of the product. Even more disturbing is a recently published article by UL stating property losses of over $1.5 billion. From the standpoint of cost-effective regulatory mandates, the requirement in the NEC for this product is unacceptable.

This whole situation reminds one of the mandates for CO detectors. All studies have shown the location for installation of the detector to be reliably effective canot be determned. Furthermore, there are numerous problems with the technology and the manufacturing of the detector. Recalls and public announcements as to the problems are constant. It may be partly due to a rush by manufacturers to get the detectors into the marketplace.

The AFCI is also a product that is untested in relationship to the actual problem that may exist, or its ability to effectively control them. Until a more complete study of the actual causes of residential electrical fire is available, and a product can be developed to meet those needs, mandates for AFCIs should not be included in the NEC. Society should not be mandated to spend 10-20 times the amount of money that may be saved without a solid basis for the expense.

(Log #2881)

2- 107 - (210-12(a)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 3-124. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Robert R. Kent, Electrical Contracting, Inc.

RECOMMENDATION: Remove the definition of arc-fault circuit interupter from this section and put it in Article 100 DEFINITIONS.

SUBSTANTIATION: This definition should be in Article 100. As I understand, the thought behind the many changes in the '99 NEC was to make it more user friendly. This then would also be a step to help in that direction.

PANEL ACTION: Reject.

PANEL STATEMENT: Based on the NEC Style Manual 2.2.2.1, the definition of AFCI should not be included in Article 100, unless the term is used in more than one article.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #3308)

2- 108 - (210-12(a) and (b)): Reject

SUBMITTER: Jack Wells, Pass & Seymour/Legrand

RECOMMENDATION: Revise to read as follows:

210-12. Arc-Fault Protection.

(a) Definition. An arc-fault circuit-interrupter is a device intended to provide protection from the effects of arc faults by recognizing characteristics unique to hazardous arcing and by functioning to deenergize the circuit when an arc fault is detected. An arc fault that occurs between the line and neutral or the line and ground conductors is a parallel arc fault. An arc fault that occurs in a single conductor, either line or neutral, is a series arc.

(b) Dwelling Unit Bedrooms. Arc-fault circuit-interrupter(s) shall provide protection for dwelling unit bedrooms as specified in either (1) or (2).

(1) All branch circuits that supply 125-volt single phase, 15 and 20-ampere receptacle outlets installed in dwelling unit bedrooms shall be protected by arc-fault circuit-interrupter(s) installed in the panelboard at the origin of the branch circuit. The arc-fault circuit-interrupter shall provide arc fault protection for the branch circuit wiring.

(2) All 125-volt, single phase, 15- and 20-ampere receptacles in dwelling unit bedrooms shall be protected by a receptacle type combination arc-fault circuit-interrupter installed as the first receptacle in all branch circuits serving dwelling unit bedroom receptacles. The receptacle type combination arc-fault circuit-interrupter shall provide series arc fault protection for the branch wiring and the extension wiring on the line and load side of the receptacle and parallel arc fault protection for the branch circuit wiring and the extension wiring on the load side of the receptacle for all 125-volt single phase, 15- and 20-ampere receptacles in dwelling unit bedrooms.

SUBSTANTIATION:

° Section 210-12(b) in the 1999 NEC requires protection of only the circuit conductors between the final overcurrent device and the outlet. This section states that branch circuits dwelling unit bedroom receptacles shall be protected by arc-fault circuit-interrupters. Branch circuits are defined in Article 100 as "The circuit conductors between the final overcurrent device protecting the circuit ad the outlet(s)."

° Since the adoption of this requirement, two significant events have occurred.

1. UL 1699 covering AFCIs has been finalized and published. This standard establishes several different types of AFCIs that provide differing levels of arc fault protection for different types of arc faults.

2. A new type of receptacle arc-fault circuit-interrupter has been developed. This device is listed by UL as a combination arc-fault circuit-interrupter embodies in an outlet receptacle type device.

° As a consequence of these developments not contemplated by CMP 2 during the initial deliberation concerning AFCIs, the current requirement needs to be revised to recognize the various types of AFCIs.

° The addition of the definition of series and parallel arcs will assist users in understanding the type of arc fault that may occur and provide a basis for understanding of the application of various types of AFCIs.

° The following are definitions of permanently wired arc fault circuit-interrupters that appear in UL 1699:

Branch/Feeder Arc Fault Circuit Interrupter. A device intended to be installed at the origin of a branch circuit or feeder, such as a panelboard. It is intended to provide protection of the branch circuit wiring the feeder wiring, or both, against unwanted effects of arcing. This device also provides limited protection to branch circuit extension wiring. It may be a circuit-breaker type device or a device in its own enclosure mounted at or near a panelboard.

Outlet Circuit Arc-Fault Circuit-Interrupter - A device intended to be installed at a branch circuit outlet, such as at an outlet box. It is intended to provide protection of cord sets and power supply cords connected to it (when provided with receptacle outlets) against the unwanted effects of arcing. This device may provide feed through protection of the cord sets and power supply cords connected to downstream receptacles.

Combination Arc-Fault Circuit Interrupter - An AFCI which complies with the requirements for both branch/feeder and outlet circuit AFCIs. It is intended to protect downstream branch wiring and cord sets and power supply cords.

The following table is an excerpt from Table 50.2 in UL 1699. It shows the arc fault test requirements that permanently wired AFCIs are required to meet.

Tests	Branch Feeder AFCI	Combination AFCI	Outlet Circuit AFCI w/Feed	Outlet Circuit AFCI w/o Feed
(a) CarbonizedPath Arc Ignition NM-B Insulation Cut	X	X		
(b) Carbonized Path Arc Interruption Test	X	X	X	
SPT-2 Insulation Cut	X	X		
NM-B Insulation Cut				
(c) Carbonized Path Arc Clearing Time Test		X	X	X
SPT-2 Insulation Cut				
(d) Point Contact Arc Test				
SPT-W Insulation Cut	X	X		X
NM-B Insulation Cut	X	X		

It is important to recognize the type of arc fault each of these test represent in order to understand the level of protection provided by different types of AFCI.

The carbonized path arc ignition test (a) is test for detection of a series arc. This test represents an arc fault in a single conductor of a 3-conductor NM-B cable. The time to clear the arc fault is not specified. The cable used as test sample is wrapped with tape in the area where the arc occurs. The taped area is loosely wrapped with a cotton indicator. The AFCI must clear the fault before a cotton indicator ignites. In the case of a branch/feeder AFCI which may only detect parallel faults, this test is likely to be satisfactorily complied with because the series fault quickly develops into a parallel fault to the equipment grounding conductor. In the case of the combination and outlet circuit AFCI, the fault is detected as a series fault.

The carbonized path arc clearing time test (c) is also a test for detection of a series arc. However, this test represents an arc fault in a single conductor of a 2-conductor SPT-2 cord. The AFCI must clear the arc fault in 1 second or less. A branch/feeder AFCI is not required to provide protection for this type of fault.

Both the carbonized path arc interruption test (b) and the point contact arc test (d) are intended to detect parallel arcs. Although the arcing paths are created by a different methods for each test, both tests create a condition of arcing between two conductors of either a 3-conductor NM-B cable or a 2-conductor SPT-2 cord. In both tests the AFCI must clear the arc fault within 8 half cycles of arcing that occur within a period of 0.5 seconds.

° An issue not directly addressed in the UL standard is series type arcing faults that may occur at loose binding screw terminals, push-in terminals, twist-on wire connectors and similar terminations in the fixed branch circuit wiring. An roc that occurs at this type of termination will appear to an AFCI as very similar to a series arc fault in a single conductor. The closest related case to a termination type of arc fault in the UL test table is the carbonized path arc clearing time test (c) which is used to detect a series arc in a single conductor of an SPT-cord. A combination AFCI and outlet circuit AFCI are subjected to this test but a branch/feeder AFCI is not. These two arcing conductors are closely related because an arc fault in single conductor occurring either in a cord, or at a terminal, occurs at a location where the arc cannot easily develop into a ground fault or into a parallel arc to another conductor. The ignition of combustible material in close proximity will likely occur by the time this type of series arc progresses to a parallel arc or a ground fault. Consequently, the UL test that requires clearing the series arc fault in 1 second or less is critical in preventing the development of a fire hazard created by allowing the series arc to progress to either a parallel arc or a ground fault.

Detection of series type arc faults at terminations by the receptacle type combination AFCI is an important features that must not be overlooked when specifying an AFCI for arc fault protection. This proposal permits selection of a receptacle type combination AFCI that provide this type of series arc fault protection.

° It is evident from the test table that the different types of AFCIs provide different levels and types of arc fault protection. For example, the branch/feeder AFCI is not required to provide series arc fault protection for SPT-2 cords although parallel arc fault protection for an SPT-2 cord must be provided. Likewise, a branch/feeder AFCI in UL 1699 states that this device provides only "limited protection" of branch circuit extension wiring such as extension cords ad power supply cords.

The levels of protection provided by different types of AFCIs must be considered when selecting a device to provide arc fault protection.

° Section 210-12(b) in the 1999 NEC requires protection of the branch circuit conductors from the final overcurrent device to the outlet. This protection is most likely to be provided by the installation of the branch/feeder AFCI at the panelboard. Although the branch-feeder AFCI provides protection for the branch circuit conductors and "limited protection" for parallel arc faults in cords, the UL test program does not require this type of AFCI to p protect against a series arc fault in a 2-conductor extension or power supply cord used to connect a load to the branch circuit.

There are many loads used in dwelling unit bedrooms and other rooms in a home that are cord connected to the branch circuit. Some of these loads such as clothes irons, space heaters, and multiple loads on extension cords can create a serious arcing hazard when connected to the branch circuit by a extension or power supply cord that has a damaged single conductor. The damaged single conductor in the cord used with these types of loads can easily develop into arc fault condition that must be cleared quickly before it becomes fire hazard.

One result of this proposal is to permit selection of an AFCI that provides protection for a series arc in a 2-conductor cord.

° The arc fault tests in UL 16999 have been developed to demonstrate the ability of an AFCI to detect an arc fault on the downstream side of the AFCI. However, the nature of series arcs and the technology used in the design of the UL listed receptacle type combination AFCI results in the ability of this type of AFCI to clear series arc both on the upstream and downstream side of the AFCI. Thus, the receptacle type combination AFCI provides series arc fault protection for the fixed branch circuit wiring from the panelboard to the outlet as well as series and parallel arc fault protection on the load side of the AFCI for the fixed branch circuit wiring, extension cords and power supply cords.

° This proposal provides the option of installing either a receptacle type combination AFCI or a branch/feeder AFCI. Both of these products offer effective arc fault protection. The NEC should be revised to permit the installation of either product.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Proposal 2-110.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
MERICLE: I vote no on the Panel Action. There exists a wealth of testing data which attests to the effectiveness of these devices in helping to prevent fires.
NISSEN: The concept present in this proposal should be accepted. The submitter has not suggested expanding AFCIs beyond the bedroom branch circuits. The substantiation addresses an alternate method of protecting bedroom circuits with a combination type AFCI. See also my comment on Proposal 2-110.

(Log #2102)

2- 109 - (210-12(b)): Reject
SUBMITTER: Chip Pudims, Hubbell Inc.
RECOMMENDATION: Revise text to read as follows:
Dwelling Unit Bedrooms.
(1) All branch circuits that supply 125-volt, single-phase, 15 and 20-ampere outlets installed in dwelling unit bedrooms shall be protected by a Branch/Feeder arc-fault circuit interrupter(s).
(2) All 125-volt, single-phase, 15 and 20-ampere receptacle outlets installed in dwelling unit bedrooms shall be protected by an Outlet/Circuit arc-fault circuit interrupter(s).
Exception: A combination unit shall be permitted to provide both Branch/Feeder and Outlet/Circuit arc-fault protection required by (1) and (2) above.
SUBSTANTIATION: Existing Code requires arc-fault protection solely for branch-feeder circuits and does not require protection for extension or power-supply cords. Independent studies have cited extension wiring as potentially significant sources of residential electrical fires, that result from arc-faults. Extension and power-supply cords are more susceptible to abuse than branch circuit wiring and can be of far less robust construction; such as 18 AWG SPT flexible cord (i.e., zip cord). Additional requirements will provide a significant increase in the level of safety.
UL 1699 identifies different levels of protection for "branch/feeder" vs. "outlet" type arc-fault circuit-interrupters and "expects a coordinated system of protection". By definition UL recognizes Branch/Feeder AFCIs provide "limited" protection to extension wiring, while Outlet AFCIs are intended to protect "cord sets and power supply cords". Branch/Feeder AFCIs do not protect against series arcs in extension wiring and series arcs are likely to occur because they only require a single break in the wire. UL 1699 requires different levels of performance testing for each type of protection and allows for a "combination" AFCI if all elements of the coordinated system are met.
As of submittal of this proposal, Outlet AFCIs, Listed to UL 1699, are not available, but are being developed and will become available by the NEC effective date of January 1, 2002. In the interest of safety, NEC Section 90-4 specifically permits "new products, constructions, or materials that may not yet be available at the time the Code is adopted." In the interim, Section 90-4 allows the enforcement of previous adopted editions of the Code. The 1984 NEC Handbook rationalizes Section 90-4 because of the greater than 2 year time lag between proposal and adoption of the Code. This Code proposal provides for an increased degree of safety in dwelling unit bedrooms, due to the additional protection for extension and power-supply cords.
The submitter requests the opportunity to present this proposal and any advances in Outlet/Circuit AFCI technology, that may occur in the next few months, to the CMP at the January 2000 meeting.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 2-110.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
MERICLE: See my Explanation of Negative Vote on Proposal 2-108.
NISSEN: See my Explanation of Negative Vote on Proposals 2-108 and 2-110.
PAULEY: See my Explanation of Negative Vote on Proposal 2-110.

(Log #2262)

2- 110 - (210-12(b)): Accept in Part
SUBMITTER: Steve Campolo, Leviton Manufacturing Co., Inc.
RECOMMENDATION: Revise text as follows:
210-12(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed in dwelling unit bedrooms shall be protected by a Branch/Feeder arc-fault circuit interrupter(s). All 125-volt, single-phase, 15- and 20-ampere receptacles in dwelling unit bedrooms shall be protected by an Outlet/Circuit arc-fault circuit interrupter(s). ~~This requirement shall become effective January 1, 2002.~~
SUBSTANTIATION: Article 100 defines the branch circuit as "The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s)." Applying this definition to Section 210-12(b) of the NEC and the definitions of UL 1699 results in a requirement that provides arc fault protection only for the fixed wiring from the overcurrent device to the receptacle outlet. This indicates that branch circuit extensions may remain unprotected. Expanding the requirement to provide arc fault protection for the receptacles and the wiring extending from the receptacles (e.g., extension cords and power supply cords) greatly increases the level of safety afforded by AFCIs. In fact, it may be argued that exposed extension cords and power supply cords are subject to considerably greater abuse than fixed wiring and are more susceptible to abuse resulting in an arcing condition.
Underwriters Laboratories Inc. issued the first edition of UL 1699, UL Standard for Safety for Arc-Fault Circuit-Interrupters, on February 26, 1999. This standard defines different types of arc-fault circuit-interrupters. The definitions include the following:
A Branch/Feeder AFCI "...is intended to provide protection of the branch circuit wiring, feeder wiring, or both, against the unwanted effects of arcing. This device also provides limited protection to branch circuit extension wiring." Simply, a Branch/Feeder AFCI is not required to offer low current arcing fault protection for branch extensions.
An Outlet Circuit AFCI "...is intended to provide protection of cord sets and power-supply cords connected to it (when provided with receptacle outlets) against the unwanted effects of arcing."
UL has indicated that a coordinated system of protection should emerge where combinations of the various types of AFCIs are used to increase the likelihood of the greatest possible degree of overall protection. This perspective is reinforced by the definitions of various types of AFCIs contained in UL 1699, which explains several different types of AFCIs.
It is apparent that the UL standard considers arc fault protection is important for both the fixed wiring of the branch circuit and the branch circuit extension wiring (Power Supply and Extension Cords). Based on the AFCIs that are defined in UL 1699, a complete system of arc fault protection may be provided by installing a Branch/Feeder AFCI in the panelboard and an Outlet Circuit AFCI at the receptacle. The branch is protected as well as branch extensions.
Adopting the proposed revision to 210-12(b) will result in a system that provides complete arc fault protection for both the fixed wiring and the branch circuit extension conductors by requiring installation of a coordinated system of AFCIs.
PANEL ACTION: Accept in Part.
The panel accepts the deletion of the last sentence in the proposal, and rejects the remainder of the proposal.
PANEL STATEMENT: The panel rejects the expansion of AFCIs beyond the bedroom branch circuits at this time. The panel continues to support the introduction of AFCIs, but intends at this time to limit the requirement to bedroom branch circuits until further data can be obtained and evaluated.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
NISSEN: The submitter has provided adequate substantiation for the need for both branch/feeder and outlet circuit AFCI protection I dwelling unit bedrooms, and that concept should be accepted.
PAULEY: NEMA supports the increase in protection that could be afforded by the addition of the outlet AFCI to Section 210-12. This addition would provide increased protection of cords and appliances connected to receptacle circuits and would enhance safety.

(Log #2745)

2- 111 - (210-12(b)): Reject
SUBMITTER: George D. Gregory, Square D Company
RECOMMENDATION: Revise as follows:
(b) Dwelling Unit Bedrooms. All 15- and 20-ampere, 125-volt, single-phase branch circuits that supply bedrooms shall be protected by a branch/feeder arc-fault circuit interrupter(s). Bedroom receptacle outlet circuits shall additionally have outlet circuit arc-fault circuit interrupter protection.
SUBSTANTIATION: This proposal is intended to accomplish four items:
1. Delete the effective date of January 1, 2002 since it will be redundant with the 2002 edition of the NEC.
2. Add protection at the branch for all 15- and 20-ampere circuits feeding bedrooms, not only receptacle outlets. This will add for protection for lighting circuits.
3. Clarify that protection is "branch/feeder" protection in correlation with the product listing.
4. Add a requirement for specific "outlet circuit" protection of receptacle outlets.
Regarding item 2, AFCI protection of lighting circuits or other dedicated circuits is needed since numbers of residential fires are initiated in lighting circuits. In fact, arcing faults can occur in any circuit.
Regarding item 3, the name branch/feeder AFCI was assigned to the device intended to protect branch or feeder circuits under the new UL 1699, Standard for Safety for Arc-Fault Circuit Interrupters.
Regarding item 4, the new UL 1669 Standard also identifies an outlet circuit AFCI that will add protection specific to protection of receptacle loads. The proposer recognizes that protection at the branch will provide protection against arcing causes of fires in fixed wiring system and considerable protection against such causes in cords and appliances. Outlet circuit protection can enhance the degree of protection.
What's New
Since Section 210-12 was added in the 1999 NEC, three significant things have occurred:
• UL 1699, Underwriters Laboratories, Inc. Standard for Safety for Arc-Fault Circuit Interrupters, dated 2/26/99, was published.
• AFCI products of at least three major manufacturers have been continuously available commercially in circuit breaker form.
• Circuit breaker AFCIs of at least three manufacturers have been Listed under UL 1699 as "Branch/Feeder AFCIs", intended for installation at branch circuits. Original products were classified by UL to an outline of investigation in the form of a proposed standard.
AFCIs have been installed in a number of homes since they were commercially introduced in 1997 as UL Classified products. There have been no reports of nuisance operation or fires of electrical origin in the homes in which they have been installed, to the knowledge of the proposer's employer. There have been testimonies of a number of users to their effectiveness in clearing hazardous circuit conditions and leading to corrections.
Electrical Fire Cause Reports
A report titled, "The U.S. Fire Problem Overview Report" dated March 1998 and published by NFPA discloses that there were 39,400 fires in residences caused by the electrical distribution system as an annual average in the period 1991-1995. [1] These fires are associated with 350 annual civilian deaths. Another 30,700 fires are caused by appliance operation in residences. Of these appliance-related fires, over 40 percent are from heat developed in electric dryers and are not from electrical causes directly. Of the remaining 60 percent, some portion of causes would be detected by the circuit breaker AFCI.
Of the 39,400 fires attributed to the distribution system, 36 percent are in fixed wiring, 18 percent are in cords and plugs, 11 percent are in switches or receptacle outlets, 11 percent are in lighting fixtures, according to the NFPA report. This data breakdown is corroborated by a report published in the January 1990 Fire Journal titled, "What Causes Wiring Fires in Residences" by Smith and McCoskrie of CPSC. [2] That report studied 149 fires in detail and found initial causes: 34 percent in fixed wiring, 19 percent in cords and plugs, 19 percent in switches and outlets, and 13 percent in lighting fixtures. In either set of data, over 60 percent of fires are from causes in the fixed wiring, switches, receptacle outlets and lighting fixtures that are part of the fixed electrical system of a residence.
In summarizing the above paragraphs, over 60 percent of fires attributed to the distribution system are in the fixed wiring system. Combining the distribution system and appliance related fires, over 35 percent of the total is in the fixed wiring system. This data soundly supports the present NEC language that requires AFCI protection at the branch.
Dwelling Rooms Affected
Fires from electrical causes originate in every room in residences. The three areas of most frequent origin, according to the National Fire Institute Reporting System (NFIRs) database for all recent years, are kitchens, bedrooms and living areas. Following these areas in frequency of fire origin are the unimproved areas such as attics, basements and crawl spaces. A convenient, but somewhat dated, breakdown of supporting data appears on page 11 of "CPSC Residential Electrical Distribution System Fires" report dated December 1987 by Smith and McCoskrie. [3] A more recent corroboration appears in "The U.S. Fire Problem Overview Report."[1]
This proposer understands that AFCI protection is needed for nearly all circuits in residences and not just those to bedroom circuits. However, this proposal suggests that the NEC continue to hold with the Panel's intent to initiate this section with protection of one of the most vulnerable locations in a residence, the bedroom. This action will permit an orderly introduction of a new product to the industry. With testimonials of protection already received, we can expect that justification for protection in other areas of residences will naturally follow.
Arcing Faults Cause Fires
Electric arcs can and do occur in damaged or uninsulated conductors from line to neutral, line to ground or within a single broken or separated conductor in series with a load. Electric arcs operate at temperatures of between 5,000 and 15,000°F and expel small particles of molten or burning materials from the center. An arc is clearly capable of igniting nearby materials, including electrical insulation, if it persists. The AFCI removes the potential cause of ignition by opening the arcing circuit within the parameters of the standard, greatly reducing the probability of fire from an electric arc.
Higher current arcs are more likely to cause a fire because of the higher energy in the arc disturbance. Greater current will melt more of the conductor metal and therefore expel more molten particles. The volume of hot, ionized gas emitted increases proportionally with energy. The branch/feeder AFCI in circuit breaker form is specifically oriented toward detecting these higher current arcs above 75 amperes and line-to-ground arcs of current levels from 5 amperes and greater under UL 1699. Commercially available B/F AFCIs will detect line-to-ground arcs of 30 milliamperes and above.
Discussion may point out that fires can be started by series arcs at lower current values, such as 5 amperes and even below. Research done by UL during the development of the standard revealed fire causes at 5 amperes and above under repeatable conditions. Following that research, it was demonstrated that arcs could cause fires with lower current arcs down to 1 ampere and possibly below. However, conditions that allow arc initiation to cause fire for the lower current arcs are difficult to establish.
AFCI Product Standard
The UL 1699 Standard requires testing of the AFCI through a rigorous set of tests for arc detection ability, unwanted operation tests (to avoid nuisance operation), and operation inhibition tests. The operation inhibition tests assure that the AFCI will detect an arc even though it may be connected electrically in series or parallel with loads that might attenuate, mask or otherwise tend to hide the arc signal.
Prior to the development of the AFCI Standard and before products were offered commercially, Square D Company conducted research to learn what arcing conditions cause fires. A part of that research involved collection of evidence from fires to which municipal fire fighters were called. Other evidence was collected from homes of Square D employees. Some of that evidence is discussed in an article published in the November 1997 EC&M Magazine. [4] The research disclosed a number of occurrences involving either short circuit (line-to-neutral faults) or arcing ground faults. The results of this internal research guided our decisions regarding input to the development of UL 1699 and to the development of a product that will address the kind of occurrences we found in the field.
An AFCI must detect potentially hazardous arcing conditions and open to denergize the hazard. It must also distinguish between normal energy and potentially hazardous energy. One method of distinguishing normal from hazardous conditions is by recognition of arcing characteristics in the electrical signal. A brief review of this approach is discussed in an IEEE paper titled "The Arc-Fault Circuit Interrupter: An Emerging Product." [5] This paper also clarifies that two primary methods of arc initiation are addressed in standardized testing. The first method is carbonized path arcing in which carbon tracking supports lower energy arcs and leads to pyrolyzation or

organic materials in the arc path. The second method is the short circuit such as might be caused by insulation damage.

Branch/Feeder and Outlet Circuit AFCIs

An AFCI intended for branch circuit application is called by UL 1699 a branch/feeder AFCI. The circuit breaker version is the only presently available form of the branch/feeder AFCI. The standard states that the branch/feeder AFCI "is intended to provide protection of the branch circuit wiring, feeder wiring, or both, against unwanted effects of arcing. This device also provides limited protection to branch circuit extension wiring." The branch/feeder AFCI provides full short circuit and ground-fault arc detection for all 2-wire cords and circuits as well as cords and circuits with a grounding conductor. However, it is not required to provide low-level series arc-fault protection that is desirable for 2-wire cords without a grounding conductor. It is therefore considered to provide limited protection of extension wiring.

The 2-wire protection does not seem so limited when we consider this fact from "The U.S. Home Product Report, 1992-1996 (Appliances and Equipment)" by Kimberly Rohr of NFPA. [6] On page 7, it clarifies that "The leading cause of cord and plug fires was short circuits and ground faults, which accounted for half or more of these fires, injuries and direct property damage. Fires caused by short circuits and ground faults also accounted for 38 percent of civilian fire deaths." The Branch/Feeder AFCIs are intended and tested for detecting these arcing short circuits and ground faults. That degree of protection extends to cords and plugs and appliances.

The UL 1699 Standard for AFCIs identifies an outlet circuit AFCI (outlet receptacle form) in addition to the branch/feeder AFCI (circuit breaker form). The two types are tested differently. Outlet circuit AFCIs are tested to detect low-level faults between 5 and 30 A such as might be found in series arcs. The branch/feeder AFCI is not tested for the low-level arcs in series with a load. On the other hand, the branch/feeder AFCI is tested with construction cable and wire in addition to cords. Outlet circuit AFCIs are not tested with building wire and cable. Having both devices in a circuit would provide protection for the greatest number of conditions. However, if one device were chosen, it must be the branch/feeder AFCI for the following reasons.

- The branch/feeder AFCI protects the fixed wiring system where the greatest numbers of fires from electrical causes originate.
- The branch/feeder AFCI provides good protection against effects of short-circuit and ground-fault arcing in extension and appliance wiring, though protection is considered limited because it is not required to detect series arcs at lower levels.
- The branch/feeder AFCI has been available for several years from three manufacturers and has exhibited good field experience.

Testimonials

1. An engineer employed by Underwriters Laboratories had circuit breaker AFCIs installed in a number of circuits in his house. When energized after installation, two of them tripped open. On the first, he unplugged all appliances connected to the circuit and then turned the AFCI on. He found a damaged lamp with line-to-ground arc that caused the AFCI to trip. On the second, he replaced the AFCI after unplugging all appliances and repeated attempts to energize it, unsuccessfully. The replacement AFCI also tripped open. After further examination of the circuit, he found a poor connection to an outlet receptacle to which the wire insulation had burnt back from the connection. After repairing it, the AFCI was energized successfully.
2. AFCI circuit breakers were installed in a number of houses in Florida near the Gulf coast in 1998. After installation, only two of these units tripped. In both cases, damage to conductor insulation was found to be the cause of low-level faults that were detected.
3. After AFCI circuit breakers were made commercially available, they were installed in a number of circuits in Square D plants. In one plant an appliance was pushed against its plug, damaging the plug. The AFCI tripped to protect the circuit. When the plug was examined afterward, it was found that the grounding pin connection had been twisted toward the line connection inside the plug housing and that arcing from line to ground had occurred. A second appliance had been jarred in the same situation. After a period of days the AFCI tripped again. No damage was apparent so the AFCI circuit breaker was turned on again to restore power. It was tripped again and was reset several times before the cause was located and corrected. The cause was an intermittent arc from line to ground within the second appliance. This second arcing condition was increasing in continuity as the arcing path became carbonized.
4. Since its commercial introduction, the AFCI circuit breaker has gained considerable respect. In the State of Vermont, an amendment to Section 210-12(b) was adopted to add branch AFCI protection for outlet receptacles in both living areas and bedrooms. Their effective date is January 2001 rather than 2002.

References

[1] John R. Hall, Jr., The U.S. Fire Problem Overview Report, National Fire Protection Association, March 1998, pages 66-88 relating to causes of home fires.

[2] Linda E. Smith and Dennis McCoskrie, "What Causes Wiring Fires in Residences?" Fire Journal, January 1990.

[3] Linda Smith and Dennis McCoskrie, Residential Electrical Distribution System Fires, U.S. Consumer Product Safety Commission, December 1987, the executive summary and page 11.

[4] George D. Gregory, "Using Arc-Fault Circuit Interrupters to Reduce Residential Fires," EC&M Magazine, November 1997.

[5] George D. Gregory and Gary W. Scott, "The Arc-Fault Circuit Interrupter, An Emerging Product," IEEE Transactions on Industry Applications, September/October 1998, pp. 928-933.

[6] Kimberly Rohr, The. U.S. Home Product Report, 1992-1996 (Appliances and Equipment), NFPA, February 1999, pages 4 through 9.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 2-110.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

NISSEN: See my Explanation of Negative on Proposal 2-110.

PAULEY: See my Explanation of Negative Vote on Proposal 2-110.

(Log #2816)

2- 112 - (210-12(b) and (c)): Accept in Part

SUBMITTER: Harvey E. Johnson, Estero, FL

RECOMMENDATION: Revise text as follows:

(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere ~~receptacle~~ outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s). This requirement shall become effective January 1, 2002.

(c) Dwelling Unit Living Areas. All branch circuits that supply 125-volt, single-phase 15- and 20-ampere outlets installed in dwelling unit living areas shall be protected by an arc-fault circuit interrupter(s).

FPN. A living area is any normally occupiable space in a residential occupancy, other than sleeping rooms or rooms that are intended for combination sleeping/living, bathrooms, toilet compartments, kitchens, closets, halls, storage or utility spaces and similar areas.

SUBSTANTIATION: During the past year I have visited many Electrical Shows and Inspector Meetings around the country. One technology that has created a great deal of interest is the Arc Fault Circuit Interrupter which has been demonstrated at many of these events by several manufacturers. The overwhelming response has been positive, and the most frequently asked question has been "Why does the Code only limit the technology to bedroom outlets?" In fact, most people consider that AFCIs should be used on all dwelling circuits.

At this time I am proposing that the circuits to all bedroom outlets be protected by AFCIs. It is difficult enough to explain to people why only bedrooms are protected without attempting to explain the further limitation to receptacle outlets. This can be resolved by removing the word "receptacle". AFCIs would then provide protection to all of the branch circuits which supply bedroom outlets, including the lighting outlets. Here I note that the AFCI protection is not limited solely to the branch circuit wiring, but AFCIs in the branch circuit also provide enhanced protection to the cords attached to the outlets.

With respect to my proposed application of AFCIs to the protection of branch circuit receptacles associated with living areas, I am responding to the question, raised at Electrical Shows and Inspector Meetings, "Why only bedrooms?" During the last Code cycle, the Code Making Panel was interested in the gradual introduction of the AFCi technology. However, during the past several years many manufacturers have introduced UL listed product, UL has issued a standard, there is increased customer awareness, and many devices have been installed. With this increased product availability and experience, I consider that the protection should be expanded. It is well recognized that bedroom and living areas are frequently associated with household electrical fires, and I therefore consider that both of these areas should be

protected without delay. This still falls well short of whole house protection.

I appreciate that the term "Living Areas" is not defined in the National Electrical Code. Here I am proposing that the NEC include, as a FPN, the definition adopted by the Vermont Code Making Authorities; namely "Any normally occupiable space in a residential occupancy, other than sleeping rooms or rooms that are intended for combination sleeping/living, bathrooms, toilet compartments, kitchens, closets, halls, storage or utility spaces and similar areas". Here I also note that Vermont has advanced the effective application date for Section 210-12(b) of the 1999 NEC from January 1, 2002 to January 1, 2001.

AFCIs at the branch circuit location, provide a significant safety enhancement that can impact the present tragic loss of human life, human injury and property damage. The devices are real, their protection is real, and their application is dependent on Code panel action.

PANEL ACTION: Accept in Part.

The panel accepts the deletion of "receptacle" in (b) of the proposal, and rejects the remainder of the proposal.

PANEL STATEMENT: See panel action and statement on Proposal 2-103.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

BROWN: See my Explanation of Negative Vote on Proposal 2-102.

COMMENT ON AFFIRMATIVE:

NISSEN: See my Comment on Affirmative on Proposal 2-103.

(Log #3687)

2- 113 - (210-12(b)): Accept in Part

SUBMITTER: Steve Campolo, Leviton Manufacturing Co., Inc.

RECOMMENDATION: Revise text to read as follows:

210.12(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed in dwelling unit bedrooms shall be protected by a Branch/Feeder arc-fault circuit interrupter(s). All 125-volt, single-phase, 15- and 20-ampere receptacles in dwelling unit bedrooms shall be protected by an outlet/circuit arc-fault circuit interrupter(s). ~~This requirement shall become effective January 1, 2002.~~

SUBSTANTIATION: Article 100 defines the branch circuit as "The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s)." Applying this definition to Section 210-12(b) of the NEC and the definitions of UL 1699 results in a requirement that provides arc fault protection only for the fixed wiring from the overcurrent device to the receptacle outlet. This indicates that branch circuit extensions may remain unprotected. Expanding the requirement to provide arc fault protection for the receptacles and the wiring extending from the receptacles (e.g., extension cords and power supply cords) greatly increases the level of safety afforded by AFCIs. In fact, it may be argued that exposed extension cords and power supply cords are subject to considerably greater abuse than fixed wiring and are more susceptible to abuse resulting in an arcing condition.

Underwriters Laboratories Inc. issued the first edition of UL 1699, UL Standard for Safety for Arc-Fault Circuit-Interrupters on February 26, 1999. This standard defines different types of arc-fault circuit-interrupters. The definitions include the following:

A Branch/Feeder AFCI "...is intended to provide protection of the branch circuit wiring feeder wiring, or both, against the unwanted effects of arcing. This device also provides limited protection to branch circuit extension wiring." Simply, a Branch/Feeder AFCI is not required to offer low current arcing fault protection for branch extensions.

An Outlet Circuit AFCI "...is intended to provide protection of cord sets and power-supply cords connected to it (when provided with receptacle outlets) against the unwanted effects of arcing."

UL has indicated that a coordinated system of protection should emerge where combinations of the various types of AFCIs are used to increase the likelihood of the greatest possible degree of overall protection. This perspective is reinforced by the definitions of various types of AFCIs contained in UL 1699, which explains several different types of AFCIs.

It is apparent that the UL standard considers arc fault protection is important for both the fixed wiring of the branch circuit and the branch circuit extension wiring (Power Supply and Extension Cords).

Based on the AFCIs that are defined in UL 1699, a complete system of arc fault protection may be provided by installing a Branch/Feeder AFCI in the panelboard and an Outlet Circuit AFCI at the receptacle. The branch is protected as well as branch extensions.

Adopting the proposed revision to 210-12(b) will result in a system that provides complete arc fault protection for both the fixed wiring and the branch circuit extension conductors by requiring installation of a coordinated system of AFCIs.

PANEL ACTION: Accept in Part.

The panel accepts the deletion of the last sentence in the proposal, and rejects the remainder of the proposal.

PANEL STATEMENT: See panel statement on Proposal 2-110.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

NISSEN: The submitter has provided adequate substantiation of the need for both branch/feeder and outlet circuit AFCI protection in dwelling unit bedrooms, and that concept should be accepted.

PAULEY: See my Explanation of Negative Vote on Proposal 2-110 (Log #2262).

(Log #3803)

2- 114 - (210-12(b)): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 17 for action. This will be considered as a public comment.

SUBMITTER: Thomas D. Mock, Consumer Electronics Mfrs Assn.

RECOMMENDATION: Revise paragraph 210.12(b) as follows:

(b) Dwelling Unit Bedrooms All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s). This requirement shall become effective January 1, 2002

(c) Dwelling Unit Living Areas All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in dwelling unit living areas shall be protected by an arc-fault circuit interrupter(s).

FPN A dwelling unit living area is any space, that can be normally occupied, other than bedrooms, bathrooms, toilet compartments, kitchens, closets, halls, storage, garage or utility spaces.

(d) Guest rooms All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in guest rooms in hotels, motels, and similar occupancies shall be protected by an arc-fault circuit interrupter(s) in accordance with the requirements for dwelling units in 210.12(b) and 210.12(c) .

(e) Limited Care Facility Bedrooms All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere outlets installed in limited care facility bedrooms shall be protected by an arc-fault circuit interrupter(s).

SUBSTANTIATION: 1. The submitter would like to respectfully disagree with the need for further field experience before mandating wider application of these devices. Research into the reliability of these devices was undertaken by the Consumer Products Safety Commission and reported in the Consumer Product Safety Review, Volume 4, Summer 1999. The results of this report can be summarized as follows;

"Problems in home wiring, like arcing and sparking, are associated with more than 40,000 home fires each year. These fires claim over 350 lives and injure 1,400 victims annually.

Several years ago, a CPSC study identified arc fault detection as a promising new technology. Since then, CPSC electrical engineers have tested the new AFCIs on the market and found these products to be effective.

You may want to consider adding AFCI protection for both new and existing homes. Older homes with ordinary circuit breakers especially may benefit from the added protection against the arcing faults that can occur in aging wiring systems."

Further delay in the proper implementation of these devices does not appear warranted.

2. The sentence: "This requirement shall become effective January 1, 2002." should to be deleted since that is the nominally effective date for the 2002 NEC® anyway. There is no technical or product supply reason for extending the effective date due to adoption of this proposal.

3. The 1999 National Electrical Code mandates the protection of all branch circuits that supply receptacle outlets installed in dwelling unit bedrooms. This Code wording was influenced, in part, by Comments during the 1999 Code Cycle, such as Comment 2-65 (1).

That Comment addresses the enhanced safety provided by AFCIs in sleeping and living areas; areas that were identified as being most prone to electrical fires as a result of low voltage arcing. The present proposal is aimed at broadening the protection of AFCIs to the branch circuits supplying all bedroom outlets in dwelling units, in guest rooms and in limited care facilities. It is also aimed at broadening the protection of AFCIs to the branch circuits of living areas in dwelling units and in guest rooms.

The substantiation for the present proposal is as follows:

With respect to 210-12 (b), the present restriction to bedroom receptacle outlets only partially satisfies the intended protection of the circuits supplying dwelling unit bedrooms. These rooms are also associated with lighting outlets, and the branch circuits supplying these lighting outlets should also be protected. The proposal, therefore, is to delete the word "receptacle" in order to provide AFCI protection to the circuits supplying all bedroom outlets.

"The U.S. Fire Problem Overview Report, Leading Causes and Other Patterns And Trends" published by NFPA in May 1999, and hereafter referred to as the Overview Report, states,

"Electrical distribution equipment fires ranked second in property damage. Electrical distribution equipment includes: fixed wiring; transformers or associated overcurrent or disconnect equipment; meters or meter boxes; power switch gear or overcurrent protection devices; switches, receptacles or outlets; light fixtures, lamp holders, light fixtures, signs, or ballasts: cords or plugs; and lamps or light bulbs.

During the five year period from 1992 through 1996, electrical distribution equipment in the home caused an annual average of 39,100 structure fires, 360 civilian fire deaths, 1,480 civilian fire injuries and $579.3 million in direct property damage.

Electrical distribution equipment fires involved ranked:

- Fifth in number of home structure fires;
- Fourth in home fire deaths;
- Seventh in home fire injuries; and
- Second in direct property damage.

A study done by the U.S. Consumer Product Safety Commission in the mid 1980's examined detailed information about electrical equipment residential fires in specific cities. They found that improper alterations contributed to 37 percent of the fires; improper initial installations factored in 20 percent of the incidents; deterioration due to aging system components contributed to 17 percent of the fires; improper use was a factor in 15 percent of the incidents; inadequate electrical capacity contributed to another 15 percent; faulty products were implicated in 11 percent, and contributing factors were unknokn in 6 percent of the fires studied."

With respect to 210-12 (c), the proposal is to extend AFCI fire protection to the circuits supplying dwelling unit living areas. This change, in conjunction with 210-12(b), would provide AFCI protection to the circuits supplying outlets in all dwelling unit rooms with the exception of bathrooms, toilet compartments, kitchens, closets, halls, storage, garage or utility spaces.

The above referenced Overview Report also states that;

"One-third of the home civilian fire deaths resulted from fires that started in the living room, family room or den."

With respect to 210-12(d), the intent is to extend the enhanced safety benefits of AFCIs in dwelling units to comparable occupancy locations (bedrooms and living areas) in the guest rooms (210-60) of hotels, motels and similar occupancies.

With respect to 210-12(e), the intent is to extend the enhanced safety benefits of AFCIs to the bedrooms of Limited Care Facilities as defined in 517-3. These facilities cater to persons who may be incapable of self-preservation or may suffer from some physical or mental limitation which would hinder the rapid exiting of buildings in an emegency. Fire safety needs to be increased by the addition of AFCIs.

This overall Code proposal is justified on the basis of enhanced safety. According to the NFPA Overview Report, the data on structure fires in residential properties (based 0n 1992-1996 annual averages) shows totals of 448,700 fires, 3,765 civilian deaths, 20,520 civilian injuries and $4,475.3 million in direct property damage. Many of these fires and much of this loss of life could have been prevented by AFCIs. But for AFCIs to be effective, it is necessary to provide arc fault detection and protection to as many dwelling-unit supply-circuits as possible.

The state of Vermont has recognized the value of AFCIs. THE VERMONT ELECTRICAL SAFETY RULES - 1999 (Effective Date: August 1, 1999) include the following;

NFPA 70, National Electrical Code, (1999 edition) To meet the needs of Vermont, NFPA 70 is amended as follows:

-delete and replace as follows - article 210-12(b)

210-12(b) Dwelling Unit living Area and Bedrooms. All branch circuits that supply 125 volts, single phase, 15 and 20 ampere receptacle outlets installed in the dwelling unit living area and bedrooms shall be protected by an arc-fault circuit interrupter(s). (To achieve an orderly transition for compliance this Section shall take effect January 1, 2001).

In view of the positive changes that have occurred since the last cycle, and the continuing heavy toll in human lives, in human injury, and in property losses occasioned by electrical distribution fires, the Code Panel is urged to adopt these proposals. The objective is to optimize protection for dwelling unit bedrooms, for dwelling unit living area circuits, for the comparable guest rooms of hotels and motels, and for the bedrooms of limited care facilities.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel statement on Proposal 2-103.

The limited care facility issue is outside the Scope of Code-Making Panel 2 and the panel recommends that the Technical Correlating Committee forward this item to Code-Making Panel 17 for action.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:

NISSEN: See my Comment on Affirmative on Proposal 2-103.

(Log #4143)

2- 115 - (210-12(b) and (c)): Accept in Part

SUBMITTER: Philip M. Piqueira, General Electric Co.

RECOMMENDATION: Modify 210-12(b); Add 210-12(c); Add FPN:

(b) Dwelling Unit Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere ~~receptacle~~ outlets installed in dwelling unit bedrooms shall be protected by an arc-fault circuit interrupter(s). This requirement shall become effective January 1, 2002.

(c) Dwelling Unit Living Areas. All branch circuits that supply 125-volt, single phase, 15- and 20-ampere outlets installed in dwelling unit living areas shall be protected by an arc-fault interrupter(s).

FPN: A dwelling unit living area is any space, that can be normally occupied, other than bedrooms, bathrooms, toilet compartments, kitchens, closets, halls storage, garage or utility spaces.

SUBSTANTIATION: This proposal is intended to enhance the protection provided by arc-fault circuit interrupters as mandated by Section 210-12 of the 1999 National Electrical Code.

210-12(b). The present restriction of this article to bedroom receptacle outlets, while partially satisfying the intention of protecting circuits supplying bedrooms from low voltage arcing, creates a significant void in the protection of the entire bedroom. The deletion of receptacle from the present article would then enable all of the circuits, including those supplying lighting outlets to be protected.

210-12(c). The addition of dwelling unit living areas to this section of the National Electrical Code is a logical extension of the work which was begun during the 1999 code cycle. It is certainly naive to assume that only bedrooms are susceptible to the dangers of low voltage arcing and, consequently, this proposal would provide AFCI protection to all of the circuits supplying outlets in dwelling unit rooms.

During the 1999 code cycle, code panel #2, in responding to one of the AFCI proposals, stated that "The panel has limited the requirements to dwelling unit bedrooms to permit these new devices to be introduced into the public domain on a gradual basis...an effective date of January 1, 2002 was established to allow industry to accommodate the new requirement and to allow a transition period". It is important to note that his statement does question the need for arc-fault circuit interrupters but, instead, deals with limiting the use of these devices and extending the timing of implementation in order to allow industry to accommodate the introduction of this new technology more effectively.

However, since the introduction of this technology into the 1999 NEC, manufacturers have gained experience with hundreds of millions of hours of operating time with AFCIs. As a result of this experience, consumers have not only benefited from enhanced protection from arc faults, but have also not experienced nuisance tripping, a concern of some of the code panel members.

Further, the CPSC (Consumer Product Safety Commission) has stated the following on its web page, Preventing Home Fires: Arc Fault Circuit Interrupters (http://cpsc.gov/cpscpub/pubs/afci.html): "...Several years ago, a CPSC study identified arc fault detection as a promising new technology. Since then, CPSC electrical engineers have tested the new AFCIs on the market and found these products to be effective."

The most recent report by the CPSC on residential fire losses has estimated that there were 41,600 fires ($682 million in property damage) and 370 civilian deaths in 1996. Many of these fires and fatalities could have been prevented if arc fault circuit interrupters had protected those residences. Code Panel #2 can certainly play a valuable role in protecting the public if they act responsibly and adopt this proposal to expand AFCI protection.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Part.

The panel accepts the deletion of the word "receptacle" in (b) of the proposal, and rejects the remainder of the proposal.

PANEL STATEMENT: See panel statement on Proposal 2-103.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

BROWN: See my Explanation of Negative Vote on Proposal 2-102.

COMMENT ON AFFIRMATIVE:

NISSEN: See my Comment on Affirmative on Proposal 2-103.

(Log #4150)

2- 116 - (210-12(b)): Accept in Part

SUBMITTER: William Keezer, Bose Corp./Rep. Nat'l Systems Contractors Assn. (NSCA)

RECOMMENDATION: Revise paragraph 210-12(b) as follows:

(b) Dwelling Unit Living Areas and Bedrooms. All branch circuits that supply 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed in the dwelling unit living areas and bedrooms shall be protected by an arc-fault circuit interrupter(s). ~~This requirement shall become effective January 1, 2002.~~

SUBSTANTIATION: Problems:

1. The 1999 NEC Handbook states that: "Restricting the requirement to bedroom circuits reflects the desire to gain field experience in a limited application before mandating installation of devices in other unit circuits. Bedrooms contain readily ignitable cloth and cotton materials, and occupants may be sleeping when ignition occurs and not likely able to take protective action rapidly." There are three issues to be addressed here:

1.1 The submitter respectfully disagrees with the contention that bedroom occupants are uniquely vulnerable to the consequences of fire initiation. The NFPA Journal frequently cites fires originating in other occupancy areas where the occupant was asleep when the fire started. These occupancy areas are usually a family room, den, TV room, or other room where the occupant falls asleep in a comfortable chair or sofa while reading, drinking, smoking, or watching TV.

1.2 Sleep is not a necessary prerequisite for failure to notice the start of a fire, nor is observing the start of a fire a guarantee of survival. It is far better if the fire never starts due to appropriate branch circuit protection.

1.3 Fire deaths and injuries happen in rooms other than the place of fire origin more than 50 percent of the time. A bedroom occupant is not protected from the initiation of a fire by an arc fault permitted to occur in a nonbedroom location within the house.

2. The sentence: "This requirement shall become effective January 1, 2002." should be deleted since that is the nominally effective date for the 2002 NEC anyway. There is no technical or product supply reason for extending the effectivity date due to adoption of this proposal.

Substantiation:

1. The State of Vermont has independently considered the issues of application inadequacy, product availability, product reliability and the improved life safety consequences of a revision such as the one proposed. The Vermont Electrical Safety Rules text replacement for 210-12(b) is fundamentally identical to this proposal and was adopted August 1999. The text of this document reads: "210-12(b) Dwelling Unit Living Area and Bedrooms. All branch circuits that supply 125 volts, single phase, 15 and 20 ampere receptacle outlets installed in the dwelling unit living area and bedrooms shall be protected by an arc-fault circuit interrupter(s). (To achieve an orderly transition for compliance this Section shall take effect January 1, 2001)." Note that the effective date for compliance with this more comprehensive requirement is one year earlier than that required in the 1999 NEC.

2. The substantiation for Proposal 2-128 (210-11-(New)) found on page #111 of the 1998 NEC Committee Report on Proposals (Annual Meeting - Cincinnati Ohio) contends that a significant percentage of electrical fires occur in permanently installed wiring or wiring devices. Such a fire could originate in a bedroom wall, but might have been caused by a circuit passing through that wall to service a kitchen, bathroom, garage, or other space within the occupancy. The circuit could even be servicing an outdoor outlet on a bedroom's exterior wall. The concept that protecting a bedroom branch circuit protects the bedroom occupant is a fallacy under such conditions.

3. In May of 1999, the NFPA published a report titled: The U.S. Fire Problem Overview Report - Leading Causes and Other Patterns and Trends (Marty Ahrens, Fire Analysis and Research Division, NFPA). Page 50 of that report supports the submitter's concern about restricting sufficient protection to bedrooms. The report states that "Half of all fire victims were fatally injured when outside the room of origin" (Actually, 57.6 percent).

4. In the same NFPA report, it is stated on page 55 that electrical distribution equipment fires ranked: fifth in number of home structure fires; fourth in home fire deaths, seventh in home fire injuries; and second in direct property damage. Electrical distribution equipment includes (but is not limited to) fixed wiring, transformers or associated overcurrent or disconnect equipment, overcurrent protection devices, switches, receptacles or outlets, cords and plugs. A U.S. Consumer Product Safety Commission study done in the mid-80's determined that improper initial installations was a factor in about 20 percent of all electrical equipment residential fires. This data supports the concern addressed in 2. above. The CPSC found that electrical distribution equipment faults were not unique to any one location of a dwelling.

Clarification:

The submitter would have preferred to state: "All branch circuits" without qualification. Limiting the circuits to receptacle outlets does address protection from arc faults in appliances and extension cords, even if not all branch circuit wiring is protected. With this proposal, what is NOT protected is the following: 1) branch circuits for lighting, 2) permanently installed appliances such as dishwashers and garbage disposals, and 3) branch circuits for 240 volt circuits such as air conditioners, heat and hot water. It is felt that this proposal is not an unreasonable increase in the protection provided by the original 210-12(b), but is not as comprehensive as it ultimately should be. It is proposed as a possible interim step toward total adoption of AFCIs for residential branch circuits in a future Code cycle.

PANEL ACTION: Accept in Part.

The panel accepts the deletion of the last sentence of the proposal, and rejects the remainder of the proposal.

PANEL STATEMENT: See panel statement on Proposal 2-103.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:

NISSEN: See my Comment on Affirmative on Proposal 2-103.

(Log #1194)

2- 117 - (210-12(b) Exception No. 1 (New)): Reject

SUBMITTER: Charles G. Hendry, Hempstead, NY

RECOMMENDATION: Add new (b) Exception No. 1:

Exception No. 1: In addition to the required receptacle outlets, receptacles supplied by a dedicated circuit, (A/C units, electric heaters etc.) shall be exempt from AFCI protection.

SUBSTANTIATION: 1) This exception will take additional big loads off the bedroom AFCI breakers.

2) In our fire district area 2 1/2 square miles (120,000 people) we had 26 bedroom fires in the last 3 years, 3 electrical (2 extension cords, 1 receptacle), "none" in direct wired units in residential use.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no substantiation to indicate that AFCIs should not protect all 15- and 20-amp, 125 volt bedroom outlet circuits.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1193)

2- 118 - (210-12(b)(1) (New)): Reject

SUBMITTER: Charles G. Hendry, Hempstead, NY

RECOMMENDATION: Add new (b) (1) to read as follows:

(1) 15 AMP Branch Circuits shall be limited to 12 receptacle outlets and

20 AMP Branch Circuits limited to 14 receptacle outlets.

SUBSTANTIATION: 1) This will still allow up to three (3) bedrooms (average 4 receptacles a room) on the circuit but would limit all bedrooms and loads being installed on one (1) AFCI.
2) At a current cost of electricians price of $75-90 per AFCI all bedrooms will end up on one (1) AFCI (some electricians are cheap).
PANEL ACTION: Reject.
PANEL STATEMENT: The number of outlets connected to an AFCI does not affect its ability to provide protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2453)

2- 119 - (210-12(c) (New)): Reject
SUBMITTER: William H. King, Jr., U.S. Consumer Product Safety Comm.
RECOMMENDATION: Add new paragraph to Section 210-12 as follows:
(c) Lighting and Appliance Branch Circuits. Each existing 125-volt, single-phase, 15- and 20-ampere lighting and appliance branch circuit shall be individually protected by an arc-fault circuit interrupter when the service equipment is replaced.
FPN: See Section 230-XX (Editorial note: Section 230-XX is a proposed new section, submitted separately to the CMP for Article 230, to compliment this proposed new paragraph (c) to Section 210-12. For information purposes, the proposed new Section 230-XX reads as follows: 230-XX. Replacement of Service Equipment in Dwelling Units. When service equipment in dwelling units is replaced, each existing 125-volt, single-phase, 15- and 20-ampere lighting and appliance branch circuit shall be individually protected by an arc-fault circuit interrupter.)
SUBSTANTIATION: According to a study conducted by the U.S. Consumer Product Safety Commission (CPSC), "Residential Electrical Distribution System Fires", Smith & McCoskrie, 1987, fires originating in branch circuit wiring predominately occurred in dwellings over 20 years old, with the highest rates of fires occurring in dwellings over 40 years old. Older dwellings are frequently upgraded with replacement service equipment to accommodate an increase in the service rating to supply additional appliance and equipment loads. However, often times, the existing lighting and appliance branch circuits in dwelling units are not replaced when the service is upgraded, due to the increased cost, and/or the inability to evaluate the remaining life expectancy of the branch circuit conductors. The branch circuit conductors are frequently located in concealed spaces surrounded with thermal insulation, and could be in a deteriorated condition at the time the service is upgraded. This proposal is intended to remedy this situation with the addition of arc-fault circuit interruption (AFCI) protection against fire hazard conditions for the existing branch circuit conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal calls for a significant expansion of this device beyond the bedroom circuits. The panel does not intend to expand the code to require AFCIs in existing dwellings at this time.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
NISSEN: See my Comment on Affirmative on Proposal 2-103.

(Log #2849)

2- 120 - (210-12(c) (New)): Reject
SUBMITTER: Donald M. King, Wilmington, DE
RECOMMENDATION: Add a new paragraph (c) to 210-12 to read as follows:
(c) Guest Rooms. All branch circuits supplying 125V single-phase 15- and 20- ampere receptacle outlets in guest rooms of hotels, motels, and similar occupancies shall be protected by an arc-fault circuit interrupter(s).
SUBSTANTIATION: Receptacle outlets and flexible cords that are installed behind furniture in guest rooms of hotels and motels are subject to the same risk of physical damage as those that are installed behind furniture in bedrooms of single family dwellings. Section 210-12(b) requires arc fault protection for branch circuits supplying receptacle outlets in bedrooms of single family dwellings. This added text would extend the same level of protection offered by this new technology to persons and property of similar occupancies.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-103.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
NISSEN: See my Comment on Affirmative on Proposal 2-103.

(Log #1050)

2- 121 - (210-19): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 210-9 as follows:
210-19(c), Exception No. 2 - change "No. 10" to "10 AWG".
210-19(d) - change "No. 14" to "14 AWG".
210-19(d), Exception No. 2 - change "No. 14" to "14 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #392)

2- 122 - (210-19(a)): Reject
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
RECOMMENDATION: Add the following to the last sentence of the paragraph:
"and where adjustment or correction factors are applied, the ampacity of the conductor shall not be less than 100 percent of the noncontinuous load plus 100 percent of the continuous load."
SUBSTANTIATION: The existing text seems to imply that is a "stand alone" statement and other NEC sections, such as the first paragraph of 240-3 and 240-3(d), do not apply if the ampacity of the conductor was greater than or equal to 125 percent of the continuous load plus 100 percent of the noncontinuous load before applying any adjustment or correction factors. There is no text to indicate the minimum conductor ampacity required after any adjustment or correction factors are applied. It is possible for the calculated conductor ampacity to be less than 100 percent of the continuous and noncontinuous loads after adjustment and correction factors are applied.
PANEL ACTION: Reject.
PANEL STATEMENT: The last sentence of 210-19(a) establishes a minimum conductor size for the branch circuit that supplies any continuous loads. The first sentence of 210-19(a) provides the text that establishes the minimum conductor ampacity by stating that it shall not be less than the load to be served. Ampacities of conductors are determined from 310-15 and 210-19(a) FPN No.1 guides the user to that section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #680)

2- 123 - (210-19(a)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) General. Branch-circuit conductors shall have an ampacity not less than the maximum computed load to be served. Where a branch circuit supplies continuous load(s) or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size, before the application of any adjustment or correction factors, shall have an allowable ampacity ~~equal to or greater~~ not less than the noncontinuous load(s), plus 125 percent of the continuous load(s) or the ampacity specified for motor circuit conductors in Sections 430-22; 430-24; 430-25; and 440-34, whichever is greater.
Exception No. 1: The correction factors for temperatures below 26°C (78°F) shall be permitted in determining the initial conductor ampacity.

Exception No. 2: Where the assembly, including any integral ~~the~~ overcurrent device(s) is listed for operation at 100 percent of its rating, the ampacity of the branch-circuit conductors shall be ~~permitted to be~~ not less than the sum of the continuous load(s) ~~plus~~ and the noncontinuous load(s), plus the ampacity specified for motor circuit conductors in Sections 430-22, 430-24, 430-25, and 440-34.

FPN No. 1: No change.

~~FPN No. 2: See Part B of Article 430 for minimum rating of motor branch circuit conductors.~~

FPN No. 3: No change.

FPN No. 4: No change.

SUBSTANTIATION: The word "computed" clarifies that total connected load is not necessarily intended. Some loads such as general-use receptacles may be only computed load. "Not less than" is editorial and consistent with that phrase in the first sentence.

The proposal allows the 125 percent increase in ampacity for (phantom) continuous load to be applied to motor conductor ampacity or the 25 percent increase for motor conductor ampacity to apply to continuous load conductor ampacity; the largest value is to be used. The 25 percent ampacity increase for motor circuit conductors is not for a phamtom load but for temporary motor overload and the general maximum rating for motor overload devices. Article 430 does not generally permit a 100 percent ampacity for motor circuit conductors whether or not operating for less than three hours. Section 430-24 does not reference a 125 percent ampacity for continuous load, but merely ampere rating of other loads.

Application of this section and those referenced in Articles 430 and 440 in the proposal for the same loads consisting of continuous and noncontinuous loads, including motors, can result in disparity between resulting minimum conductor sizes. Which articles have precedence?

Admittedly such disparities are not as likely for branch circuits as feeders due to consideration of overcurrent protection requirements, but they can occur, especially with combination-load equipment with supplementary overcurrent protection for various components and served by a branch circuit. The examples I have provided indicate such disparity.

Proposed Exception No. 1 is to allow for increased ampacity rating to be initially applied. While perhaps relatively minor and infrequently used it could be a critical allowance for some "borderline" ampacity ratings.

Exception No. 2 is revised to clarify that some assemblies such as unfused safety switches, transfer switches, and clock-operated switches are listed for continuous operation at 100 percent of rating. Present wording suggests the assemblies always contain overcurrent devices. Consideration for conductors which also supply a motor is added. If this proposal is accepted FPN No. 2 becomes superfluous.

The panel statement for Comment 1-174 in the 1998 ROC indicated motor loads continuing for three hours or more are not excluded from the definition of continuous load. Under that concept, conductors would have to have an ampacity of 125 percent of each motor rather than just the largest one, and if the motor operates for less than three hours no multiplier is required. Continuous load and continues duty are not the same in the context of the code.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Part.

The panel accepts the portion of the recommendation changing "equal to or greater" to "not less", and rejects the remainder of the recommendation.

PANEL STATEMENT: The rejected portions of the proposal are rejected based on the following:

1) The first sentence is accurate as written in the present code. Computed load would imply that conductors serving loads could have some additional computed factor applied. Article 220 provides the necessary information for determining the load in question.

2) The changes relative to motor circuit conductors are unnecessary. Section 210-2 clearly indicates that motor branch circuit conductors are sized in Article 430.

3) The proposed Exception No. 1 is unnecessary, since 310-15 already allows this to be applied to determine conductor ampacity.

4) The wording for "integral" overcurrent devices is unnecessary. The present requirement is for "listed assemblies" which covers the various arrangements of overcurrent devices.

5) FPN No. 2 is retained to provide correlation with 210-2.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2569)

2- 124 - (210-19(a)): Reject

SUBMITTER: Travis Lindsey, Bldg Dept., Clark County, NV

RECOMMENDATION: Revise as follows:

(a) Branch-circuit conductors shall have an ampacity not less than the load to be served and shall not be smaller than No. 12.

SUBSTANTIATION: In our jurisdiction we have rules limiting branch circuits to No. 12. We did this because there were problems with heating of conductors, overloaded circuits and tripping related to these conditions. Since enacting these regulations the number of problems have been reduced significantly.

Many times conductors have been applied incorrectly. Ambient temperature correction factors are not always considered. Most attics are hot enough for prolonged periods during the summer months that application of the correction factors would reduce the current carrying capacity of the No. 14 wire to a very small number. Increased heating occurs when these circuits are heavily loaded.

In cases such as single outlet appliance circuits serving refrigerators and similar loads, the circuits have been known to fatigue and deteriorate (oxidize and burn) at connection points, overcurrent devices and receptacles due to the high starting loads and the small wire size.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has presented insufficient technical substantiation that No. 14AWG conductors are creating safety concerns. Many of the situations described in the submitter's substantiation, such as high temperature in attics, have been dealt with through various changes elsewhere in the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:

BROWN: The actions by an Authority Having Jurisdiction arbitrarily deciding to change the requirements of the NEC without the benefit of specific fire loss data should not be the basis for a change in the NEC. The concerns of the submitter would be alleviated with proper installation inspection by a certified electrical inspector, and education of the installers through courses taught in their locality.

(Log #3156)

2- 125 - (210-19(a)): Reject

SUBMITTER: John Wyrick, Byron, MI

RECOMMENDATION: The second sentence of the exception should be deleted.

SUBSTANTIATION: The second sentence and the exception are inconsistent with each other. The tables in Article 310 give the safe allowable ampacity of conductors continuously. If their numbers are not correct, then change the tables. The second sentence is also very confusing when it comes to conductor derating.

PANEL ACTION: Reject.

PANEL STATEMENT: The text in Section 210-19(a) second sentence ensures proper conductor selection based upon the conductor sizes that are used for evaluating the devices where the conductor is connected. The same text was developed in Section 210-20(a) and works in conjunction with 210-19(a) to prevent overheating of the insulation at the termination point on the overcurrent protection device. The combination of proper sizing for both the conductor and the overcurrent protective device ensures that the overcurrent protection device operates as it was originally evaluated and listed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4110)

2- 126 - (210-19(a)): Accept in Part

SUBMITTER: Truman C. Surbrook, Michigan State University

RECOMMENDATION: Revise the second sentence of the section as follows with the deletions and additions as indicated:

"Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the ~~minimum~~ branch-circuit conductor ~~size, before the application of any adjustment or correction factors,~~ shall have an allowable ampacity

~~equal to or greater~~ not less than the noncontinuous load plus 125 percent of the continuous load."
SUBSTANTIATION: The phrase "before the application of any adjustment or correction factors" is particularly confusing to electricians making conductor ampacity selection when adjustment factors are being used. Some apply the adjustment factors to the allowable ampacity found in the appropriate table and then compare it with 100 percent of both continuous load and noncontinuous load, others compare the adjusted allowable ampacity to the sum of 100 percent of the noncontinuous load and 125 percent of the continuous load. By removing the confusing statement, it makes the section clear that the adjusted allowable ampacity of the conductor is not permitted to be less than the sum of 100 percent of the noncontinuous load plus 125 percent of the continuous load.
PANEL ACTION: Accept in Part.
The panel accepts the change of "equal to or greater" to "not less". The remainder of the proposal is rejected.
PANEL STATEMENT: See panel action on Proposal 2-123. The text recommended for deletion is necessary for proper application of the section. The second sentence of 210-19(a) establishes the minimum conductor size permitted for a circuit supplying any continuous loads. Actual conductor allowable ampacity (relative to the load current) is determined by applying 310-15, including the adjustment factors. This allows the allowable ampacity calculation to take advantage of higher temperature ratings on conductor insulation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4131)

2- 127 - (210-19(a)): Reject
SUBMITTER: David T. Brender, Cooper Development Assn. Inc.
RECOMMENDATION: Revise text to read as follows:
(a) General. Branch-circuit conductors shall have an ampacity not less than the maximum load to be served and shall not be smaller than 12 AWG.
SUBSTANTIATION: The fine print notes let the user know to check the conductor's ampacity rating, temperature limit, and voltage drop. Ampacity rating and temperature limits are addressed in the NEC but are not generally applied. Voltage drop is only addressed through the fine print note. As homes continue to be built larger and larger, as panelboards are located more often at the end of the house, with an increase in the number of electrical appliances in a typical home, and with appliances having increased power consumption and more stringent power quality demands, the risk of overloaded conductors and occurrence of unacceptable circuit voltage drops have dramatically increased. Just as the minimum conductor size for bathrooms was increased due to the change in the type of appliances used on the bathroom circuit, the minimum conductor size for all branch circuits should be increased to 12 AWG. The increase in minimum size will increase safety by reducing the risk of overloaded circuits and the need to rewire existing circuits to meet the needs of heavily loaded circuits, increased harmonic loads and sensitive electronic equipment. As reported in the Eleventh Edition of "Fire in the United States 1987-1996," published by United States Fire Administration National Fire Data Center, the leading causes of 1996 nonresidential structure fires in stores, offices, and basic industry are attributed to electrical distribution. This same publication also states that electrical distribution is the 4th most common cause of fire. The areas where fires most often occur are in the sleeping rooms, lounge areas (living rooms) and kitchens. The overcurrent device ampacity is not intended to be changed by this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that ampacity rating and temperature limits addressed in the NEC are not generally applied. Also, see panel statements on Proposals 2-98 and 2-124.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4351)

2- 128 - (210-19(a), FPN No. 4): Reject
SUBMITTER: R. Gerald Irvine, Suffern, NY
RECOMMENDATION: Change FPN No. 4 to a requirement by inserting "shall be" before "sized" and deleting all after "5 percent" in the first sentence.
SUBSTANTIATION: Voltage drop limitations are necessary for proper equipment operation and for conservation of energy by reducing excessive line losses. ASHRAE (IESNA 90.1R Energy Conservation in New Buildings) also contains voltage drop limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that the Fine Print Note should be made mandatory code language. The concern for a specific percentage voltage drop is a design consideration as are the energy conservation requirements. Voltage drop depends on conductor size, loading, and other factors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1020)

2- 129 - (210-19(a), FPN No. 5 (New)): Reject
SUBMITTER: Charles W. Algood, A&A Electric Services Inc./Rep. L.U. 915 I.B.E.W.
RECOMMENDATION: Add FPN No. 5 to read as follows:
FPN No. 5: See Section 110-14(c) for temperature limitations of conductors.
SUBSTANTIATION: This UL Greenbook requirement is an essential factor in the selection of appropriate branch circuit conductors, especially at points of terminating the conductors, and the use of higher temperature rated conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees that 110-14(c) is an important section, but its application in conductor selection is a much broader application than just 210-19. Adding another Fine Print Note in this section would not improve the usability since 110-14 is a general requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4111)

2- 130 - (210-19(a), Exception): Accept in Principle
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: Revise the Exception as follows:
"Where the assembly, including the overcurrent devices protecting the branch circuit(s), is listed for operation at 100 percent of its rating, the allowable ampacity of the branch circuit conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load, and not less than the rating of the overcurrent."
SUBSTANTIATION: The addition of the word "allowable" ampacity should make it clear that it is the ampacity under the prevailing conditions including the application of adjustment factors if they apply.
The rule for sizing conductors when the overcurrent device is listed for 100 percent operation and one that is not such listed can lead to widely different conductor sized for the same identical load. At least in the case where the overcurrent device is listed for 100 percent operation, the minimum allowable ampacity of the conductor should not be permitted to be less than the rating of the overcurrent device. The following example illustrates the point.
Example: If a branch circuit supplied a continuous load of 130 amperes and the overcurrent device and enclosure are listed for operation at 100 percent of its rating then the overcurrent device is permitted to be rated at 150 amperes. In this case the conductor is permitted to be sized based upon an allowable ampacity not less than 100 percent of the continuous load. If copper conductors are used with 75°C insulation and terminations, the maximum conductor size required would be AWG #1 which is listed in Table 310-16 as 130 amperes. If the overcurrent device had not been listed for 100 percent operation, the minimum overcurrent device rating for this load would have been 175 amperes and the minimum conductor size would have been AWG #2/0. This seems to be a wide difference in minimum conductor size for the same identical load

simply because one overcurrent device is rated for 100 percent operation and the other is not.
PANEL ACTION: Accept in Principle.
Revise the exception in the existing Code to read as follows:
"Exception: Where the assembly, including the overcurrent devices protecting the branch circuit(s), is listed for operation at 100 percent of its rating, the allowable ampacity of the branch circuit conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load. In no case shall the ampacity be less than the rating of the overcurrent device."
PANEL STATEMENT: The panel has accepted the submitter's recommendation relative to the use of "allowable" in the exception. The submitter's wording can be interpreted to be permissive relative to the minimum sizing compared to the overcurrent device. As such, the panel has revised the exception to accomplish the objective using clearer language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3851)

2- 131 - (210-19(b) Exception No. 1): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise as follows:
Exception No. 1: Tap conductors supplying electric ranges, wall-mounted electric ovens, and counter-mounted electric cooking units from a 50-ampere branch circuit shall have an ampacity of not less than 20 and shall be sufficient for the load to be serviced. The taps shall be longer than necessary for supplying power to the outlet for ~~servicing~~ the appliance within the same kitchen.
SUBSTANTIATION: Editorial. The term "servicing" has been fairly widely interpreted to include the supply whip that is provided by the appliance manufacturer. This change will make it clear that the tap is a branch circuit tap that terminates at the outlet for the appliance.
This revision brings the exception into compliance with the definition of "branch circuit" in Article. The branch circuit ends at the outlet and does not include the appliance whip. The appliance whip is supplied by the manufacturer of the listed appliance in accordance with the product safety standard. The added text "within the same kitchen" will prevent the tap from being made in one room and the appliances being in another. This will keep the taps to be not longer than necessary.
Finally, the conductors are protected from overload by being suitable for the load and from short-circuit by the overcurrent device on the line side.
PANEL ACTION: Reject.
PANEL STATEMENT: The text from Exception No. 1 entered the Code in the 1962 edition. At that time, the definition of branch circuit included all conductors up to the load. The objective of the exception was to allow a tap (including a factory supplied whip) from the cooking unit to the larger branch circuit. In 1971, the definition of branch circuit changed to be substantially what we have today. Although the branch circuit ends at the outlet, the language does provide guidance that the conductors extending to the cooking unit are not to be longer than necessary for servicing. If the whip is supplied with the appliance, it should be connected directly to the branch circuit junction box without another tap being
installed. For appliances that are supplied with a factory installed terminal box, the exception allows a set of tap conductors to be field installed between the junction box for the branch circuit and the terminals of the appliance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #681)

2- 132 - (210-19(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Household Ranges and Cooking Appliances.
(1) Branch-circuit conductors supplying a household range~~s~~, a wall-mounted oven~~s~~, a counter-mounted cooking unit~~s~~, ~~and~~ or other similar household cooking appliances, or more than one such appliance shall have an ampacity not less than the rating of the branch circuit and not less than the ~~maximum~~ demand load to be served. ~~For ranges of~~ Where the branch circuit supplies only a single appliance with a nameplate rating over 8-3/4 kW, ~~or more,~~ the minimum branch circuit rating shall be 40-amperes.
Exception No. 1: ~~Tap conductors supplying electric ranges, wall-mounted ovens, and counter-mounted cooking units from a 50-ampere branch circuit shall have an ampacity of not less than 20 and shall be sufficient for the loads served. The taps shall not be longer than necessary for serving the appliance.~~ The neutral conductor of a 3-wire, 120/240 volt branch circuit that supplies only a single appliance with a nameplate rating over 8-3/4 kW shall be permitted to have an ampacity less than the ungrounded conductors but not less than 70 percent of the branch-circuit rating, and shall not be smaller than No. 10.
Exception No. 2: ~~The neutral conductor of a 3-wire branch circuit supplyuing a household electric range, a wall-mounted oven, or a counter-mounted cooking unit shall be permitted to be smaller than the ungrounded conductors where the maximum demand of a range of 8-3/4 kW or more rating has been computed according to Column A of Table 220-19, but shall have an ampacity of not less than 70 percent of the branch-circuit rating and shall not be smaller than No. 10.~~
(2) Where one or more electric cooking appliances is supplied by a single branch circuit, tap conductors shall have an ampacity not less than the load to be served, but shall not be required to have an ampacity higher than the branch-circuit conductors, and shall not be smaller thant he sizes specified in Table 210-24.
SUBSTANTIATION: Present wording is not clear whether it covers a branch circuit supplying a single appliance or more than one. "Similar" is proposed to differentiate other cooking appliances such as fry pans, cooking pots, small ovens, etc. "Maximum" load is not clear whether intended to be nameplate ratings or demand load of Table 220-19.
Present Exception No. 1 is not a true exception since this section relates to branch circuit conductors and the exception does not. The proposal incorporates it into the rule and clearly indicates it appplies to one or more appliances. The proposed (2) covers tap conductors by reference to Table 210-24, which covers other than 50-ampere circuits. It also allows for the condition where "sufficient for the load" could result in tap conductors with higher ampacity than the branch-circuit conductors. For example, tap conductors for a 12kW range require a higher ampacity than the branch-circuit conductors which may be based on 8kW demand. This situation can also occur where more than one appliance is supplied by a single branch circuit permitted to have a demand factor but the tap conductors may not. Since O.C.P. is specficially indicated to exceed 15-amperes, No. 14 tap conductors would comply with "ampacity of not less than 20" as Table 310-16 indicates an ampacity of 20 or 25. Is that the intent?
The proposal limits the neutral size reduction to 120/240 volt systems since the neutral of a 3-wire 208y/120 volt system carries approximately the same current as the ungrounded conductors.
Column C of Table 220-19 includes appliances up to 8-3/4 kW rating; the text of (c) and Exception No. 2 also include ranges of 8-3/4 kW which allows column A or C to be used. Subsection (c) requires a minimum branch-circuit rating of 40-amperes for 8-3/4 kW but column C allows a demand of 80 percent, or a 29-ampere ampacity at 240 volts. Ranges of 8-3/4 kW, singly, or with other appliances, results in a lower demand with use of column C rather than A. The proposal specifies over 8-3/4 kW. Note 2 for Table 220-19 states over 8-3/4 kW.
PANEL ACTION: Reject.
PANEL STATEMENT: The rejection of the proposal is based on the following:
1) The first sentence is clear that it applies to single or multiple cooking appliances by using language to indicate multiple units. The submitter speculates that there is confusion about what types of cooking equipment this is applicable to, but has presented no substantiation that the present text is a problem.
2) The reference to "demand" load is not needed since Article 220 determines how the "load" is determined. Article 220 is clear relative to cooking equipment load calculations.
3) The present reference to 8-3/4kW for a 40A circuit is the correct reference for a minimum circuit.
4) Exception No. 1 is necessary for this section. See panel statement on Proposal 2-131.
5) The revision to Exception No. 2 (proposed as Exception No. 1) is insufficiently substantiated. Although in a typically loaded 208Y/120V three wire circuit, the neutral carries approximately the same current when assuming single phase loads connected between phase and neutral, the loading for the cooking equipment is mostly across the phase conductors and the 70% permission has not been shown to be inadequate.
6) The new recommendation (2) is unnecessary since Article 220 appropriately describes how to determine the load associated with the cooking circuits.
Engineering data from a technical survey should be provided to substantiate the need for changes in load calculations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3852)

2- 133 - (210-19(c) Exception No. 1): Accept in Principle
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise text to read as follows:

(c) Other Loads. Branch-circuit conductors supplying loads other than cooking appliances as covered in (b) above and as listed in Section 210-2 shall have an ampacity sufficient for the loads served and shall not be smaller than No. 14.

Exception No. 1: Tap conductors for such loads shall have an ampacity not less than 15 for circuits rated less than 40 amperes and not less than 20 for circuits rated at 40 or 50 amperes and only where these tap conductors supply any of the following loads:

a. Individual lampholders or fixtures with taps extending not longer than 18 in. (457 mm) beyond any portion of the lampholder or fixture.

b. A fixture having tap conductors as provided in Section 410-67 shall be not smaller than the load served.

SUBSTANTIATION: No guidance is given in Section 410-67 for the minimum size of conductor required for the lighting fixture tap and should be specified here. The "tap" conductors in Section 410-67 are usually of the same size as the branch circuit conductors (not a smaller size as contemplated in Section 240-3) but have an insulation temperature rating higher than the insulation of the branch circuit conductors.
PANEL ACTION: Accept in Principle.
In the main paragraph of 210-19(d) Exception No. 1, revise the text to read:

"Tap conductors shall have an ampacity sufficient for the load served. In addition, they shall have an ampacity of not less than 15 for circuits rated less than 40 amperes and not less than 20 for circuits rated at 40 or 50 amperes and only where these tap conductors supply any of the following loads:".

PANEL STATEMENT: The panel notes that the revision is to Section 210-19(d) rather than 210-19(c). The revision to the main paragraph of Exception No. 1 will make it clear that the tap conductors must always have an ampacity sufficient for the load served. This meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #682)

2- 134 - (210-19(d) Exception No. 1): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Exception No. 1: Tap conductors for such loads shall ~~have an ampacity not less than 15 for circuits rated less than 40 amperes and not less than 20~~ not be smaller than No. 12 for circuits rated at 40 or 50-amperes ~~and only~~ where these tap conductors are the nonheating leads of utilization equipment covered in Articles 424, 426, 427, or supply any of the following loads:

a. No change
b. No change
c. No change
d. No change
~~e. Nonheating leads of deicing and snow-melting cables and mats.~~

SUBSTANTIATION: Editorial. The 15 ampere requirement is basically redundant since the No. 14 specified in the text will generally have an ampacity of 15 or higher. Since the exception relates to tap conductor ampacity it can be construed as modifying "ampacity sufficient for the load". Since the exception infers permitted overcurrent protection greater than 15 amperes, No. 14 ocnductors have an ampacity of 20 or 25 amperes per Table 310-16 and renders the ampacity requirements irrelevant. Fixture wires which may be used would be covered by the size requirements since Section 240-4 permits No. 14 for 30-amepre and under circuits and No. 12 for 40 and 50 ampere circuits.

Nonheating leads may be considered as tap conductors and if so this exception covers tap conductors supplying other tap conductors.

It appears reasonable to apply this exception to equipment covered in the articles noted; many of which utilized nonheaitng leads.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's recommendation does not improve clarity or usability. The present reference to the tap conductor ampacity is accurate. In addition, the submitter has provided no substantiation to extend the allowance to other than de-icing and snow melting cables or mats.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4132)

2- 135 - (210-19(e) (New)): Reject
SUBMITTER: David T. Brender, Cooper Development Assn. Inc.
RECOMMENDATION: Add new text to read as follows:

(e) Habitable Room Branch Circuits. Branch-circuit conductors serving habitable room receptacle outlet(s) shall not be smaller than 12 AWG.

SUBSTANTIATION: As reported in the Eleventh Edition of "Fire in the United States 1987-1996," published by United States Fire Administration National Fire Data Center, fires caused by electrical distribution are the 4th most common cause of fire. The areas where fires most often occur are in the sleeping rooms, lounge areas (living rooms) and kitchens. 20 amp circuits are required in the kitchen, bathroom and laundry room to address the risk of fire. As homes continue to be built larger and larger, as panelboards are located more often at the end of the house, with an increase in the number of electrical appliances in a typical home, and with appliances having increased power consumption and more stringent power quality demands, the risk of overloaded conductors and occurrence of unacceptable circuit voltage drops have dramatically increased. Recent research (International Telework Association and Council-report release October 27, 1999) indicates that 19.2 million people, or 10 percent of the U.S. workforce, now telecommute, supporting the growing residential use of computers, printers, fax machines, copiers, etc. In fact, 55 percent of all U.S. households now have one or more computers (Parks Associates, Forum99, October 1999), and this is expected to grow further to 75-80 percent within the next years. Just as the minimum conductor size for bathrooms was increased due to the change in the type of appliances used on the bathroom circuit, the minimum conductor size for branch circuits should be increased to 12 AWG. The increase in minimum size will increase safety by reducing the risk of overloaded circuits and the need to rewire existing circuits to meet the needs of heavily loaded circuit and sensitive electronic equipment. The overcurrent device ampacity is not intended to be changed by this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statements on Proposals 2-98, 2-124, and 2-127.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #683)

2- 136 - (210-20(b) Exception No. 1): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete Exception No. 1.
SUBSTANTIATION: Editorial. This is not a true exception to any requirement of Section 240-3 since subsection (e) of that section covers tap conductors of Section 210-19(d).
PANEL ACTION: Accept.
In addition to the submitter's recommendation, revise the main text of existing 210-20(b) to read as follows:

"(b) Conductor Protection. Conductors shall be protected in accordance with Section 240-3. Flexible cords and fixture wires shall be protected in accordance with 240-4."

Delete 210-20(b) Exception No. 1 and Exception No. 2.
PANEL STATEMENT: The panel has revised the main paragraph to provide reference to the applicable sections of Article 240. Since this guidance is now provided in the main paragraph, the exceptions are not necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2051)

2- 137 - (210-21): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Revise section 210-21 to read as follows:
Add the word (continuous) to the section 210-21(b) as shown in the revised wording below:
210-21 Outlet devices. Outlet devices shall have an ampere rating that is not less than the load to be served and shall comply with (a) and (b).
(a) Lampholders. Where connected to a branch circuit having a rating in excess of 20 amperes, lampholders shall be of the heavy-duty type. A heavy-duty lampholder shall have a rating of not less than 660 watts if of the admedium type and not less than 750 watts if of any other type.
(b) Receptacles.
1. A single receptacle installed on an individual branch circuit shall have an ampere rating of not less than that of the branch circuit and comply with Table 210-21(b)(2).
Exception No. 1: Where installed in accordance with Section 430-81(c).
Exception No. 2: A receptacle installed exclusively for the use of a cord- and plug-connected arc welder shall be permitted to have an ampere rating not less than the minimum branch-circuit conductor ampacity determined by Section 630-11(a) for arc welders.
FPN: See definition of Receptacle in Article 100.
2. Where connected to a branch circuit supplying two or more receptacles or outlets, a receptacle shall not supply a total cord- and plug-connected continuous load in excess of the maximum specified in Table 210-21(b)(2).

Table 210-21(b)(2). Maximum Cord- and Plug-Connected Continuous Load to Receptacle

Circuit Rating (Amperes)	Receptacle Rating (Amperes)	Maximum Continuous Load (Amperes)
15 or 20	15	12
20	20	16
30	30	24

rest of section 210-21 to remain as is.....(3).....
SUBSTANTIATION: This change is necessary to provide consistency between this section and section 384-16(d), 210-20, 210-19 and other sections requiring the 80 percent rule. Portable appliances (such as microwave units and hair dryers) and relocatable power taps are UL tested for a maximum of 1800 watts on a 15 ampere branch circuit and operate as a non continuous load on these branch circuits without a problem.
Panel 20 and Panel 2 have established a Study Task Group to bring some suggestions for a resolution of this issue.
UL 498 tests receptacles at 150 percent of their rating so limiting the load on as now required by Table 210-21(b)(2) for noncontinuous load is unnecessary.
See also Proposal 20-52 on page 668 of the 98 ROP.
Statement by panel: Quote" the substantiation does not justify the reduction in rating to 12 amperes and 16 amperes for appliances rated between 12 and 15 amperes and between 16 and 20 amperes respectively."
This Section as revised will make it mandatory for continuous loads only and not for noncontinuous loads.
However, the branch circuit requirements remain the same as do the receptacle sizes.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has addressed the concept that the submitter has proposed in Proposal 2-143. The use of the term "continuous load" would allow the language to be applied to a wider range of appliances than what is presently being done in product listing. The approach taken in Proposal 2-143 addresses the issue, but limits the scope to a narrower range of products.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP208)

2- 137a - (210-21(b)): Accept
SUBMITTER: CMP 2
RECOMMENDATION: Add titles to 210-21(b) as follows:
"(1) Single Receptacle on an Individual Branch Circuit. A single receptacle...
(2) Total Cord- and Plug-Connected Load. Where connected to...
(3) Receptacle Ratings. Where connected to...
(4) Range Receptacle Rating. The ampere rating ...".
SUBSTANTIATION: To comply with the NEC Style Manual titles have been added.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1746)

2- 138 - (210-21(b)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for information.
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise to read as follows:
210-21. Outlet Devices. ....
(3) Where connected to a branch circuit supplying two or more receptacles or outlets, receptacle ratings shall conform to the values listed in Table 210-21(b)(3), or where larger than 50 amperes, the receptacle rating shall not be less than the branch-circuit rating.
Exception No. 1: Receptacles for one or more cord- and plug-connected arc welders shall be permitted to have ampere ratings not less than the minimum branch-circuit conductor ampacity permitted by Section 630-11(a) or (b) as applicable for ac transformer and dc rectifier arc welders, and Section 630-21(a) or (b) as applicable for motor-generator arc welders.
Exception No. 2: The ampere rating of a receptacles installed for electric discharge lighting shall be permitted to be based 410-30 (c)
SUBSTANTIATION: It is not clear when a receptacle is installed pertaining to 410-30 (c) "Receptacles and attachment plugs shall be permitted to be of lower ampere rating than the branch circuit but not less than 125 percent of the fixture full-load current". This conflicts with Table 210-21 (b) (3) the table for example requires 30 amp receptacles for 30 amp circuits for electric discharge lighting, regardless of the load on the receptacle.
PANEL ACTION: Accept in Principle.
Add a new Exception No. 2 to existing 210-21(b)(3) to read:
"Exception No. 2: The ampere rating of a receptacle installed for electric discharge lighting shall be permitted to be based on 410-30(c)."
PANEL STATEMENT: The panel has accepted the submitter's recommendation, but has revised the wording to correct the grammatical inconsistencies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3348)

2- 139 - (210-21(b)(2)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise to read as follows:
Where connected to a branch circuit supplying two or more receptacles or outlets, a receptacle shall not supply a total cord- and plug-connected continuous load in excess of the maximum specified in Table 210-21(b)(2).
SUBSTANTIATION: Individual appliances, rated more than 80 percent that are not continuous loads do not pose a hazard when connected to branch circuits. This change will make this section consistent with Sections 210-19 and 210-20, and consistent with the loads on overcurrent devices, located in a panelboard, in accordance with Section 384-16(d).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3765)

2- 140 - (Table 210-21(b)(2)): Reject
SUBMITTER: Julie I. Ayres, Assn. of Home Appliance Mfrs
RECOMMENDATION: Add underlined text in Table 210-21(b)(2):

Table 210.21(b)(2) Maximum Cord-Plug-Connected Load to Receptacle

Circuit Rating Amperes	Receptacle Rating Amperes	Maximum Continuous Load Amperes
15 to 20	15	12
20	20	16
30	30	24

SUBSTANTIATION: A discrepancy exists in what is stated literally in Section 210-23(a) and Table 210-21(b)(2) in the National Electrical Code (NEC) and what occurs in field practice. Presently, many types of cord-connected appliances that are normally operated for periods of less than 3 hours employ attachment plugs utilized at 100 percent of the current rating of the plug. A Task Group comprised of members from code-making panel #2 and #20 met on 7/14/99 at Underwriters Laboratories Inc. in Northbrook, IL and developed examples of the diversity of products that utilize 100 percent of the current rating of the plug. These included intermittent duty products such as microwaves, power tools, personal care products, exercise machines, kitchen appliances, and lawn and garden equipment.

Evidence of problems stemming from excessive current do not exist with the above products. A review of manufacturers' complaint databases and the U.S. Consumer Product Safety Commission (CPSC) data shows no evidence of problems with cords on these appliances from excessive current draw.

The prevalence of these products has continued to increase in the marketplace with a continued decline in fire death rates. Data supplied by the National Fire Protection Association (NFPA)[1] states that the number of fire deaths for 1998 represents the lowest U.S. fire death toll in 20 years. This 2 year downward trend continued for consecutive years 1997 and 1998. The NFPA report indicates that home fire deaths fell by another 4.2 percent in 1998 bringing such rates to a new low.

Section 210-23(a) and Table 210-21(b)(2) in the NEC must be modified to clarify the discrepancies detailed above. Amending the code would be representative of current field practice and would not decrease the level of safety established by the NEC.

[1]Press release dated 8/11/99 released from NFPA titled "NFPA Announces U.S. Fire Losses on Decline"
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP201)

2- 142a - (210-23): Accept
SUBMITTER: CMP 2
RECOMMENDATION: Revise existing 210-23(a) to read as follows:

"a) 15- and 20-Ampere Branch Circuits. A 15- or 20-ampere branch circuit shall be permitted to supply lighting units or other utilization equipment, or a combination of both, and shall comply with (1) and (2).

Exception: The small appliance branch circuits, laundry branch circuits, and bathroom branch circuits required in a dwelling unit(s) by Sections 210-11(c)(1), (2), and (3) shall supply only the receptacle outlets specified in that section.

(1) Cord- and Plug-Connected Equipment. The rating of any one cord- and plug-connected utilization equipment shall not exceed 80 percent of the branch-circuit ampere rating unless listed and marked to inform the user of the necessity for providing an individual branch circuit.

(2) Utilization Equipment Fastened in Place. The total rating of utilization equipment fastened in place, other than lighting fixtures, shall not exceed 50 percent of the branch-circuit ampere rating where lighting units, cord- and plug-connected utilization equipment not fastened in place, or both, are also supplied."

SUBSTANTIATION: The panel has revised Section 210-23 to improve readability, and has integrated the language accepted on Proposal 2-143.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CARPENTER: Permitting marking cord- and plug-connected utilization equipment that exceeds 80 percent of the branch-circuit rating with a label that informs the user of the necessity of an individual branch circuit is expecting too much from the consumer. By merely informing the user by a tag that the equipment needs an individual branch circuit would be inviting code violations. A 15-ampere cord cap could be plugged into a 15-ampere receptacle on a 15- or 20-ampere branch circuit. If the plug fits, the user will connect it. It should not be assumed that just because there is a tag or label an individual branch circuit will be installed wherever one might use the appliance. This appears to be a condition that the listing process should address.

(Log #2052)

2- 141 - (210-23): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Revise section 210-23(a) by adding (operating as a continuous load) to the second sentence to read as follows:

210-23. Permissible Loads. In no case shall the load exceed the branch-circuit ampere rating. An individual branch circuit shall be permitted to supply any load for which it is rated. A branch circuit supplying two or more outlets or receptacles shall supply only the loads specified according to its size as specified in (a) through (d) and as summarized in Section 210-24 and Table 210-24.

(a) 15- and 20-Ampere Branch Circuits. A 15- or 20-ampere branch circuit shall be permitted to supply lighting units or other utilization equipment, or a combination of both. The rating of any one cord- and plug-connected utilization equipment operating as a continuous load shall not exceed 80 percent of the branch-circuit ampere rating. The total rating of utilization equipment fastened in place, other than lighting fixtures, shall not exceed 50 percent of the branch-circuit ampere rating where lighting units, cord- and plug-connected utilization equipment not fastened in place, or both, are also supplied.

Exception: The small appliance branch circuits, laundry branch circuits, and bathroom branch circuits required in a dwelling unit(s) by Sections 210-11(c)(1), (2), and (3) shall supply only the receptacle outlets specified in that section.

(b)..... (c).....(d).....to remain as now written.

SUBSTANTIATION: This change is required if the change to section 210-21 is accepted so that both Sections correlate.

Substantiantion for 210-21 as submitted:

This change is necessary to provide consistency between this section and section 384-16(d), 210-20, 210-19 and other sections requiring the 80 percent rule.

Portable appliances (such as microwave units and hair dryers) and relocatable power taps are UL tested for a maximum of 1800 watts on a 15 ampere branch circuit and operate as a non continuous load on these branch circuits without a problem.

Panel 20 and Panel 2 have established a Study Task Group to bring some suggestions for a resolution of this issue.

UL 498 tests receptacles at 150 percent of their rating so limiting the load on as now required by Table 210-21(b)(2) for noncontinuous load is unnecessary.

See also Proposal 20-52 on page 668 of the 98 ROP.

Statement by panel: Quote" the substantiation does not justify the reduction in rating to 12 amperes and 16 amperes for appliances rated between 12 and 15 amperes and between 16 and 20 amperes respectively."

This Section as revised will make it mandatory for continuous loads only and not for noncontinuous loads.

However, the branch circuit requirements remain the same as do the receptacle sizes.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4380)

2- 142 - (210-23): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add a new sentence as follows:
"For the purposes of this section, utilization equipment held in place by piping or hose connections shall be considered to be fastened in place."
SUBSTANTIATION: Utilization equipment, such as waste disposals, swimming pool pumps, etc., that is held in place by piping or hose connections without the use of specific additional fasteners is being interpreted as not being fastened in place. Permissible loads and computation of loads on circuits are being compromised.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel disagrees that all piping or hose connected equipment is considered to be fastened in place because some hoses used to connect blower or vacumn units can be flexible or movable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3249)

2- 143 - (210-23(a)): Accept in Principle
SUBMITTER: Henry Jenkins, N.C. Ellis Cannady Chapter, IAEI
RECOMMENDATION: Revise text to read as follows:
(a) 15- and 20-Ampere Branch Circuits. A 15- or 20-ampere branch circuit shall be permitted to supply lighting units or other utilization equipment, or a combination of both. The rating of any one cord- and plug-connected utilization equipment shall not exceed 80 percent of the branch-circuit ampere rating unless listed and marked to inform the user of the necessity for providing an individual branch circuit. The total rating of utilization equipment fastened in place other than lighting fixtures, shall not exceed 50 percent of the branch-circuit ampere rating where lighting units, cord- and plug-connected utilization equipment not fastened in place, or both, are also supplied.
Exception: The small appliance branch circuits, laundry branch circuits, and bathroom branch circuits required in a dwelling unit(s) by Sections 210.11(c)(1), (2), and (3) shall supply only the receptacle outlets specified in that section.
SUBSTANTIATION: The proposal addresses the issues raised by Mr. King in Proposal 20-52 NFPA 70-A98 ROP and fulfills the direction of CMP-20 in its disposition of Comments 20-9 and 20-42 through 71.
Presently, many types of cord-connected appliances employ attachment plugs utilized at 100 percent of the current rating of the plug as illustrated by the table. The table does not cover all appliances and is only provided to illustrate that the requirements applied take into account the types of appliances and their intended use. The proposal recognizes presently existing field conditions and provides a means for addressing the safety of these products in their intended applications. Further work will need to be done to develop definitions for continuous and intermittent duty as applied to 15 amp and 20 amp cord and plug connected appliances so that product standards can specifically address the issues of branch circuit loading.
The work towards harmonization of the National Electrical Code and Canadian Electrical Code is also noted and it is suggested that the NEC TCC take action to include this issue as a topic for discussion within the harmonization effort.
(See table below)
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: After much discussion, the panel has accepted this proposal in principle and encourages public comment. The panel acknowledges that the table submitted with the substantiation represents present practice for listing, does not cover all appliances, and recognizes that it also includes commercial appliances. The wording of the proposal has been intergrated with the revisions in Proposal 2-142a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3349)

2- 144 - (210-23(a)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise to read as follows:
(a) 15- and 20-Ampere Branch Circuits. A 15- or 20-ampere branch circuit shall be permitted to supply lighting units or other utilization equipment, or a combination of both. The rating of any one cord- and plug-connected ~~utilization equipment~~ continuous load shall not exceed 80 percent of the branch-circuit ampere rating. The total rating of utilization equipment fastened in place, other than lighting fixtures, shall not exceed 50 percent of the branch-circuit ampere rating where lighting units, cord- and plug-connected utilization equipment not fastened in place, or both, are also supplied.
SUBSTANTIATION: Individual appliances, rated more than 80 percent that are not continuous loads do not pose a hazard when connected to branch circuits. This change will make this section consistent with Section 210-19 and 210-20, and consistent with the loads on overcurrent devices, located in a panelboard, in accordance with Section 384-16(d).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

Appliance	Plug Rating			Duty	
20a, Cord and Plug Connected	80%	100%	100% w ded. Receptacle	Intermittent	Continuous
Air Compressor			X		X
Central Vacuum Cleaner			X		X
Vacuum Cleaner	X				X
Clothes Dryer			X		X
Heating Equipment	X	X			X
Exercise Equipment		X			X
Indoor/Outdoor Grill		X			X
Lawn and Garden Tools		X		X	
Microwave Ovens		X		X	
Hair Dryers		X		X	
Power Tools		X		X	
Washing Machines			X		X

(Log #3764)

2- 145 - (210-23(a)): Reject
SUBMITTER: Julie I. Ayres, Assn. of Home Appliance Mfrs
RECOMMENDATION: Revise text to read as follows:
(a) 15- and 20-Ampere Branch Circuits. A 15- or 20-ampere branch circuit shall be permitted to supply lighting units or other utilization equipment, or a combination of both. The rating of any one cord- and plug-connected utilization equipment operating under a continuous load shall not exceed 80 percent of the branch circuit ampere rating. The total rating of utilization equipment fastened in place, other than lighting fixtures, shall not exceed 50 percent of the branch-circuit ampere rating where lighting units, cord- and plug-connected utilization equipment not fastened in place, or both, are also supplied.
SUBSTANTIATION: A discrepancy exists in what is stated literally in Section 210-23(a) and Table 210-21(b)(2) in the National Electrical Code (NEC) and what occurs in field practice. Presently, many types of cord-connected appliances that are normally operated for periods of less than 3 hours employ attachment plugs utilized at 100 percent of the current rating of the plug. A Task Group comprised of members from code-making panel #2 and #20 met on 7/14/99 at Underwriters Laboratories Inc. in Northbrook, IL and developed examples of the diversity of products that utilize 100 percent of the current rating of the plug. These included intermittent duty products such as microwaves, power tools, personal care products, exercise machines, kitchen appliances, and lawn and garden equipment.
Evidence of problems stemming from excessive current do not exist with the above products. A review of manufacturers' complaint databases and the U.S. Consumer Product Safety Commission (CPSC) data shows no evidence of problems with cords on these appliances from excessive current draw.
The prevalence of these products has continued to increase in the marketplace with a continued decline in fire death rates. Data supplied by the National Fire Protection Association (NFPA)[1] states that the number of fire deaths for 1998 represents the lowest U.S. fire death toll in 20 years. This 2 year downward trend continued for consecutive years 1997 and 1998. The NFPA report indicates that home fire deaths fell by another 4.2 percent in 1998 bringing such rates to a new low.
Section 210-23(a) and Table 210-21(b)(2) in the NEC must be modified to clarify the discrepancies detailed above. Amending the code would be representative of current field practice and would not decrease the level of safety established by the NEC.
[1]Press release dated 8/11/99 released from NFPA titled "NFPA Announces U.S. Fire Losses on Decline"
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3350)

2- 146 - (210-23(b)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise to read as follows:
(b) 30-Ampere Branch Circuits. A 30-ampere branch circuit shall be permitted to supply fixed lighting units with heavy-duty lampholders in other than a dwelling unit(s) or utilization equipment in any occupancy. A rating of any one cord- and plug-connected ~~utilization equipment~~ continuous load shall not exceed 80 percent of the branch-circuit ampere rating.
SUBSTANTIATION: Individual appliances, rated more than 80 percent that are not continuous loads do not pose a hazard when connected to branch circuits. This change will make this section consistent with Sections 210-19 and 210-20, and consistent with the loads on overcurrent devices, located in a panelboard, in accordance with Section 384-16(d).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2571)

2- 147 - (Table 210-24): Reject
SUBMITTER: Travis Lindsey, Bldg Dept., Clark County, NV
RECOMMENDATION: Revise Table 210-24 to require No. 12 minimum conductor size for 15 amp branch circuits.
This proposed change is intended to coordinate with the proposed change in 210-19(a).
(a) Branch-Circuit conductors shall have an ampacity not less than the load to be served and shall not be smaller than No. 12.
SUBSTANTIATION: In our jurisdiction we have rules limiting branch circuits to No. 12. We did this because there were problems with heating of conductors, overloaded circuits and tripping related to these conditions. Since enacting these regulations the number of problems have been reduced significantly.
Many times conductors have been applied incorrectly. Ambient temperature correction factors are not always considered. Most attics are hot enough for prolonged periods during the summer months that application of the correction factors would reduce the current carrying capacity of the No. 14 wire to a very small number. Increased heating occurs when these circuits are heavily loaded.
In cases such as single outlet appliance circuits serving refrigerators and similar loads, the circuits have been known to fatigue and deteriorate (oxidize and burn) at connection points, overcurrent devices and receptacles due to the high starting loads and the small wire size.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-124.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1766)

2- 148 - (Table 210-24, FPN): Accept in Principle
SUBMITTER: Edward Olson, Pendleton, SC
RECOMMENDATION: Add a fine print note to read as follows:
(FPN): The gauges listed in Table 210-24 for tap conductors are minimum values. The ampacities of the tap must conform to Section 310-15 and the overcurrent protection of the tap must adhere to Section 240-21.
SUBSTANTIATION: I have witnessed several instances were technicians and engineers have to refer to Table 210-24 as a conductor size reference. Thus asserting that 14 AWG taps to receptacles and lampholders can be connected to 12 AWG branch circuits protected by a single 20 AMP overcurrent device located at the service entrance, utilizing nonmetallic-sheathed cable in a one/two family dwelling.
PANEL ACTION: Accept in Principle.
Revise the existing first paragraph of 210-24 to read as follows:
"The requirements for circuits that have two or more outlets or receptacles, other than the receptacle circuits of Sections 210-11(c)(1) and (2), are summarized in Table 210-24. This table provides only a summary of minimum requirements. See 210-19, 210-20 and 210-21 for the specific requirements applying to branch circuits".
PANEL STATEMENT: The first paragraph of 210-24 has been revised to make it clear that the table provides only a summary of requirements and that the user must consult 210-19, 20 and 21 to apply the rules.
Also, the panel has removed the words "as specifically provided for above" in the first paragraph since they provide no reference to what is "above".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1487)

2- 149 - (210-25): Reject
SUBMITTER: Northeastern Regional Fire Code Dev. Committee
RECOMMENDATION: Revise to read:
210-25. Common Area Branch Circuits. Branch circuits in dwelling units shall supply only loads within that dwelling unit or loads associated only with that dwelling unit. Branch circuits required for the purpose of lighting, central alarm, signal, communications, or other needs for public or common areas of ~~a~~

~~two family or~~ multifamily dwelling shall not be supplied from equipment that supplies an individual dwelling unit.
SUBSTANTIATION: The requirements of Section 210-25 provide an unnecessary burden on 2 family homes that contain common areas and are largely owner occupied. This section requires 2 family homes to install a separate meter and electric panel to serve as few as 3 smoke detectors and 1 light in the basement of a building where the dwelling units are one over the other and each dwelling unit has the required means of egress directly to outdoors. The cost of this separate service can be anywhere from $500.00 to $1,000.00.
Some electric utilities treat a separate "House Meter" as a commercial installation and often charge a minimum monthly fee of as much as $20.00 where the actual usage is only pennies. In most two-family dwellings there are no, or very small, common areas, these circuits could be added to one of the dwelling units.
This requirement is not in the current CABO One- and Two-Family Code. For consistency with the CABO Code and should be eliminated in the NEC.
Appliances, devices, circuits or panels in the common area could be marked as to which panel controls them to eliminate any safety concerns.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that two family dwellings should be excluded from the rule. The common area loads are not limited to smoke alarms and lights, but have also included water pumps, sprinkler pumps, common boilers, etc.
This requirement is not in the CABO document because the CABO document is based on a previous edition of the NEC. The One- and Two-Family Dwelling Unit Code should be revised to reflect the requirements contained in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3683)

2- 150 - (210-26 (New)): Reject
SUBMITTER: Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL
RECOMMENDATION: Add new text to read as follows:
210.26 The maximum number of 120 volt outlets permitted per circuit in residential occupancies shall not exceed the provisions of Table 210.26.

Table 210.26 Maximum Number of Outlets Per Circuit for Residential Occupancies

Lighting outlets	12	11	10	9	8	7	6	5	4	3	2	1	0
Duplex receptacle	0	0	1	1	2	2	3	3	4	4	5	5	6

SUBSTANTIATION: This new section and table would provide a greater degree of safety for residential occupancies. The homeowner would have a greater degree of flexibility using today's many appliances, computers, televisions, etc.
PANEL ACTION: Reject.
PANEL STATEMENT: The outlets provided for dwelling units by the requirements in Section 210-52 are intended to be convenience outlets and adding outlets does not necessarily add load. There is no intent to limit the number of convenience outlets on a general branch circuit in a dwelling unit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3238)

2- 151 - (210-50): Reject
SUBMITTER: Edward J. Fox, Jr., Orange County Bldg Div., FL
RECOMMENDATION: 210-50: There shall be a minimum of two (2) duplex receptacles in each office, and classroom. They shall be separated by a reasonable distance to provide access from different areas of the room.
SUBSTANTIATION: By providing receptacles that would normally not be installed for offices, and classrooms, the citizens would not have to use extension cords, nor would they have to hire an electrician to come in and add receptacles after they have taken occupancy.
All offices have many electrical appliances and it would be safer if these had receptacles to plug into instead of extension cords.
By providing a better electrical system up front, the citizens are not impacted by additional cost later due to adding more receptacles and circuits to handle an ever-increasing demand.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's proposed revision does not resolve the situation presented in the substantiation. The present code rule in 210-50(b) requires a receptacle where cord and plug connections are used. Adding a rule to provide two receptacles would not keep (or in some cases even minimize) the user from violating the Code and using an extension cord, since the final usage of the particular space is not known. For non-dwelling unit applications, proper planning and design must be used to provide adequate access to receptacle outlets. If the receptacles are not provided, then it would be necessary to have receptacles installed by a qualified person.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #684)

2- 152 - (210-50(a)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Cord Pendants. A cord connector body that is ~~supported~~ supplied by a permanently ~~installed~~ connected cord ~~pendant~~ shall be considered a receptacle outlet.
SUBSTANTIATION: Editorial. Cord connector body seems to be the commonly used term. The distinction of limitation to a pendant infers other than pendants are not receptacles, such as may be permitted in Articles 305, 364, Sections 422-17(b), 422-22(a). Some code sections indicate receptacles and cord connectors are not the same, e.g., Sections 210-7(b)(c); Article 410 Part L, Sections 422-17(b); 422-22(a)(c); 305-4(d); 513-11(b); etc. If a permanently connected cord (where permitted) with cord connector body is not clearly designed as a receptacle many code requirements may not be deemed applicable, such as Sections 210-21(b)(1)(2)(3)(4); 220-13; 400-7(b); 410-56(a); 430-42(c); 430-81(c); 430-109, Exception No. 6; 440-55(b), etc.
PANEL ACTION: Accept in Part.
Revise the wording in existing Section 210-50(a) to read as follows:
"(a) Cord Pendants. A cord connector that is supplied by a permanently connected cord pendant shall be considered a receptacle outlet."
PANEL STATEMENT: The word "body" was rejected since the current terminology for this device is "cord connector," not "cord connector body." See UL's guide information for Attachment Plugs (AXGV) in Green (Electrical Construction Equipment) and White (General Information) Directories.
The panel accepted "supplied" as more appropriate since "supported" implies a physical attachment rather than an electrical connection.
The panel rejected the elimination of "pendant" in the sentence to make clear that "pendant" is the appropriate term as it applies here and in other parts of the Code. See Sections 370-23(h), 370-25(c), and 400-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2747)

2- 153 - (210-50(b)): Reject
SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.
RECOMMENDATION: Revise as follows:
(b) Cord Connections. A receptacle outlet shall be installed wherever flexible cords with attachment plugs are used. Where flexible cords are permitted to be permanently connected, receptacles shall be permitted to be omitted for such cords. (Receptacles installed in the face down position shall be of the twist-lock type.)
SUBSTANTIATION: While inspecting a job that did utilize attachment plugs as permanent connections, the problem arose that when the cord reels supplying the required outlets were shaken the plugs pulled out from their connection. Also, I've encountered garage door openers that have shaken their attachment plug loose.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not presented sufficient evidence that there is a problem with properly installed receptacles in a face-down position. The panel notes that changing to twist-lock receptacles would render many devices such as garage door openers

and cord reels unusable because they are supplied with standard attachment caps.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP202)

2- 153a - (210-52): Accept
SUBMITTER: CMP 2
RECOMMENDATION: Add a new first sentence to 210-52 to read as follows:
"This section provides requirements for 125-volt, 15- and 20-ampere receptacle outlets."
SUBSTANTIATION: The panel has added a new sentence to clarify that the required receptacles in Section 210-52 are to be 125-volt, 15- or 20-ampere configurations only.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2249)

2- 154 - (210-52): Reject
SUBMITTER: Dennis R. Scarfo, LDA Co.
RECOMMENDATION: I feel that all general purpose receptacles should be required to have the ground slot installed on top.
SUBSTANTIATION: Recently, I have become aware of this and I feel that it would be good practice and prevent a possible accident, if an object were to come in contact, possibly by dropping on the hot and neutral blades of a connected load. The ground slot installed on top would eliminate this possible danger.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no evidence to support a required orientation of the ground slot for a receptacle outlet. The panel notes that receptacles have been installed with the ground pin up and down (as well as horizontally) for many years with no established trend of one orientation being better than the other.
Other arguments include ones stating that keeping the grounding slot in the lower position will keep the grounding pin of an attachment plug connected to the receptacle for as long as possible if the plug starts to disengage.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3351)

2- 155 - (210-52): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Delete all occurrences "of (in) dwelling unit" within this section. Revise as follows:
(a) General Provisions. In every kitchen, family room, dining room, living room, parlor, library, den, sunroom, bedroom, recreation room, or similar room or area ~~of dwelling units,~~ receptacle outlets shall be installed in accordance with the general provisions specified in (1) through (3).
(b) Small Appliances. 1. In the kitchen, pantry, breakfast room, dining room, or similar area ~~of a dwelling unit,~~ the two or more 20-ampere small-appliance branch circuits required by Section 210-11(c)(1) shall serve all receptacle outlets covered by Sections 210-52(a) and (c) and receptacle outlets for refrigeration equipment.
(c) Countertops. In kitchens and dining rooms ~~of dwelling units,~~ receptacle outlets for counter spaces shall be installed in accordance with (1) through (5).
(d) Bathrooms. ~~In dwelling units,~~ At ~~at~~ least one wall receptacle outlet shall be installed in bathrooms within 36 in. (914 mm) of the outside edge of each basin. The receptacle outlet shall be located on a wall that is adjacent to the basin location. See Section 210-8(a)(1).
(h) Hallways. ~~In dwelling units,~~ Hhallways of 10 ft (3.05 m) or more in length shall have at least one receptacle.
SUBSTANTIATION: Section 210-60 requires that 210-52 be bused for the installation requirements for receptacles in hotel and motel guest rooms. The phrase dwelling unit conflicts with this requirement. The phrase dwelling unit would remain in the title of Section 210-52 to maintain the requirement to dwelling units.

PANEL ACTION: Accept in Principle.
Revise 210-60(a) to read as follows:
"(a) General. Guest rooms in hotels, motels and similar occupancies shall have receptacle outlets installed in accordance with 210-52(a) and 210-52(d). Guest rooms meeting the definition of a dwelling unit, shall have receptacle outlets installed using all of the applicable rules in 210-52."
PANEL STATEMENT: The panel has kept the term dwelling unit in 210-52, but has revised 210-60 to make it clear as to what provisions of 210-52 apply to guest rooms. This accomplishes the objective of the submitter to make it clear as to what portions of 210-52 apply.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BROWN: There is an inherent problem with trying to equate a "guest room" and a "dwelling unit". All definitions in the model building codes, and the documents of the NFPA family of codes and standards, including the NEC, reference a "dwelling unit" only to those occupancies in one- and two-family dwellings and multifamily dwellings. The definition of a "guest room" (and guest suite) is referenced only to those areas in hotel occupancies. In other words, a "guest room" cannot be a "dwelling unit". The last sentence of the revision should be changed to read: "Guest rooms shall have receptacle outlets installed using all of the applicable rules in Section 210-52." The intent of this requirement will not be changed.

(Log #2810)

2- 156 - (210-52(a), Exception (New)): Reject
SUBMITTER: Bud Swathwood, Bud Swathwood Consulting
RECOMMENDATION: Add an exception to read as follows:
Exception: A receptacle shall not be required in areas behind interior doors that will cover the receptacle when the door is open. These areas would include bedrooms, bathrooms, kitchens, etc.
SUBSTANTIATION: A problem we are having is the damaging of portable cords for lamps, sweepers etc., when doors are opened and these appliances are plugged into these outlets. There have been cases where people have tripped when walking into rooms and the cord is across the doorway after being plugged into these outlets.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel continues to maintain the long standing position that these receptacles are required. Frequently, the receptacles in these locations are the only ones remaining available for plugging in portable appliances (such as vacuum cleaners, etc.) after the furniture is in place in the room.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #685)

2- 157 - (210-52(a)(1)): Accept in Principle
Note: The Technical Correlating Committee understands that the values in the panel action are as accepted in the action on Proposal 2-3.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Spacing. Receptacles shall be installed so that no point along the floor line in any wall space is more than 6 ft (1.83 m) measured horizontally, from ~~an~~ a receptacle outlet in that space. ~~Receptacle outlets shall, insofar as practicable, be spaced equal distances apart.~~
SUBSTANTIATION: The requirement proposed to be deleted is not needed and if enforced can cause problems. Basic spacing is covered by the first paragraph and normally results in compliance with equal spacing. If, for example, three receptacle outlets are installed one foot apart for a particular need such as supply for an entertainment center a strict enforcement of the rule would require the same spacing for all other receptacle outlets. I believe this equal spacing requirement is a holdover from previous code when a minimum number of receptacle outlets (two?) was required per room, and justified by in effect requiring two receptacle outlets to be installed on opposite walls, not the same wall.
PANEL ACTION: Accept in Principle.

Revise existing Section 210-52(a)(1) to read as follows:
"(1) Spacing. Receptacles shall be installed so that no point along the floor line in any wall space is more than 6 ft (1.83 m), measured horizontally, from another receptacle outlet in that space."
PANEL STATEMENT: The panel has accepted the submitter's deletion of the second sentence and has revised the first sentence to make it clear that the spacing is from another receptacle outlet in the space.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #360)

2- 158 - (210-52(a)(1), Exception (New)): Reject
SUBMITTER: James Goshey, Spruce Electric
RECOMMENDATION: Add an exception to read as follows:
Exception: A wall space 2 ft or larger which would be completely covered by a door in an open position, shall not be required to have a receptacle located within.
SUBSTANTIATION: A receptacle located behind an open door invites many hazards. It seems to encourage the use of a fixture cord or extension cord across a walkway, possibly under a rug or carpet runner.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-156.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #428)

2- 159 - (210-52(a)(2)): Reject
SUBMITTER: Mike Forster, Toronto, OH
RECOMMENDATION: Receptacles should be 2 ft from every corner of the wall.
SUBSTANTIATION: Worded wrong and should say receptacles should start 2 ft from every corner on every 6 ft spacing.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's recommendation is not clear. The receptacle spacing presently specifies, appropriately spaced receptacles around the wall to allow typical cord- and plug-connected devices to be used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2428)

2- 160 - (210-52(a)(2)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Add a new Part D:
"Fireplace mantels shall have a receptacle."
SUBSTANTIATION: So many times a receptacle is needed for all the accessories that can be installed on a mantel.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not presented any substantiation other than that associated with convenience. The panel notes that a receptacle installed for a mantel is not prohibited by the present code and could be specified by the designer/owner.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2284)

2- 161 - (210-52(a)(2) Exception No. 1 (New)): Reject
SUBMITTER: Terry L. Schneider, Regional Bldg Dept.
RECOMMENDATION: Add a new Section 210-52(a)(2) Exception No. 1 to read:
"Outlets shall not be required to be installed in wall spaces located behind the swing of a door."
SUBSTANTIATION: Having requirements for outlets in these areas is not only impractical, but could lead to damaged cords, and personal hazards resulting from items utilizing these outlets.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-156.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #288)

2- 162 - (210-52(a)(2)(a)): Reject
SUBMITTER: J. Michael Scott, Three Forks, MT
RECOMMENDATION: Revise text to read:
(a) Any space ~~2 ft (610 mm)~~ 4 ft (2440 mm) or more in width (including space measured around corners) and unbroken along the floor line by doorways, fireplaces, and similar openings.
SUBSTANTIATION: The existing text requires a receptacle on unusable wall sections and wall sections between closets. This provision should be a design criteria, and not a code requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that the two foot wall space section is unusable space. These spaces have tables with lamps or other similar furniture that need access to a receptacle. Also, this space serves to provide access to a convenience outlet that might otherwise be covered up by larger furniture and helps to eliminate the use of extension cords by persons attempting to locate a more permanent outlet in that space.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2429)

2- 163 - (210-52(a)(2)(a)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Revise text to read:
"Any space 2 ft or more in width and unbroken along the floor by doorways ~~fireplaces~~ and similar openings."
SUBSTANTIATION: Fireplaces are not defined as to what part of the fireplace constitutes wall space. If it were just the fire box there is not a problem but if you take the width of the overall fireplace (say it's 6 ft) then take 6 ft on each side of the fireplace you wind up with 18 ft. If you include the fireplace as wall space then you cut down the gap between receptacles. Fireplaces should have a receptacle fairly close to incorporate mantels with lights, clocks, Xmas trimmings, etc. to eliminate extension cords.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that the fireplace opening needs any different treatment than a doorway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP207)

2- 163a - (210-52(b)): Accept
SUBMITTER: CMP 2
RECOMMENDATION: In 210-52(b) add titles as follows:
"(1) Receptacle Outlets Served. In the kitchen...
(2) No Other Outlets. The two or more...
(3) Kitchen Receptacle Requirements. Receptacles installed in...".
SUBSTANTIATION: The panel has added titles to comply with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #289)

2- 164 - (210-52(b)(1)): Reject
SUBMITTER: J. Michael Scott, Three Forks, MT
RECOMMENDATION: Revise text to read:
(1) In the kitchen, pantry, breakfast room, dining room, or similar

area of a dwelling unit, the two or more 20 ampere small appliance branch circuits required by 210-11(c)(1) shall serve all receptacle outlets covered by Sections 210-52(a) and (c) and receptacle outlets for refrigeration equipment and may also supply the range hood fan.

SUBSTANTIATION: No reason why not.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not presented any substantiation. The panel addressed the range hood issue during the 1996 NEC cycle and concluded that it was not appropriate for the range hood to be connected to the small appliance branch circuit. Depending on the configuration, the range hood can add significant load to the small appliance circuit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #686)

2- 165 - (210-52(b)(1) Exception No. 2): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception No. 2: ~~The receptacle outlet~~ A single receptacle for refrigeration equipment shall be permitted to be supplied from an individual branch circuit rated 15 amperes or greater.
SUBSTANTIATION: Editorial. An individual branch circuit (per definition) implies a single receptacle. The receptacle outlet (per definition) may contain several receptacles. A duplex receptacle at the edge of and above a countertop supplied by a small appliance circuit is not prohibited from supplying a refrigerator. The exception permits a 15 ampere circuit for such receptacle, with no load calculation required.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has attempted to be reasonable with the exception and not require a single receptacle be used.
The panel notes that the exception permits an additional circuit to supply the refrigerator. It is recognized that frequently the receptacle is indeed located behind the refrigerator making the single receptacle requirement overly burdensome. Should the outlet be close to or above the countertop, it would not count as the required countertop outlet by 210-52(c) and another outlet would be required to be installed and connected to the small appliance branch circuit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #588)

2- 166 - (210-52(b)(2) Exception No. 3 (New)): Reject
SUBMITTER: John Ziegler, Wentzel Electric
RECOMMENDATION: Add an exception to 210-52(b)(2) to read as follows:
Exception No. 3: A receptacle or direct wire for exhaust hood and light or microwave hood combination, shall be permitted on the small appliance branch circuit required in 210-52(b)(1).
SUBSTANTIATION: Problem. Exhaust hoods changed out to microwave hood combination overloads lighting circuit.
1) Microwave on counter would be on small appliance circuit anyway
2) Gas fired appliances have lights and small fans like hoods and are allowed
3) Referenced equipment should be on 3rd small appliance circuit (See additional submitted proposal)
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-164. The panel does not agree that placing the microwave/range hood on the small appliance branch circuit resolves what is indicated in the substantiation. The panel notes any load placed on the lighting circuit (as noted in the substantiation) would have to comply with 210-23.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4163)

2- 167 - (210-52(b)(2) Exception No. 3): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Add a third Exception as follows:
Exception No. 3: Where receptacles are located to serve a kitchen counter top on a peninsula or an island that is also a fixed room divider between two rooms, and where one of those rooms is not included in Section 210-52(b)(1), and where those receptacles qualify by their location and are used to meet the requirements of Section 210-52(a) for that room, those receptacles shall be permitted to be connected to a small appliance branch circuit.
SUBSTANTIATION: Many times a peninsula is the divider between two rooms. If one of those rooms does not qualify for small-appliance branch-circuit supplied receptacles, then there is a possibility of multiple receptacle outlets at one location. This is definitely unintended and a real burden. Small appliance branch circuits are unlikely to be compromised by the very occasional small loads represented by such items as floor lamps.
It is difficult to imagine a scenario where what would probably be the load connected to no more than one duplex receptacle would unduly burden a small-appliance branch circuit, except in a case where such a load would be an even greater burden on the associated lighting circuit. What isn't difficult to imagine is the consternation of a homeowner looking at the side of the peninsula between the kitchen area and the living room area, and seeing a receptacle just below the counter and a perimeter receptacle two feet below that. This in particular after he or she just threatened to sue the electrician and the municipal inspector for requiring the nice cherry finish to be disrupted by a receptacle.
In the last cycle CMP 2 responsibly recognized that owners simply aren't willing to tolerate tombstone receptacle outlets on flat islands. Any inspector will also tell you they don't want the visual effect of the sides of peninsulas or islands disrupted. I can remember holding a certificate of occupancy for eleven months while I fought with the homeowner about just one receptacle outlet on the side of his island. The electrician had no problem, it was just another opening to him. Remember, on the literal text, you couldn't even split a duplex receptacle with the top half on a small-appliance circuit and the lower half on the lighting circuit, because both halves would still service the countertop and qualify for mandatory inclusion on the small appliance circuit. One receptacle is enough at any given portion of a peninsula. One receptacle required at a point two feet above another on the same peninsula is absurd and unlikely to be enforced.
PANEL ACTION: Reject.
PANEL STATEMENT: The receptacles in the adjacent room should not be permitted on the small appliance branch circuit. Some of the constructions encountered would fit well into the submitter's concept, but others may indeed place a burden on the small appliance branch circuit. Given the wide and varying constructions, it is prudent to keep the receptacles delineated between the two rooms.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4164)

2- 168 - (210-52(b)(3)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
3. Receptacles installed in a kitchen to serve countertop surfaces shall be supplied by ~~not less~~ no fewer than two small-appliance branch circuits, either or both of which shall also be permitted to supply receptacle outlets in the same kitchen and in other rooms specified in Section 210-52(b)(1). Additional small-appliance branch circuits shall be permitted to supply receptacle outlets in the kitchen and other rooms specified in Section 210-52(b)(1). No small-appliance branch circuit shall serve more than one kitchen.
SUBSTANTIATION: The Style Manual does not mandate that the code be written in violation of accepted principles of English grammar, contrary to popular opinion. That responsibility rests with the code making panels. When a number of items is countable, the term is "fewer" and when not, "less." For example, I might have less sand, but if that were the case, I probably would have fewer grains of sand. The terminology in the Style Manual about "not less than" is on a list, but the list is not an exclusive list. Furthermore, the example in the current style manual ("Shall have a clearance of not less than 5 cm…") is used correctly. See also Sections 280-24(a)(1) and 334-10(a) which use the words correctly.
PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4075)

2- 169 - (210-52(c)): Reject
SUBMITTER: Carol Roseman, San Francisco, CA
RECOMMENDATION: Add a new item and renumber.
"Wall Opening Counter Spaces. At least one receptacle outlet shall be installed at each wall opening counter space if the opening exceeds 4 ft."
SUBSTANTIATION: This proposal identifies an increasingly common architectural practice and applies an existing method of remedy.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's recommendation is not clear. "Wall opening counter space" is not a defined term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2435)

2- 170 - (210-52(c)(4)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Revise text to read as follows:
"Countertop spaces separated by appliance garages, range tops, refrigerators, sinks shall be considered as separate countertop spaces in appliances."
SUBSTANTIATION: When appliance garages are used, it covers up a required receptacle allowing areas of the countertop without any receptacle.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that appliance garages generally split the countertops into separate spaces. However, the panel has addressed the issue of location of receptacle outlets in Proposal 2-172.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1483)

2- 171 - (210-52(c)(5)): Accept
Note: The Technical Correlating Committee directs that the panel provide the appropriate metric values. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Martha Montana, Montana Interior Design
RECOMMENDATION: Change 18 in. to 20 in.
SUBSTANTIATION: Kitchen cabinets are designed so the height of the base cabinet is 36 inches. The height of the top cabinets are 84 inches (7 feet) these top cabinets are 30 inches high this leaves 18 inches above the counter. However, I would like to install plug mold at the bottom of the cabinet in the 2 inch recess of the top cabinet that supports the bottom shelf. This would still all use of appliances with 24 inch cords, and allow for better mounting of under the cabinet appliances.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2422)

2- 172 - (210-52(c)(5)): Accept
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Revise the last line of (5) to read:
"Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, or appliances occupying dedicated space shall not be considered as these required outlets."
SUBSTANTIATION: Although an appliance garage contains appliances that take up dedicated slack there seems to be confusion on the interpretation and the words appliance garage will help.
PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3862)

2- 173 - (210-52(c)(5)): Accept
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise text to read as follows:
(5) Receptacle Outlet Location. Receptacle outlets shall be located above, but not more than 18 in. (458 mm) above the countertop. ~~Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops.~~ Receptacle outlets rendered not readily accessible by appliances fastened in place or appliances occupying dedicated space shall not be considered as these required outlets.
SUBSTANTIATION: This is a companion proposal to one that intends to locate this requirement in Section 210-7 so it will apply to all dwelling unit receptacle outlets.
PANEL ACTION: Accept.
The panel has accepted the deletion of the sentence.
PANEL STATEMENT: See panel action and statement on Proposal 2-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #423)

2- 174 - (210-52(c)(5), Exception): Reject
SUBMITTER: Larry N. Toyas, Toyas Brothers Electrical Contractors Inc./Rep. I.A.E.I.
RECOMMENDATION: Revise 210-52(c)(5) Exception to read as follows:
To comply with the conditions as specified in (a) or (b), receptacle outlets shall not be permitted to be mounted ~~not more than 12 in. (305 mm)~~ below the countertop.
SUBSTANTIATION: It was always apparent to me that a child could pull on a cord and get severely burned by an appliance that was plugged into an outlet below the countertop such as a coffee pot. When I asked about this code at a 1999 code seminar, I was told by the guest speaker that Colorado does not permit outlets below the countertop. Why are you allowing such a dangerous condition to exist. Please stop it before another child is hurt.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel shares concerns relative to the access of a side-mounted receptacle to children and that's why the language minimizes the installation of receptacles on the side of countertops as much as possible with the present products and construction methods. Parents will have to be prudent in their use of side-mounted receptacles where small children are present as they are with many other hazards in the home. The primary requirement is that the receptacles be mounted above the countertops.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BROWN: There will be a need for the committee to consider the installation requirements for these outlets in relationship to their use by the physically handicapped. Forthcoming actions being taken by the development committee on ANSI A117.1 as soon as they are available. Some of the concerns have already been addressed by the Technical Committee on Electric on NFPA 501, Standard on Manufactured Homes.

(Log #1484)

2- 175 - (210-52(c)(5), Exception): Accept in Principle
Note: The Technical Correlating Committee understands that the values in the panel action are as accepted in the action on Proposal 2-3.
SUBMITTER: Martha Montana, Montana Interior Design
RECOMMENDATION: Revise exception to read as follows:
Exception: To comply with the conditions as specified in (a) or (b), receptacle outlets shall be permitted to be mounted not more

than 12 in. (305 mm) below the countertop. Receptacles mounted below the countertop in accordance with this exception shall not be located where the receptacle countertop extends more than 6 in. (153 mm) beyond the edge of the countertop measured horizontally its support base.

SUBSTANTIATION: As the code text is now written, a receptacle cannot be located on the bottom of the countertop. I would like to be able to use plug mold located within 6 in. of the edge of the countertop even if the countertop extended more than 6 in. beyond the base of the cabinet.
PANEL ACTION: Accept in Principle.
Revise the second sentence of existing Section 210-52(c)(5) Exception to read:
"Receptacles mounted below a countertop that extends more than 6 in. (153 mm) beyond its support base, shall be located so that they are not more than 6 in. (153 mm) from the outside edge of the countertop."
PANEL STATEMENT: The panel has revised the second sentence of the exception to provide specific guidance for receptacles mounted below an extended edge countertop. This wording would allow any method of locating these receptacles (including surface receptacles) provided they are within six inches of the outside edge of the countertop.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
CARPENTER: There has been considerable opposition for allowing receptacle outlets located below countertops to serve countertop spaces. The Panel has provided for a way to allow for a receptacle outlet no more than 12 in. below the countertop when certain conditions are met. This does not totally eliminate the danger of cords being draped over the countertop but, at least, does keep the cord close to the base cabinet. This proposal would allow the draped cord to hang out away from the base cabinet, more susceptible to being caught and pulling the equipment off the surface. These countertop extensions of more than 6 in. are usually used as eating surfaces with chairs or bar stools being used or stored under the area which increases the danger of hooking the cord and causing damage.
NISSEN: I am voting negative based on the negative comments of Mr. Carpenter and Mr. Roche on the proposal's receptacle outlets. I agree that there is a potential hazard in permitting a cord to be connected to this revised location, that is, beneath the overhanging countertop.
ROCHE: Where a countertop extends more than 6 in. beyond its support base, that portion of the countertop is likely to be used as a location for seating. People will be seated on chairs or stools at that countertop, and beside them will be dangling cords plugged into receptacles that would be allowed to be installed by this change. It is a certainty that cords would be hit and devices moved or pulled off the countertop. Restricting that receptacle to be within 6 in. of the outside edge of the countertop does not improve the situation. That 6 in. is a space where there is likely to be significant arm and leg movement by someone seated at the countertop.

(Log #3251)

2- 176 - (210-52(c)(5), Exception): Accept in Principle
SUBMITTER: Michael R. Fisher, Bluhm Electric Inc.
RECOMMENDATION: Revise text to read as follows:
Exception: To comply with the conditions as specified in (a) or (b), receptacle outlets shall be permitted to be mounted not more than 12 in. (305 mm) below countertop. Receptacles mounted below countertop in accordance with this exception shall ~~not be located where the countertop extends more than 6 in. 153 mm).~~ be located within 6 in. (153 mm) from where the countertop extends beyond its support base.
SUBSTANTIATION: Most countertops are extending beyond 6 in. from its support, so we are installing receptacles on sides of cabinets that are in the walkways of the kitchen so when the homeowner uses an appliance the cord end is in the walkway - but if installed under the countertop only the cord is along side, and less likely to be in the way. As long as the receptacle is 6 in. from the countertop, it does not matter how much the countertop extends beyond its support base.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 2-175.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
ROCHE: See my Explanation of Negative Vote on Proposal 2-175.

(Log #4076)

2- 177 - (210-52(c)(5), Exception (b)): Reject
SUBMITTER: Carol Roseman, San Francisco, CA
RECOMMENDATION: Add text to read:
"On island, peninsula and wall opening countertops."
SUBSTANTIATION: This section of code must be revised to reference my proposed addition to Section 210-52(c).
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's recommendation is not clear. The term "wall opening countertop" is not defined.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1829)

2- 178 - (210-52(c)(5)(a) and (b)): Reject
SUBMITTER: Kevin X. Smith, Apopka, FL
RECOMMENDATION: Revise to read as follows:
Receptacles shall be mounted below the countertops only in facilities built and designed for physically impaired persons.
SUBSTANTIATION: Section 210-52(c)(5)(b) does not take into consideration that small children are likely to pull or tug on cords plugged into receptacles. This could be a dangerous problem.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-174.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #8)

2- 179 - (210-52(d)): Accept in Principle
NOTE: The following proposal consists of Comment 2-119 on Proposal 2-5 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 2-5 was:
Revise Articles 210, 215 and 220 as follows:

ARTICLE 210 -- BRANCH CIRCUITS

A. General Provisions
210-1. Scope. no changes
210-2. Other Articles for Specific-Purpose Branch Circuits. no changes
210-3. Rating. no changes
210-4. Multi-wire Branch Circuits. no changes
210-5. Color Code for Branch Circuits. no changes
210-6. Branch Circuit Voltage Limitations. no changes
210-7. Receptacles and Cord Connectors. no changes
210-8. Ground-Fault Circuit-Interrupter Protection for Personnel. no changes
210-9. Circuits Derived from Autotransformers. no changes
210-10. Ungrounded Conductors Tapped from Grounded Systems. no changes
210-11. Branch Circuits Required. Branch circuits for lighting and for appliances, including motor-operated appliances, shall be provided to supply the loads computed in accordance with Section 220-3. In addition, branch circuits shall be provided for specific loads not covered by Section 220-3 where required elsewhere in this Code and for dwelling unit loads as specified in (c) below.
(a) Number of Branch Circuits. The minimum number of branch circuits shall be determined from the total computed load and the size or rating of the circuits used. In all installations, the number of circuits shall be sufficient to supply the load served. In no case shall the load on any circuit exceed the maximum specified by Section 220-4.
(b) Load Evenly Proportioned Among Branch Circuits. Where the load is computed on a volt-amperes-per-square foot (0.093-sq m) basis, the wiring system up to and including the branch-circuit

panelboard(s) shall be provided to serve not less than the calculated load. This load shall be evenly proportioned among multioutlet branch circuits within the panelboard(s). Branch-circuit overcurrent devices and circuits need only be installed to serve the connected load.

(c) Dwelling Units

(1) Small Appliance Branch Circuits. In addition to the number of branch circuits required by other parts of this section, two or more 20-ampere small appliance branch circuits shall be provided for all receptacle outlets specified by Section 210-52(b).

(2) Laundry Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s) required by Section 210-52(f). This circuit shall have no other outlets.

(3) Bathroom Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one 20-ampere branch circuit shall be provided to supply bathroom receptacle outlets. Such circuits shall have no other outlets.

(FPN): See Examples 1(a), 1(b), 2(b), and 4(a), Chapter 9.

B. Branch-Circuit Ratings

210-19. Conductors -- Minimum Ampacity and Size.

(a) General. Branch-circuit conductors shall have an ampacity not less than the maximum load to be served. Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size, without the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load. ~~In addition, conductors of multioutlet branch circuits supplying receptacles for cord-and-plug-connected loads shall have an ampacity of not less than the rating of the branch circuit. Cable assemblies where the neutral conductor is smaller than the ungrounded conductors shall be so marked.~~

Exception: Where the assembly including the overcurrent devices protecting the branch circuit are listed for operation at 100 percent of their rating, neither the ampere rating of the overcurrent device nor the ampacity of the branch circuit conductors shall be less than the sum of the continuous load plus the noncontinuous load.

(FPN No. 1): See Section 310-15 for ampacity ratings of conductors.

(FPN No. 2): See Part B of Article 430 for minimum rating of motor branch-circuit conductors.

(FPN No. 3): See Section 310-10 for temperature limitation of conductors.

(FPN No. 4): Conductors for branch circuits as defined in Article 100, sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet does not exceed 5 percent, will provide reasonable efficiency of operation. See Section 215-2 for voltage drop on feeder conductors.

(b) Multioutlet Branch Circuits. Conductors of multioutlet branch circuits supplying receptacles for cord- and plug-connected portable loads shall have an ampacity of not less than the rating of the branch circuit.

(c) Household Ranges and Cooking Appliances. Branch-circuit conductors supplying household ranges, wall-mounted ovens, counter-mounted cooking units, and other household cooking appliances shall have an ampacity not less than the rating of the branch circuit and not less than the maximum load to be served. For ranges of 8 3/4 kW or more rating, the minimum branch-circuit rating shall be 40 amperes.

Exception No. 1: Tap conductors supplying electric ranges, wall-mounted electric ovens, and counter-mounted electric cooking units from a 50-ampere branch circuit shall have an ampacity of not less than 20 and shall be sufficient for the load to be served. The taps shall not be longer than necessary for servicing the appliance.

Exception No. 2: The neutral conductor of a 3-wire branch circuit supplying a household electric range, a wall-mounted oven, or a counter-mounted cooking unit shall be permitted to be smaller than the ungrounded conductors where the maximum demand of a range of 8 3/4 kW or more rating has been computed according to Column A of Table 220-19, but shall have an ampacity of not less than 70 percent of the branch-circuit rating and shall not be smaller than No. 10.

(d) Other Loads. Branch-circuit conductors supplying loads other than those specified in Section 210-2 and other than cooking appliances as covered in (c~~b~~) above ~~and as listed in Section 210-2~~ shall have an ampacity sufficient for the loads served and shall not be smaller than No. 14.

Exception No. 1: Tap conductors for such loads shall have an ampacity not less than 15 for circuits rated less than 40 amperes and not less than 20 for circuits rated at 40 or 50 amperes and only where these tap conductors supply any of the following loads:

a. Individual lampholders or fixtures with taps extending not longer than 18 in. (457 mm) beyond any portion of the lampholder or fixture.

b. A fixture having tap conductors as provided in Section 410-67.

c. Individual outlets, other than receptacle outlets, with taps not over 18 in. (457 mm) long.

d. Infrared lamp industrial heating appliances.

e. Nonheating leads of deicing and snow-melting cables and mats.

Exception No. 2: Fixture wires and cords as permitted in Section 240-4.

210-20. Overcurrent Protection.

Branch-circuit conductors and equipment shall be protected by overcurrent protective devices having a rating or setting complying with (a) through (d) below. ~~(not exceeding that specified in Section 240-3 for conductors, (2) not exceeding that specified in the applicable articles referenced in Section 240-2 for equipment, and (3) as provided for outlet devices in Section 210-21.~~

(a) Continuous and Noncontinuous Loads. Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly including the overcurrent devices protecting the branch circuit are listed for operation at 100 percent of their rating, neither the ampere rating of the overcurrent device nor the ampacity of the branch circuit conductors shall be less than the sum of the continuous load plus the noncontinuous load.

(b) Conductor Protection. Conductors shall be protected in accordance with Section 240-3.

Exception No. 1: Tap conductors as permitted in Section 210-19(d)~~(e)~~ shall be permitted to be protected by the branch-circuit overcurrent device.

Exception No. 2: Fixture wires and cords as permitted in Section 240-4.

~~(FPN): See Section 240-1 for the purpose of overcurrent protection and Sections 210-22 and 220-3 for continuous loads.~~

(c) Equipment. The rating or setting of the overcurrent protective device shall not exceed that specified in the applicable articles referenced in Section 240-2 for equipment.

(d) Outlet Devices. The rating or setting shall not exceed that specified in Section 210-21 for outlet devices.

210-21. Outlet Devices. - no changes

~~210-22. Maximum Loads.~~

The total load shall not exceed the rating of the branch circuit, and it shall not exceed the maximum loads specified in Sections 210-22(a) through (c) under the conditions specified therein.

~~(a) Motor-Operated and Combination Loads. Where a circuit supplies only motor-operated loads, Article 430 shall apply. Where a circuit supplies only air-conditioning equipment, refrigerating equipment, or both, Article 440 shall apply. For circuits supplying loads consisting of motor-operated utilization equipment that is fastened in place and that has a motor larger than 1/8 horsepower in combination with other loads, the total computed load shall be based on 125 percent of the largest motor load plus the sum of the other loads.~~

~~(b) Inductive Lighting Loads. For circuits supplying lighting units having ballasts, transformers, or autotransformers, the computed load shall be based on the total ampere ratings of such units and not on the total watts of the lamps.~~

~~(c) Other Loads. The rating of the branch-circuit overcurrent device serving continuous loads, such as store lighting and similar loads, shall be not less than the noncontinuous load plus 125~~

~~**percent of the continuous load. The minimum branch circuit conductor size, without the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load.**~~

~~*Exception: Circuits supplied by an assembly, together with its overcurrent devices, that is listed for continuous operation at 100 percent of its rating.*~~

~~**It shall be acceptable to apply demand factors for range loads in accordance with Table 220-19, including Note 4.**~~

210-21. Outlet Devices. - no changes

210-23. Permissible Loads.

In no case shall the load exceed the branch-circuit ampere rating. An individual branch circuit shall be permitted to supply any load for which it is rated. A branch circuit supplying two or more outlets or receptacles shall supply only the loads specified according to its size in (a) through (d) below and summarized in Section 210-24 and Table 210-24.

(a) 15- and 20-Ampere Branch Circuits. A 15- or 20-ampere branch circuit shall be permitted to supply lighting units, other utilization equipment, or a combination of both. The rating of any one cord- and plug-connected utilization equipment shall not exceed 80 percent of the branch-circuit ampere rating. The total rating of utilization equipment fastened in place shall not exceed 50 percent of the branch-circuit ampere rating where lighting units, cord- and plug-connected utilization equipment not fastened in place, or both, are also supplied.

Exception: The small appliance branch circuits, ~~and the~~ laundry branch circuits, and bathroom branch circuits required in a dwelling unit(s) by Sections 210-11(c)(1), (2), and (3) ~~220-4(b) and (c)~~ shall supply only the receptacle outlets specified in that section.

(b) 30-Ampere Branch Circuits. no changes

(c) 40- and 50-Ampere Branch Circuits. no changes

210-24. Branch-Circuit Requirements -- Summary. no changes

210-25. Common Area Branch Circuits. - no changes

C. Required Outlets

210-50. General. - no changes

210-52. Dwelling Unit Receptacle Outlets.

(a) General Provisions. - no changes

(b) Small Appliances.

(1) In the kitchen, pantry, breakfast room, dining room, or similar area of a dwelling unit, the two or more 20-ampere small appliance branch circuits required by Section 210-11(c)(1) ~~220-4(b)~~ shall serve all receptacle outlets covered by Sections 210-52(a) and (c) and receptacle outlets for refrigeration equipment.

Exception No. 1: In addition to the required receptacles specified by Section 210-52, switched receptacles supplied from a general-purpose branch circuit as defined in Section 210-70(a), Exception No. 1 shall be permitted.

Exception No. 2: The receptacle outlet for refrigeration equipment shall be permitted to be supplied from an individual branch circuit rated 15 amperes or greater.

(2) The two or more small appliance branch circuits specified in (b)(1) above shall have no other outlets.

Exception No. 1: A receptacle installed solely for the electrical supply to and support of an electric clock in any of the rooms specified above.

Exception No. 2: Receptacles installed to provide power for supplemental equipment and lighting on gas-fired ranges, ovens, or counter-mounted cooking units.

(3) Receptacles installed in the kitchen to serve countertop surfaces shall be supplied by not less than two small appliance branch circuits, either or both of which shall also be permitted to supply receptacle outlets in the kitchen and other rooms specified in Section 210-52(b)(1). Additional small appliance branch circuits shall be permitted to supply receptacle outlets in the kitchen and other rooms specified in Section 210-52(b)(1).

(c) Countertops. no changes

(d) Bathrooms. In dwelling units, at least one wall receptacle outlet shall be installed in bathrooms adjacent to each basin location. ~~Bathroom receptacle outlets shall be supplied by at least one 20-ampere branch circuit. Such circuits shall have no other outlets~~ See Section 210-8(a)(1).

Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops in a bathroom basin location.

(e) Outdoor Outlets. no changes

(f) Laundry Areas. no changes

(g) Basements and Garages. no changes

(h) Hallways. no changes

210-60. Guest Rooms. no changes

210-62. Show Windows. no changes

210-63. Heating, Air-Conditioning, and Refrigeration Equipment Outlet. no changes

210-70. Lighting Outlets Required. no changes

ARTICLE 215 -- FEEDERS

215-1. Scope.

This article covers the installation requirements, overcurrent protection requirements, ~~and~~ minimum size, and ampacity of conductors for feeders supplying branch-circuit loads as computed in accordance with Article 220.

Exception: Feeders for electrolytic cells as covered in Section 668-3(c), Exception Nos. 1 and 4.

215-2. Minimum Rating and Size.

(a) General. Feeder conductors shall have an ampacity not less than required to supply the load as computed in Parts B, C, and D of Article 220. The minimum feeder circuit conductor size, without the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly including the overcurrent devices protecting the feeder(s) are listed for operation at 100 percent of their rating, neither the ampere rating of the overcurrent device nor the ampacity of the feeder conductors shall be less than the sum of the continuous load plus the noncontinuous load.

Additional minimum sizes shall be as specified in (b), (c), and (d) below under the conditions stipulated.

~~**Feeder conductors shall have an ampacity not less than required to supply the load as computed in Parts B, C, and D. of Article 220. The minimum sizes shall be as specified in (a) and (b) below under the conditions stipulated. Feeder conductors for a dwelling unit or a mobile home need not be larger than service entrance conductors. Article 310, Note 3, Notes to Ampacity Tables of 0 to 2000 Volts, shall be permitted to be used for conductor size.**~~

(b) For Specified Circuits. The ampacity of feeder conductors shall not be less than 30 amperes where the load supplied consists of any of the following number and types of circuits: (1) two or more 2-wire branch circuits supplied by a 2-wire feeder; (2) more than two 2-wire branch circuits supplied by a 3-wire feeder; (3) two or more 3-wire branch circuits supplied by a 3-wire feeder; or (4) two or more 4-wire branch circuits supplied by a 3-phase, 4-wire feeder.

(c) Ampacity Relative to Service-Entrance Conductors. The feeder conductor ampacity shall not be less than that of the service-entrance conductors where the feeder conductors carry the total load supplied by service-entrance conductors with an ampacity of 55 amperes or less.

(d) Individual Dwelling Unit or Mobile Home Conductors. Feeder conductors for individual dwelling units or mobile homes need not be larger than service-entrance conductors. Article 310, Note 3, Notes to Ampacity Tables of 0 to 2000 Volts, shall be permitted to be used for conductor size.

(FPN No. 1): See Examples 1 through 10 in Chapter 9.

(FPN No. 2): Conductors for feeders as defined in Article 100, sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet does not exceed 5 percent, will provide reasonable efficiency of operation.

(FPN No. 3): See Section 210-19(a) for voltage drop for branch circuits.

215-3. Overcurrent Protection.

Feeders shall be protected against overcurrent in accordance with the provisions of Part A of Article 240. Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly including the overcurrent devices protecting the feeder(s) are listed for operation at 100 percent of their rating, neither the ampere rating of the overcurrent device nor the ampacity of the feeder conductors shall be less than the sum of the continuous load plus the noncontinuous load.

215-4. Feeders with Common Neutral. no changes

215-5. Diagrams of Feeders. no changes
215-6. Feeder Conductor Grounding Means. no changes
215-7. Ungrounded Conductors Tapped from Grounded Systems. no changes
215-8. Means of Identifying Conductor with the Higher Voltage to Ground. no changes
215-9. Ground-Fault Circuit-Interrupter Protection for Personnel. no changes
215-10. Ground-Fault Protection of Equipment. no changes
215-11. Circuits Derived from Autotransformers. no changes

ARTICLE 220 -- BRANCH-CIRCUIT, FEEDER, AND SERVICE CALCULATIONS

A. General

220-1. Scope.

This article provides requirements for ~~determining the number of branch circuits required and for~~ computing branch-circuit, feeder, and service loads.

Exception: Branch-circuit and feeder calculations for electrolytic cells as covered in Section 668-3(c), Exception Nos. 1 and 4.

220-2. Voltages. no changes

220-3. Computation of Branch Circuits Loads. Branch-circuit loads shall be computed as shown in (a) through (c) below.

~~(a) Continuous and Noncontinuous Loads. The branch circuit rating shall not be less than the noncontinuous load plus 125 percent of the continuous load. The minimum branch circuit conductor size without the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load.~~

~~Exception: Where the assembly, including overcurrent devices, is listed for continuous operation of 100 percent of its rating.~~

(a) Lighting Load for Specified ~~Listed~~ Occupancies. A unit load of not less than that specified in Table 220-3(~~ab~~) for occupancies specified ~~listed~~ therein shall constitute the minimum lighting load for each square foot (0.093 sq m) of floor area. The floor area for each floor shall be computed from the outside dimensions of the building, dwelling unit, or other area involved. For dwelling units, the computed floor area shall not include open porches, garages, or unused or unfinished spaces not adaptable for future use.

(FPN): The unit values herein are based on minimum load conditions and 100 percent power factor, and may not provide sufficient capacity for the installation contemplated.

(b) Other Loads -- All Occupancies. In all occupancies, the minimum load for each outlet for general-use receptacles and outlets not used for general illumination shall be not less than that computed in (1) through (10) below, ~~the following,~~ the loads shown being based on nominal branch-circuit voltages.

Exception: The loads of outlets serving switchboards and switching frames in telephone exchanges shall be waived from the computations.

(1) Specific appliances or loads. An ~~O~~outlet for a specific appliance or other load not covered in (2) through (9) below ~~except for a motor load~~ .....~~.~~shall be computed based on the ampere rating of appliance or load served.

(2) Electric Dryers and household electric cooking appliances. Load computations shall be permitted as specified ~~given~~ in Section 220-18 for electric dryers and Section 220-19 for electric ranges and other cooking appliances.

(3) Motor loads. Outlets for motor loads shall be computed in accordance with the requirements in ~~Articles 430~~ Sections 430-22 and 430-24 and Article 440. ~~(see Sections 430-22 and 430-24 and Article 440).~~

(4) Recessed lighting fixtures. An outlet supplying recessed lighting fixture(s) shall be computed based on the maximum volt-ampere rating of the equipment and lamps for which the fixture(s) is rated.

(5) Heavy duty lampholders. Outlets for heavy-duty lampholders shall be computed at a minimum of .....600 volt-amperes.

(6) Track lighting. Track lighting shall be computed based on Section 410-102. ~~(see Section 410-102)~~

(7) Sign and outline lighting. Sign and outline lighting outlets shall be computed at 1200 volt-amperes for each required branch circuit specified in Section 600-5(a).

(8) Show windows. Show windows shall be computed per Section 220-12.

(9) Fixed multioutlet assemblies. Fixed multioutlet assemblies used in other than dwelling units or the guest rooms of hotels or motels shall be computed in accordance with (a) or (b) below.

(a) Where appliances are unlikely to be used simultaneously, each 5 ft (1.52 m) or fraction thereof of each separate and continuous length shall be considered as one outlet of not less than 180 volt-amperes.

(b) Where appliances are likely to be used simultaneously, each 1 ft (305 mm) or fraction thereof shall be considered as an outlet of not less than 180 volt-amperes.

(10) Other outlets.~~*~~ ~~—~~Other outlets not covered in (1) through (9) above shall be computed based on 180 volt-amperes per outlet.

(a) For receptacle outlets, each single or each multiple receptacle on one strap shall be considered at not less than 180 volt-amperes.

(b) All general-use receptacle outlets of 20-ampere or less rating in one-family, two-family, and multi-family dwellings and in guest rooms of hotels and motels [except those connected to the receptacle circuits specified in Sections 210-11(c)(1) and (2)] shall be considered as outlets for general illumination, and are included in the general lighting load calculations of Section 220-3(a). No additional load calculations shall be required for such outlets.

(c)~~*~~ This provision shall not be applicable to receptacle outlets connected to the circuits specified in Sections 210-11(c)(1) and (2).~~220-4(b) and (c)~~

Exception No. 1: Where fixed multioutlet assemblies are employed, each 5 ft (1.52 m) or fraction thereof of each separate and continuous length shall be considered as one outlet of not less than 180 volt-amperes capacity unless appliances are likely to be used simultaneously. Where appliances are likely to be used simultaneously, each 1 ft (305 mm) or fraction thereof shall be considered as an outlet of not less than 180 volt-amperes. The requirements of this exception shall not apply to dwelling units or to the guest rooms of hotels or motels.

Exception No. 2: Table 220-19 shall be permitted for computing the load of household electric ranges.

Exception No. 3: A load of not less than 200 volt amperes per linear ft (305 mm) of show window, measured horizontally along its base, shall be permitted instead of the specified unit load per outlet.

Exception No. 4: The loads of outlets serving switchboards and switching frames in telephone exchanges shall be waived from the computations.

Exception No. 5: Section 220-18 shall be considered as a permitted method of computing the load for a household electric clothes dryer.

(c) Loads for Additions to Existing Installations. no changes

Table 220-3(a). General Lighting Loads by Occupancies

(at the bottom of Table 220-3(a) - revise the * footnote as follows:)

***See Section 220-3(b)(10)(b)~~-All general-use receptacle outlets of 20-ampere or less rating in one-family, two-family, and multifamily dwellings and in guest rooms of hotels and motels [except those connected to the receptacle circuits specified in Sections 220-4(b) and (c)[] shall be considered as outlets for general illumination, and no additional load calculations shall be required for such outlets.~~**

220-4. Maximum Loads. The total load shall not exceed the rating of the branch circuit, and it shall not exceed the maximum loads specified in (a) through (c) below under the conditions specified therein.

(a) Motor-Operated and Combination Loads. Where a circuit supplies only motor-operated loads, Article 430 shall apply. Where a circuit supplies only air-conditioning equipment, refrigerating equipment, or both, Article 440 shall apply. For circuits supplying loads consisting of motor-operated utilization equipment that is fastened in place and that has a motor larger than 1/8 horsepower in combination with other loads, the total computed load shall be based on 125 percent of the largest motor load plus the sum of the other loads.

(b) Inductive Lighting Loads. For circuits supplying lighting units having ballasts, transformers, or autotransformers, the computed load shall be based on the total ampere ratings of such units and not on the total watts of the lamps.

(c) Range Loads. It shall be acceptable to apply demand factors for range loads in accordance with Table 220-19, including Note 4. ~~220-4. Branch Circuits Required.~~

~~Branch circuits for lighting and for appliances, including motor operated appliances, shall be provided to supply the loads computed in accordance with Section 220-3. In addition, branch circuits shall be provided for specific loads not covered by Section 220-3 where required elsewhere in this Code; for small appliance loads as specified in (b) below; and for laundry loads as specified in (c) below..~~

~~(a) Number of Branch Circuits. The minimum number of branch circuits shall be determined from the total computed load and the size or rating of the circuits used. In all installations, the number of circuits shall be sufficient to supply the load served. In no case shall the load on any circuit exceed the maximum specified by Section 210-22~~

~~(b) Small Appliance Branch Circuits. Dwelling Unit. In addition to the number of branch circuits determined in accordance with (a) above, two or more 20 ampere small appliance branch circuits shall be provided for all receptacle outlets specified by Section 210-52 for the small appliance loads.~~

~~(c) Laundry Branch Circuits. Dwelling Unit. In addition to the number of branch circuits determined in accordance with (a) and (b) above, at least one additional 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s) required by Section 210-52(f). This circuit shall have no other outlets.~~

~~(d) Load Evenly Proportioned Among Branch Circuits. Where the load is computed on a volt-amperes per square foot (0.093 sq m) basis, the wiring system up to and including the branch circuit panelboard(s) shall be provided to serve not less than the calculated load. This load shall be evenly proportioned among multioutlet branch circuits within the panelboard(s). Branch-circuit overcurrent devices and circuits need only be installed to serve the connected load.~~

~~(FPN): See Examples 1(a), 1(b), 2(b) and 4(a), Chapter 9.~~

B. Feeders and Services

220-10. General.

(a) ~~Ampacity and~~ Computed Loads. ~~Feeder conductors shall have sufficient ampacity to supply the load served. In no case shall the~~ The computed load of a feeder shall not be less than the sum of the loads on the branch circuits supplied as determined by Part A of this article after any applicable demand factors permitted by Parts B, C, or D have been applied.

(FPN): See Examples 1 through 10, Chapter 9. See Section 220-4(b) ~~210-22(b)~~ for maximum load in amperes permitted for lighting units operating at less than 100 percent power factor.

~~(b) Continuous and Noncontinuous Loads. Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125 percent of the continuous load. The minimum feeder circuit conductor size, without the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load.~~

~~Exception: Where the assembly including the overcurrent devices protecting the feeder(s) are listed for operation at 100 percent of their rating, neither the ampere rating of the overcurrent device nor the ampacity of the feeder conductors shall be less than the sum of the continuous load plus the noncontinuous load.~~

220-11. General Lighting. The demand factors specified ~~listed~~ in Table 220-11 shall apply to that portion of the total branch-circuit load computed for general illumination. They shall not be applied in determining the number of branch circuits for general illumination.

220-12. Show-Window Lighting. no changes

220-13. Receptacle Loads -- Nondwelling Units. In other than dwelling units, receptacle loads computed at not more than 180 volt-amperes per outlet in accordance with Section 220-3(b)(10) ~~220-3(c)(7)~~ and fixed multi-outlet assemblies computed in accordance with Section 220-3(b)(9) shall be permitted to be added to the lighting loads and made subject to the demand factors given in Table 220-11, or they shall be permitted to be made subject to the demand factors given in Table 220-13.

220-14. Motors. - no changes

220-15. Fixed Electric Space Heating. - no changes

220-16. Small Appliance and Laundry Loads -- Dwelling Unit.

(a) Small Appliance Circuit Load. In each dwelling unit, the feeder load shall be computed at 1500 volt-amperes for each 2-wire small appliance branch circuit required by Section 210-11(c)(1)~~220-4(b) for small appliances supplied by 15 or 20 ampere receptacles on 20 ampere branch circuits in the kitchen, pantry, dining room, and breakfast room.~~ . Where the load is subdivided through two or more feeders, the computed load for each shall include not less than 1500 volt-amperes for each 2-wire small appliance branch circuit~~.for small appliances.~~ These loads shall be permitted to be included with the general lighting load and subjected to the demand factors provided ~~permitted~~ in Table 220-11~~. for the general lighting load.~~

(b) Laundry Circuit Load. A feeder load of not less than 1500 volt-amperes shall be included for each 2-wire laundry branch circuit installed as required by Section 210-11(c)(2)~~220-4(c)~~. This load shall be permitted to be included with the general lighting load and subjected to the demand factors provided in Table 220-11. ~~It shall be permissible to include this load with the genial lighting load and subject it to the demand factors provided in Section 220-11.~~

220-17. Appliance Load -- Dwelling Unit(s). - no changes

220-18. Electric Clothes Dryers -- Dwelling Unit(s). - no changes

220-19. Electric Ranges and Other Cooking Appliances -- Dwelling Unit(s). - no changes

220-20. Kitchen Equipment -- Other than Dwelling Unit(s). - no changes

220-21. Noncoincident Loads. - no changes

220-22. Feeder Neutral Load. - no changes

C. Optional Calculations for Computing Feeder and Service Loads - no changes

D. Method for Computing Farm Loads no changes

SUBMITTER: Robert H. Keis, Dover, DE

RECOMMENDATION: Remove the word "basin" in the following sentence.

Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops in a bathroom basin location.

SUBSTANTIATION: There is just as much chance for spillage on the work surfaces in a bathroom without a basin as there is a work surface with a basin. This corrected wording can be found in the present Section 210-52(c)(5) for kitchen sinks and in new proposal 2-216 concerning wet bar sinks. Section 550-8(f)(2) prohibits a faceup outlet in any countertop as does 551-41(d). The only countertop you can put a face-up receptacle in is in a dwelling bathroom if it doesn't have a basin in it. This should not be considered new material as this section is in the process of a rewrite.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action on Proposal 2-53. This addresses the submitter's concern for bathroom work surfaces.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #CP209)

2- 178a - (210-52(d)): Accept

SUBMITTER: CMP 2

RECOMMENDATION: Delete the last phrase "See section 210-8(a)(1)" from Section 210-52(d).

SUBSTANTIATION: The panel has eliminated the mandatory cross-reference to comply with the Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #3052)

2- 180 - (210-52(d)): Reject

SUBMITTER: Dwayne A. Gunnels, Clio, MI

RECOMMENDATION: Delete the second sentence:

~~The receptacle outlet shall be located on a wall that is adjacent to the basin location.~~

SUBSTANTIATION: The interpretation of the word adjacent is not clear. Locating the receptacle within 36 in. of the edge of the basin is sufficient. Frequently a large mirror is covering the wall in front of the basin. This is not a practical location for the receptacle. It should be possible to install on any wall as long as it is within 36 in. of the basin.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel had many public comments on this issue during the last code cycle. The word "adjacent" is defined in the dictionary to mean "next to". The objective is to not allow the receptacle on the wall in front of the basin (behind the user) and still meet the 36 in. requirement. This was the noted concern from submitters during the last code cycle.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #3192)

2- 181 - (210-52(d)): Reject
SUBMITTER: William J. Miner, Saginaw, MI
RECOMMENDATION: In the second line after the words "36 in." add the words measured horizontally so the section will read:
"... shall be installed in bathrooms within 36 in. (914 mm) measured horizontally of the...".
SUBSTANTIATION: In cases of large mirrors or tile walls where it isn't practical to place a receptacle, a person should be ~~able~~permitted to place the receptacle at any vertical point within 36 in. horizontally. The code isn't clear on whether the distance is horizontal vertical or shortest distance.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement is that the receptacle be within 36 in. The Code is clear as the distance is to be the shortest distance where no other requirement is applicable. This prohibits installing receptacles at heights where they are impractical and could impose potential hazards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3252)

2- 182 - (210-52(d)): Reject
SUBMITTER: Michael R. Fisher, Bluhm Electric Inc.
RECOMMENDATION: Revise text to read as follows:
"Bathrooms. In dwelling units, at least one wall receptacle outlet shall be installed in bathrooms, within ~~36 in. (914 mm)~~ the countertop it serves. The receptacle outlet for a single hung sink shall be located on a wall adjacent to the basin location. See Section 210.8(a)(1).
Receptacle outlets shall not be installed in face up position in the work surfaces or countertops of bathroom basin location."
SUBSTANTIATION: Within 36 in. of basin, we now have longer countertops, so the receptacles then is placed on the mirror or to the shallow side of the basin. If placed in mirror surface it becomes a problem for mirror installer to cut the proper hole size, which means we need to use sparkings and becomes difficult to use a GFCI receptacle, also the receptacles when mirror is cleaned is being constantly sprayed, which can cause a safety issue inside receptacles, and when placed on close, side of sink, you are always dragging your cord over the basin - a potential safety hazard. There appears that most of the appliances used in the bathroom, they do not need to be within 3 in. of basin for use.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel notes that the submitter's substantiation primarily concerns installation in a mirrored wall. If this is the desired location by the designer (or installer) there are many acceptable methods of installing the receptacle safely. The submitter's proposal would limit the number of alternatives available to meet the code requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3864)

2- 183 - (210-52(d)): Accept
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Delete the existing second paragraph of this Section as shown:
"~~Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops in a bathroom basin location.~~
SUBSTANTIATION: This is a companion proposal to one that intends to locate this requirement in Section 210-7 so it will apply to all dwelling unit receptacle outlets.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action and statement on Proposal 2-53.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3926)

2- 184 - (210-52(d)): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Add the following text to this section:
(d) Bathrooms. In dwelling units, at least one wall receptacle outlet shall be installed in bathrooms located above, but not more than 18 in. above the basin, and within 36 in. (914 mm) of the outside edge of each basin. The receptacle outlet shall be located on a wall that is adjacent to the basin location. See Section 210-8(a)(1).
SUBSTANTIATION: Section 210-52(c) Countertops (5) Receptacle Outlet Location is distinctive in locating outlets to serve a function be above the location to be served. In many other areas of the code both vertical and horizontal restrictions are established. Following that logic the same requirements for bathroom receptacles would be well served to be included in the 2002 Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements in Section 210-52(d) meet the intent of the panel for the receptacle location, and no more restrictive placement is warranted based on the substantiation provided by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BROWN: See my Comment on Affirmative on Proposal 2-174.

(Log #3945)

2- 185 - (210-52(d) (New)): Reject
SUBMITTER: Bill Voisinet, Laingsburg, MI
RECOMMENDATION: Add a new paragraph as follows:
(d) All open wall spaces not covered by the opening of a door.
SUBSTANTIATION: In rooms specified in 210-52(a) the spacing for receptacles should not be measured from the entrance of the room. The space behind the swing of the door is unusable space. In all cases of which I have experienced, no one has ever questioned measuring off the end of a door swing for the six foot rule.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-156. The panel notes that measuring from the end of the door swing does not meet the intent of the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4112)

2- 186 - (210-52(d)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: Delete the last sentence of the section.
SUBSTANTIATION: The word "adjacent" is confusing to many inspectors and installers. Frequently it is easier to install the receptacle on an adjoining wall when a full length mirror in on the wall in front of the basin.
PANEL ACTION: Reject.
PANEL STATEMENT: The word "adjacent" is necessary to avoid placing the receptacle on the wall behind the user. See also the panel statement on Proposal 2-180.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4113)

2- 187 - (210-52(d)): Reject
SUBMITTER: Robert Fick, Michigan State University
RECOMMENDATION: Add the words measured horizontally after the 36 in. so the section will read as follows:
"...shall be installed in bathrooms within 36 in. (914 mm) measured horizontally of the outside edge of the basin."
SUBSTANTIATION: It is not specified how the measurement is to be made. The measurement needs to be horizontal because tile or a mirror is frequently installed in front of the basin making it difficult to locate the receptacle other than measured horizontally.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-181.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4366)

2- 188 - (210-52(d)): Reject
SUBMITTER: Ed Stubbs, City of Atlanta, GA
RECOMMENDATION: Revise text as follows:
210-52. Dwelling Unit Receptacle Outlets. (Add to text)
(d) Bathrooms. In dwelling units, at least one wall receptacle outlet shall be installed in bathrooms within 36 in. (914 mm) of the outside edge of each basin. The receptacle outlet shall be located on a wall that is adjacent to the basin location. (Adjacent in this code shall be located above the basin if the basin is mounted in a wall to wall basin top or cabinet supporting the basin.) See Section 210-8(a)(1).
(Add to text) Exception No. 1: If the basin has a base only, the receptacle outlet shall be no lower than 12 in. (____ mm) below the basin edge and shall include the maximum of 36 in. (914 mm) away from the basin edge.
(Add to text) Exception No. 2: If the basin has a cabinet support and basin top; and is separated from a side wall, the receptacle outlet shall be no lower than 12 in. (____ mm) below the basin edge and shall include the maximum of 36 in. (914 mm) away from the basin edge.
SUBSTANTIATION: Making the requirement of 36 in. from the basin edge allows the contractor/owner to place the receptacle in the baseboard of the adjacent wall since you didn't specify a height requirement. Most of your bathroom basins are 30 in. above the floor. If you don't specify a height, they have and will put the outlet in the baseboard and some have moved it in the base of the cabinet of the basin. Well, isn't that within 36 in. of the basin? What is the intent? The code forces the owners to have a receptacle in the bathroom, but allows them to put it out of reach close to the floor and then forces others to get an extension cord because the equipment cord is to short to dry your hair. Are we not defeating the intent? A direction is needed to remove the debate on the location of the outlet. As an Inspector I am forced to debate with homeowners on the outlet height. Now the next issue is "what is a powder room?"
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-184.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #534)

2- 189 - (210-52(e)): Reject
SUBMITTER: John M. Vargo, City of Lorain, OH
RECOMMENDATION: Revise as follows:
For a one-family dwelling, each unit of a two-family dwelling and each (dwelling unit in "row" housing) that is at grade level, etc.
SUBSTANTIATION: Dwelling units in "row" housing should be included in 210-52(e) as per the 1999 NEC Handbook Figure 210.28. The one-family dwelling in Figure 210.28 must be changed to dwelling unit because it is a definition contradiction.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's description of row housing is not clear. Each house would be a one-family dwelling (constructed in accordance with the definition to be separate buildings), and would require a receptacle in front and back. If the "row houses" were actually units of a multi-family dwelling (multiple units in a single building) the requirement for receptacles in front and back would not be applicable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BROWN: The substantiation of the submitter noting the problems in the definitions in the NEC is well founded. The Technical Correlating Committee should take action to revise existing definitions, and also include new definitions that would better relate the requirements of the NEC to those found in the model building codes, and the documents of the NFPA family of codes and standards. With jurisdictions now adopting a "single correlated set" of construction codes for the built environment, this will increasingly become an issue of importance.

(Log #2020)

2- 189a - (210-52(e)): Reject
SUBMITTER: Jerry Knoerr, Village of Greendale, Village of Mukwonago, WI
RECOMMENDATION: Add sentence that an outdoor outlet be provided within 3 ft of all patio doors that exit to the ground level.
SUBSTANTIATION: There are frequently no outlets for people to use on a patio.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation to change the basic rule that requires a receptacle in the front and back of the dwelling unit. The substantiation indicates that the submitter is concerned with a convenience issue that must be dealt with by the designer.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2506)

2- 190 - (210-52(e)): Reject
SUBMITTER: Angelo S. Sperlongo, City of Coral Springs, FL
RECOMMENDATION: Revise as follows:
For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet accessible at grade level and not more than 6 1/2 ft above grade shall be installed at the front and back of the dwelling, the receptacle shall be installed outside of any enclosure added to back of the dwelling.
SUBSTANTIATION: To prevent the use of extension cords being run through doors and windows to get outside an enclosure. Many times an inground pool is added to a dwelling with an enclosure. The receptacle that was originally installed at back of dwelling is not accessible to backyard. I have witnessed extension cords run across a pool to get outside the enclosure.
PANEL ACTION: Reject.
PANEL STATEMENT: The code language requires that the receptacle be "accessible at grade level". If the user has to go inside an "enclosure" to get to the receptacle, then it is not accessible at grade level. The panel cannot anticipate what alterations might be made to the structure at a later date that might change the application of the rule.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2754)

2- 191 - (210-52(e)): Reject
SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.
RECOMMENDATION: Revise as follows:
(e) Outdoor Outlets. For a one-family dwelling, and each unit of a two-family dwelling that is at grade level. ~~at least one~~.
(a) Receptacle outlet accessible at grade level and not more than 6 1/2 ft above grade shall be installed ~~at~~ to serve the front and back of the dwelling.
SUBSTANTIATION: The word at limits the installers options. As long as the outlet is located to serve the front and back such a definite location need not be given. If the intent of the code be one receptacle at each front and back the wording "~~at least one~~" "receptacle" should be deleted.
PANEL ACTION: Reject.
PANEL STATEMENT: The word "at" is used in this section to avoid the argument that a single receptacle installed on the side of the house serves both the front and back.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3159)

2- 192 - (210-52(e)): Reject
SUBMITTER: Richard Kownacki, Totowa, NJ
RECOMMENDATION: Add the following text:
Outdoor receptacle outlets shall not be installed less than 12 in. above finished grade.

SUBSTANTIATION: Currently, there is no minimum height requirement for outdoor receptacles. I have seen many receptacles installed only an inch or two above the ground, and some even lower. This close proximity to the ground virtually insures that water will enter the outlet box. Weatherproof receptacle covers are designed to prevent water from entering from above (rain), they do not effectively protect from water splashing upward from below, as from a heavy rain. Also, a few inches of wet snow can effectively place a receptacle under water.
Safety concerns: In dwelling units, receptacle replacement is commonly done by the homeowner or a handyman, usually, unqualified personnel. To replace a receptacle mounted in a box an inch off the ground and make wiring repairs, it is usually necessary to lie down on the ground. The ground is likely to be damp, there may or may not be any ground fault protection, and the circuit may or may not be energized. The hazards of these situations can be greatly reduced by establishing a minimum mounting height for outdoor receptacles. Twelve inches would seem to be a reasonable height.
PANEL ACTION: Reject.
PANEL STATEMENT: There are proper methods and materials that can be used to locate a receptacle in close proximity to the ground. The panel does not want to restrict the use of these materials. Listed wet location covers are evaluated for water splashing up from below.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4399)

2- 193 - (210-52(e)(1) (New)): Reject
SUBMITTER: Monte R. Ewing, State of Wisconsin
RECOMMENDATION: Add new text to read as follows:
(1) In multi-family dwellings at least one receptacle outlet accessible at grade level and not more than 6 ft 6 in. above grade shall be installed outdoors for each dwelling unit which is located at grade level and which has individual entrance/exit doors to grade.
SUBSTANTIATION: The same problem of people running cords through the exterior door exists for the grade level multi-family dwelling units as does the single- and two-family dwelling units (car heaters, radios, etc.). Keep in mind that there are lots of condominiums utilized as single family having to perform their own yard maintenance but the NEC does not require any exterior receptacles because these buildings are multi-family. The State of Wisconsin has had this requirement in their code for over three NEC code cycle now and I feel it needs to be addressed by the National Electrical Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is not compelled by the limited substantiation that the rule should be applied to all dwelling units. In multi-family arrangements, issues associated with receptacle use only by the owner, and other abuses, can lead to other hazards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1142)

2- 194 - (210-52(g) and 210-63): Reject
SUBMITTER: James A. Perkins, City of Rochester, NH
RECOMMENDATION: Revise 210-52(g) to read:
210-52(g) Basements and Garages. For a one-family dwelling, at least one receptacle outlet, in addition to any provided for laundry equipment, shall be installed in each basement and in each attached garage, and in each detached garage with electric power. See Sections 210-8(a)(2) and (a)(5). Where a portion of the basement is finished into a habitable room(s) the receptacle outlet required by this section shall be installed in the unfinished portion.
FPN: See Section 210-63 Requirement for installation of heating equipment service receptacle outlet in basements.
Revise 210-63 to read:
210-63. Heating, Air-Conditioning, and Refrigeration Equipment Outlet. A 125-volt, single phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning, and refrigeration equipment on rooftops, in attics, basements and crawl spaces. The receptacle shall be located on the same level and within 25 ft (7.62 m) of the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.
Exception: Rooftop equipment on one- and two-family dwellings.
FPN: See Section 210-8 for ground-fault circuit-interrupter requirements.
SUBSTANTIATION: During my inspections of many large new homes, I have found many to be in excess from 50 ft to 75 ft from the boilers (heating equipment) to the nearest basement receptacle outlet. I do believe that a service outlet in the heating equipment area of the basement could possibly eliminate later servicing hazards. Also, in commercial areas.
PANEL ACTION: Reject.
PANEL STATEMENT: Since the present code already requires a receptacle in the basement, the addition of language to specify the distance serves little purpose. The panel does not see any hazard presented if the receptacle in the basement is 50 ft. away. In the 210-63 locations, the distance is specified because the receptacle's sole purpose was to provide power for servicing in attics, rooftops, and crawl spaces.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2432)

2- 195 - (210-52(g)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Revise text to read as follows:
"For a one-family dwelling, at least one receptacle outlet, in addition to any provided for laundry equipment, shall be installed in each basement and in each attached garage, and in each detached garage with electric power. Garage outlets shall be mounted 18 in. above the floor."
SUBSTANTIATION: With the numerous amounts of equipment using gas lawn mowers, 4 wheel buggies, motorcycles, etc. and the use of plug operated tools to work on these vehicles. The same reasons for receptacles in commercial garages should be applied to residential.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no substantiation to require the 18 in. limitation. In commercial garages, the area up to 18 in. above the floor is considered to be a Class 1 Division 2 location. Garages in dwelling units are not classified areas.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3792)

2- 196 - (210-52(g)): Accept
SUBMITTER: John I. Williamson, Minnesota Board of Electricity
RECOMMENDATION: Modify the wording in the last sentence to read as follows:
"Where a portion of the basement is finished into one or more habitable rooms, each separate unfinished portion shall have a receptacle outlet installed in accordance with this section."
SUBSTANTIATION: Very often, basements that are finished into habitable rooms result in more than one discontinuous unfinished area. These unfinished areas may be widely separated at opposite ends of a basement. It does not create an undue hardship to require a receptacle outlet in each separate unfinished area. This new requirement, together with the requirement for GFCI protection, will help to increase life safety when portable tools and other cord- and plug-connected equipment is used in damp unfinished basement areas that may pose a higher risk of electric shock.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3398)

2- 197 - (210-52(h)): Reject
SUBMITTER: Donald Kuntz, Denton Electric

RECOMMENDATION: Revise text to read as follows:
"In dwelling units, hallways and clothes closets of 10 ft or more in length shall have at least one receptacle outlet."
SUBSTANTIATION: Closets of this size could use an outlet for many of the same reasons a hallway does, mainly for vacuum.
PANEL ACTION: Reject.
PANEL STATEMENT: The desire to have a receptacle in a clothes closet is a design issue and should not be required in all installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1875)

2- 198 - (210-55 (New)): Reject
SUBMITTER: Ivan Sucic, City of Willoughby Hills, OH
RECOMMENDATION: I propose the following new section to be added to the NEC under Article 210, Branch Circuits. (This is a direct quote from the International One- and Two-Family Dwelling Code 1998 - Section 316.)
Section 210.55 — Dwelling Unit Smoke Detectors.
210.71 Smoke detectors required. Smoke detectors shall be installed in each sleeping room, outside of each separate sleeping area in the immediate vicinity of the bedrooms and on each additional story of the dwelling, including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels, a smoke detector needs be installed only on the upper level, provided the lower level is less than one full story below the upper level, except that if there is a door between levels, then a detector is required on each level. All detectors shall be interconnected such that the actuation of one alarm will activate all the alarms in the individual unit and shall provide an alarm which will be audible in all sleeping areas. All detectors shall be approved and listed and shall be installed in accordance with the manufacturer's instructions.
210.55.1 Alterations, repairs and additions. When alterations, repairs or additions requiring a permit occur, or when one or more sleeping rooms are added or created in existing dwellings, the entire building shall be provided with smoke detectors located as required for new dwellings; the smoke detectors shall be interconnected and hard wired.
Exception: Detectors shall not be interconnected and hard wired where the alterations, repairs or additions do not result in the exposure of electrical wiring by the removal of interior wall and ceiling finishes.
210.55.2 Power source. In new construction, the required smoke detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke detectors shall be permitted to be battery operated when installed in existing buildings or in buildings without commercial power or in buildings that undergo alterations, repairs or additions regulated by Section 316.1.1.
SUBSTANTIATION: At the present time smoke detector installations are required by Building Codes, but such installations are generally done by electrical contractors. Often these electrical contractors are bidding on jobs only per minimum requirements of the NEC. They base their bids on these minimum requirements and seldom refer to any building codes. If a building contractor or other subcontractor does not include smoke detectors in their bid specifications, the electrical contractor does not include them in their bid and does not do such installations.
In larger communities where there are separate electrical and building inspectors, the electrical inspector inspects only those items required by the NEC. The building inspector inspects per building codes. This leaves the installation of smoke detectors in limbo. There is confusing as to which inspector must approve or disapprove installations. Even in communities where one inspector does all inspections, the inspector is left with a problem of who to cite for any violations regarding smoke detectors, the electrical contractor or the general contractor.
Smoke detectors are electrical installations not required by NEC but are required only under building codes. If a requirement mandating installation of smoke detectors were included in the NEC as well as the building codes it would remove the ambiguity and confusion of responsibility.
PANEL ACTION: Reject.
PANEL STATEMENT: The placement of smoke detectors is covered by NFPA 101, The Life Safety Code. The NEC does provide guidance on how to get power to the detector, but requirements for the detector locations are not under the scope of the NEC. See NEC Section 90-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BROWN: The submitter has submitted a proposal for the location and installation of smoke alarm devices, not one of the safety concerns of the electrical installation as found in the NEC. As noted by the submitter, the concerns for when smoke alarms are required are already outlined in the model building codes, and NFPA 101 - Life Safety Code. NFPA 72 - Fire Alarm Code, addresses the requirements of the installation of the smoke alarms when they are required. All things considered, if the electrician installs the electrical wiring and locates the alarm relative to the ceiling or wall in accordance with the instructions included with the listed smoke alarm, one need only be aware of which rooms require the installation of an alarm.

(Log #3236)

2- 199 - (210-60): Reject
SUBMITTER: Edward J. Fox, Jr., Orange County Bldg Div., FL
RECOMMENDATION: 210-60. Guest Rooms. Guestrooms in hotels, motels, and similar occupancies shall have receptacle outlets installed in accordance with Section 210-52. See Section 210-8(b)(1).
(b) Receptacle Placement. In applying the provisions of Section 210-52(a), the total number of receptacle outlets shall not be less than the minimum number that would comply with the provisions of that section by using 210-52(a)(1) guidelines only, excluding 210-52(a)(2) and (3).
SUBSTANTIATION: By excluding 210-52(a)(2) and (3) requirements, you are only measuring the total length of wall space in an area for a room whether it is including a door, movable panel, or short wall space. You are only concerned with the entire length of wall space.
I have seen many large hotel rooms that require far too many receptacles for hotel rooms due to doors, partitions, wall cut outs and configurations. When the furniture is fixed in place, basically the owners define the areas. When you have a fixed furniture layout, you know how and what uses the room is designed for, and you can design for that and not over design.
PANEL ACTION: Reject.
PANEL STATEMENT: Experience has shown that reducing the application of the rule would increase the use of extension cords in guest rooms.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2811)

2- 200 - (210-60, Exception (New)): Reject
SUBMITTER: Bud Swathwood, Bud Swathwood Consulting
RECOMMENDATION: Add an exception to read:
Exception: Where the bed is permanently fastened to the motel room wall a receptacle(s) shall not be required.
SUBSTANTIATION: Many motels are permanently fastening the bed headboard to the wall. It is almost impossible to plug a cord into the receptacle(s) that are in the area of the headboard. A person would have to lay down on the floor and reach under the bed to do so. With the requirement of having a "suitable cover" on the outlet further makes it difficult to use the outlet.
PANEL ACTION: Reject.
PANEL STATEMENT: A receptacle behind the bed is not required, but where installed, a "suitable guard" is required to protect the receptacle.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP204)

2- 201a - (210-60(a)): Accept

SUBMITTER: CMP 2
RECOMMENDATION: Delete "See Section 210-8(b)(1)." in the last sentence of the existing code.
SUBSTANTIATION: To comply with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #295)

2- 201 - (210-60(a)): Reject
SUBMITTER: David Burger, Peninsula Engineering, Inc.
RECOMMENDATION: Revise 210-60(a) to read as follows:
Guest rooms in hotels, motels, and similar occupancies shall have receptacle outlets in accordance with Section 210-52. See Section 210-8(b)(1).
Exception: In multi-room suites, wall spaces 3 ft 0 in. or less in length, entry hall spaces and similar uninhabitable space shall not be used in figuring receptacles required.
SUBSTANTIATION: Following 210-52 to the letter on hotels and motels that have extended stay suites, results in an unjustifiably high receptacle count. These are not homes subject to moving and added furniture, all equipment needing power gets power as directed by the furniture layout. The engineer knows where power is needed in these facilities, in a house they don't.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-199.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2053)

2- 202 - (210-60(b)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a new paragraph to Section 210-60(b) to read as follows:
(b) Receptacle Placement. In applying the provisions of Section 210-52(a), the total number of receptacle outlets shall not be less than the minimum number that would comply with the provisions of that section. These receptacle outlets shall be permitted to be located conveniently for permanent furniture layout. At least two receptacle outlets shall be readily accessible. Where receptacles are installed behind the bed, the receptacle shall be located to prevent the bed from contacting any attachment plug that may be installed, or the receptacle shall be provided with a suitable guard.
The two receptacles required to be readily accessible shall be located so that other room electrical equipment shall not utilized these outlets (such as TV's, lamps, and vibrating beds). One these receptacles shall be located adjacent to the telephone outlet, and the other readily accessible required receptacle shall be located within 5 ft (1.5 m) of the bed headboard.
SUBSTANTIATION: The location of these two receptacles are critical for the following reasons:
1. The business traveler now carries many different electronic devices-such as cell phone chargers, laptop computers with telephone connection requirements, portable printers, portable scanners, palm top organizers, and other electronic devices which require power to operate or to charge batteries.
2. Many physical disabled or medical impaired individuals traveling today require readily accessible power near the bed headboard to operate life support electrical equipment. Oxygen generators, respiratory breathing equipment, heart monitoring equipment, and other medical devices which require power to operate while the guest stays overnight or longer.
3. Power is also required to charge electrical wheel chairs.
4. Presently these people are checking into guest rooms with long extension cords and multiple plug aps to accommodate all these different devices.
PANEL ACTION: Reject.
PANEL STATEMENT: The present requirement that at least two of the receptacle outlets be readily accessible will provide for sufficient access by the occupant of the room.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3237)

2- 203 - (210-60(b)): Reject
SUBMITTER: Edward J. Fox, Jr., Orange County Bldg Div., FL
RECOMMENDATION: 210-60(b) Receptacle Placement. In applying the provisions of Section 210-52(a), the total number of receptacle outlets shall not be less than the minimum number that would comply with the provisions of that section. These receptacle outlets shall be permitted to be located conveniently for permanent furniture layout. At least three receptacle outlets shall be readily accessible, with one located adjacent to each side of each bed in that room, and one located adjacent to a desk or like furniture.
SUBSTANTIATION: By requiring one receptacle outlet to be located adjacent to each side of each bed and one located adjacent to a desk, or a like furniture, there would be adequate receptacles to use for portable computers, sleep apnea equipment, and other small appliances used by people who travel a lot.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-202.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2423)

2- 204 - (210-61 (New)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Add a Section 210-61 to read:
"All bathrooms are required to have at least one 120 volt receptacle - see Section 210-8(b)(1)."
SUBSTANTIATION: Bathrooms in other than dwelling units are being used for all sorts of uses such as hairstyling, shaving, portable heaters, floor cleaning equipment, etc. When there is no outlet in the bathroom a cord is run in through the door. When the door is metal it rubs the cord and energizes the door, creating a hazard of electric shock when the door gets opened while still touching the plumbing (sink). I've witnessed this problem in three instances. Two were in restaurant bathrooms where people traveling brought their own extension cord and ran it through the door creating this hazard. Although the owners of these bathrooms don't want people using their electricity it would still be cheaper than a lawsuit.
PANEL ACTION: Reject.
PANEL STATEMENT: Given the wide variety of nondwelling related bathrooms and their use, the decision to place a receptacle outlet in the bathroom is that of the designer and must be considered on a case-by-case basis.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3310)

2- 205 - (210-61 (New)): Reject
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Add a new section to read as follows:
210-61. Child Care. In child care areas such as day care centers, preschools, elementary schools and similar areas where children have access to receptacles, all 15- and 20 ampere, 125-volt receptacles shall be listed tamper resistant receptacles.
SUBSTANTIATION: Section 517-18(c) recognizes the hazard of children inserting conductive objects into receptacles in pediatric care areas. In the areas referred to in the proposal, children have ready access to receptacles and the same hazard exists. Adoption of the requirement for tamper resistant receptacles in pediatric care areas served to protect children from electrical shock. This same level of protection should be required wherever children are normally present for extended periods.
PANEL ACTION: Reject.
PANEL STATEMENT: Tamper resistant receptacles are not the sole method by which such protection can be provided. There are tamper resistant covers or inserts available. Proper child supervison is also necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #313)

2- 206 - (210-63): Reject
SUBMITTER: Victor V. Timpanaro, Rep. Municipal Electrical Inspectors Assoc. of NJ, Inc.
RECOMMENDATION: Revise third sentence in 210-63 to read as follows:
The receptacle outlet shall not be connected to the line or load

side of the equipment disconnecting means when the branch circuit rating is greater than 20 amperes.
SUBSTANTIATION: This will prevent tap conductors from being installed on supply side of HVAC branch circuit conductors where their rating exceeds 20 amps. Since these are not feeder conductors, taps are not permitted here and the new language would prevent inspectors and installers from concluding that the receptacle outlet may be installed on the line side.
This language also would permit the receptacle outlet to be installed on line side of disconnecting means when conductors are rated 20 amperes or less, thereby having overcurrent protection by the branch circuit OCPD.
PANEL ACTION: Reject.
PANEL STATEMENT: 210-19(d) already addresses the issue of concern stated by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #398)

2- 207 - (210-63): Reject
SUBMITTER: Peter Garthwaite, Garthwaite & Green Inc.
RECOMMENDATION: Revise 210-63 to read as follows:
A 125 volt single-phase 15- or 20 ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air conditioning, and refrigeration equipment on rooftops and in attics, cellars and crawl spaces.
SUBSTANTIATION: In New England (Maine) many old houses do not have any receptacles in the cellar. Thus servicing or repairing a heating system in the middle of a cold night and plugging a drop light into light adaptor is unsafe and takes time. In many new houses, the heating system is set off in a utility room in the cellar where the rest of the cellar is finished and separated thus there is not a receptacle within the area or within 25 ft.
PANEL ACTION: Reject.
PANEL STATEMENT: The cellar is considered to be a basement and is covered by 210-52(g), which requires at least one receptacle outlet.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1687)

2- 208 - (210-63): Reject
SUBMITTER: Harold R. Endean, III, Township of Montville, NJ
RECOMMENDATION: After the following words... "on rooftops and in attics and crawl spaces."
Then add: "and outside HVAC equipment." Ground fault protection is required when receptacle is outside as required by Section 210-8(a)(3).
SUBSTANTIATION: I feel there should be a receptacle within 25 feet of all HVAC equipment. Especially the air compressors that are located outside of a dwelling. Whenever a repairperson comes to fix the equipment there is never an outlet nearby. Then the person would open up a window and plug into a receptacle inside the house. Therefore the person could be outside working on an air compressor without the benefit of ground fault protection. BOCA mechanical states that a receptacle must be located within 75 feet of an appliance. However, I feel that this is too far away. I believe that 25 feet would be a more safe distance for anyone working on HVAC equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: 210-52(e) requires outside receptacles at the front and rear of dwellings that could be used for HVAC servicing.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1904)

2- 209 - (210-63): Reject
SUBMITTER: Michael L. Simmons, Simmons Electric Co.
RECOMMENDATION: Revise as follows:
"210-63. Heating, Air-Conditioning, and Refrigeration Equipment Outlet. A 125-volt, single-phase, 15- or 20- ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning, and refrigeration equipment ~~on rooftops and in attics and crawl spaces~~. The receptacle shall be located on the same level and within 25 feet (7.62m) of the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.
~~Exception: Rooftop equipment on one and two family dwellings.~~

FPN: See Section 210-8 for ground-fault circuit-interrupter requirements."
SUBSTANTIATION: Background: A very hazardous situation exists in the servicing of heating, air-conditioning, and refrigeration equipment. The current paragraph 210-63 requirements are not uniform in the safety protection provided for various applications. Paragraph 210-63 currently requires that a receptacle outlet be located near heating, air-conditioning, and refrigeration equipment; but the paragraph excludes coverage for all ground-level equipment and rooftop equipment in one and two family dwellings. HVAC (heating, ventilating, and air-conditioning) servicepeople, who are not necessarily required to be fully qualified electricians, usually service the equipment covered by paragraph 210-63.
Description of the Hazard: The most frequent need for an HVAC serviceperson to use a nearby receptacle outlet is for lighting; electrical power tools are a second need. Scheduled service calls are routine, but emergency service calls are also required on HVAC equipment at all hours of the day and night, including calls during wet weather or when the ground is wet after recent rain or snow. The vast majority of these calls are made for ground-level equipment at residences. Emergency calls are often made at night when lighting is required. It is normal practice for the serviceperson to plug into the nearest outlet they see during such service calls, but quite often there is not an outlet within sight. As a result, I have seen HVAC technicians plug into a non-GFI home outlet immediately inside the house, which was the nearest outlet available to the outside ground-level air-conditioner. Others will simply put jumpers inside the disconnect box to get power, putting themselves at risk to get the job done quickly. Connecting to a non-GFI outlet or using jumpers creates an immediate electrocution hazard if the ground is wet and there is a short in the equipment or extension cord.
These are clearly not acceptable servicing practices, but as a master electrician with experience in many states, I have seen them occur repeatedly, due either to ignorance of the seriousness of the hazard or due to the constant pressure on the serviceperson to accomplish the job efficiently and quickly. I do not know how many injuries/fatalities this causes nationwide every year.
Summary: The proposed deletions to paragraph 210-63 would have the effect of applying the same requirement to all equipment, regardless of the location of the equipment. The changes would thus extend safety protection uniformly to all equipment applications, including ground-level equipment, where the largest hazard exists. The cost would be the cost of an additional nearby outlet in those applications where none now exists. I believe this equipment cost is nominal compared to the increase in safety and the reduced medical cost and lost-wage cost from injuries/fatalities. An added benefit to this proposed change is that the nearby outlet will provide an additional convenience outlet to the homeowner or property maintenance personnel, who increasingly use outdoor electric appliances such as lawnmowers and weedcutters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-208.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4165)

2- 210 - (210-63): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
"A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible lo-cation for servicing of heating, air conditioning, and refrigeration equipment located outdoors including on rooftops, and in attics and crawl spaces. The receptacle shall be located on the same level and within 25 ft (7.62 m) of the heating, air conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means."
SUBSTANTIATION: This change will ensure that the ground level HRAC equipment will be treated the same way as those on rooftops, attics, and crawl spaces. It corresponds to mechanical code requirements, and eliminates the need for service personnel to run cords out of windows, etc. in order to work on this equipment.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-208.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #687)

2- 211 - (210-63, Exception): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception: A receptacle outlet shall not be required for ~~Rooftop~~ rooftop equipment on one- and two-family dwellings.
SUBSTANTIATION: Editorial. The exception is an incomplete sentence and may not be clear to the average code user whether it applies to the requirement for a receptacle, the level and distance requirement or the connection point requirement, or all.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3863)

2- 212 - (210-63, Exception): Accept in Principle
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise text to read as follows:
210.63. Heating, Air-Conditioning, and Refrigeration Equipment Outlet. A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning, and refrigeration equipment on rooftops and in attics and crawl spaces. The receptacle shall be located on the same level and within 25 ft (7.62 m) of the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.
Exception: A receptacle outlet shall not be required for rooftop on one- and two-family dwellings.
SUBSTANTIATION: Since the section contains several requirements, it is important that the exception be a complete sentence and clarify which of the requirements in the section the exception applies to.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel statement on Proposal 2-211.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2424)

2- 213 - (210-64 (New)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Add a Section 210-61 to read:
"At least one receptacle on the outside of all buildings - See 210-8(b)."
SUBSTANTIATION: Extension cords are run out through metal doors of buildings for maintenance, temporary signs, lighting, etc. causing the door to rub on the cord and energizing the door which can create a shock hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: For other than dwelling units, the requirement for general use outdoor receptacle outlets is best left to the designer so that the needs of the building owner can be taken into account.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4365)

2- 214 - (210-70): Reject
SUBMITTER: Ed Stubbs, City of Atlanta, GA
RECOMMENDATION: Revise text as follows:
210-70. Lighting Outlets Required. (Add to text)
(a) Dwelling Units
(1) Habitable Rooms
Exception No. 1: In other than kitchens and bathrooms, one or more receptacles controlled by a wall switch shall be permitted in lieu of lighting outlets. (In every kitchen and bathroom there shall be one or more lighting fixture installed with the lighting outlet.)
Exception No. 2: (no change)

Exception No. 3: (add to text) In every clothes closet where a lighting outlet is installed and meets the requirements of 410-8, shall have a fixture installed with the lighting outlets.
FPN: (add to text) It is the intent to assure that improper fixtures not installed over a lighting outlet such as keyless fixtures or track lights.
SUBSTANTIATION: As an inspector, I have come across incidents where the contractor is forced to install the improper fixture or just doesn't install the proper fixture in the closet, kitchen or bathroom that is not listed and labeled or sometimes not bonded or even came with a bonding means. All these code requirements on grounding and bonding, listing and label, and proper clearances and we turn right around and don't require fixtures in for a final. You can just blank them off. Now we leave it up to the owner to supply the fixtures that may not be safe and possibly installed improperly. Where does that leave the contractor and the authority having jurisdiction? Can we say liable? Sometimes contractors can only do what they are told, so it becomes a no win situation and the owner gets BURNED. Lighting outlets only specify a box with no fixture. I know it is not the intent of the code to require installation of fixtures. The requirement is for areas that do not want receptacles in lieu of lighting outlets. If you didn't require this existing code, people would install cord and plug lamps in the closets that could start a fire, or in the kitchen and bathroom be subject to a shock hazard. How safe is a closet without a listed fixture installed before the final?
PANEL ACTION: Reject.
PANEL STATEMENT: The application of the rules in 210-70(a) is to only require a properly installed lighting outlet. Adding a requirement to install a luminaire will not resolve instances where the installer knowingly chooses to violate the proper rules.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

Note: The sequence no. 2-215 was not used.

(Log #3853)

2- 216 - (210-70(a)): Accept in Principle
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise the existing third paragraph as follows:
"Where one or more lighting outlet(s) are installed for ~~in~~ interior stairways, there shall be a wall switch at each floor level to control the lighting outlet(s) where the stairway ~~difference~~ between floor levels has ~~is~~ six ~~steps~~ risers or more."
SUBSTANTIATION: Editorial, and to bring the usage of stairway risers into harmony with the building codes. The term "risers" is more precise than "steps" and is the preferable term. In addition, the building codes regulate the construction of stairs so the NEC term should agree.
The use of the term "riser" solves the issue as to whether or not the tread (floor surface) at the bottom of the stairs and tread (floor surface) at the top of the stairs is a step or not. The risers for the stairs can be more easily determined.
Accepting this proposal will provide for more uniform interpretation and application of the NEC and make it more "user-friendly".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 2-226a which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1514)

2- 217 - (210-70(a)(1)): Reject
SUBMITTER: Russel LeBlanc, Peterson School of Engineering
RECOMMENDATION: Revise text as follows:
~~At least~~ one wall switch-controlled lighting outlet shall be installed

within 6 ft of at least one entrance to every habitable room and bathroom.
SUBSTANTIATION: If a room has multiple entrances it does not make sense to possibly have to walk all the way through the room in the dark to turn on the lights. This requirement would at least give someone the option of using an entrance with a switch.
PANEL ACTION: Reject.
PANEL STATEMENT: The location of switches for general lighting outlets is a design consideration that must be covered by the designer/installer for each unique situation. The panel notes that the submitter's recommendation would require the lighting outlet to be located at the point of entry and the substantiation deals with the location of the switch.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1828)

2- 218 - (210-70(a)(1)): Reject
SUBMITTER: Stephen A. Blydenburgh, Nassau, NY
RECOMMENDATION: Revise to read as follows:
(1) Habitable Rooms. At least one wall switch-controlled lighting outlet shall be installed at the point(s) of entry in every habitable room and bathroom.
SUBSTANTIATION: Section 210-70(a)(3) requires a lighting outlet containing a switch or controlled by a wall switch at the point of entry in rooms of occasional use for storage and that contain equipment. Would it not also be logical to have the same requirement for rooms that are used on a daily basis at times when there is little or no natural light.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-217. The panel notes that the submitter's recommendation would require the lighting outlet to be located at the point of entry and the substantiation deals with the location of the switch.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4011)

2- 219 - (210-70(a)(1)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 9 for information. See panel action on Proposal 9-42.
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: This proposal is to add a sentence to the end of the section:
Article 210.70(a)(1) "...in every habitable room and bathroom. If a ceiling mounted outlet box is installed, it must be listed as suitable as the sole means of support for a ceiling suspended (paddle) fan."
SUBSTANTIATION: The average house today has 3 bedrooms, a kitchen, a family room, a dining room, and 1-1/2 bathrooms. The bedrooms usually comply with 210-70(a)(1) Exception No. 1. Bathrooms usually have a wall sconce above a mirror to meet compliance. The lighting outlet boxes in the kitchen, family room, and the dining room would most likely be the only areas affected by this code change. These three rooms would most likely have some sort of ceiling mounted outlet box.
This proposal would mandate that these three ceiling outlet boxes be listed and suitable as the sole means to support a ceiling suspended (paddle) fan. I do not feel that a $20.00 increase in costs between the old outlet boxes and the new outlet boxes is enough to justify the refusal of this proposal.
Consider this true scenario. A homeowner buys a paddle fan at his local home improvement center and decides to replace the existing hanging fixture in his kitchen with the paddle fan complete with a light kit. Initially it looks good and it even works. Two weeks later when the homeowner was cooking dinner, the fan came down from ceiling. The fan was still attached to the junction box and still had some drywall around it. The romex cable kept the fan from hitting the table because it was probably stapled within 12 in. from the box. Luckily, no people were injured nor was there a fire. It is obvious that a real hazard does exist.
I urge that you do not reject this proposal for the sake of $20.00 added to the price of a $110,000.00 home. I am sure the homeowner would be more than willing to part with his $20.00.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel recommends that the Technical Correlating Comittee refer this proposal to Code-Making Panel 9 for action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4372)

2- 220 - (210-70(a)(1)): Reject
SUBMITTER: Joseph A. Hertel, Safety and Buildings Div., State of Wisconsin
RECOMMENDATION: Revise text to read as follows:
(1) Habitable Rooms. At least one wall switch-controlled lighting outlet shall be installed in every habitable room, kitchen, and bathroom.
SUBSTANTIATION: Many building codes do not recognize kitchens as habitable rooms. The addition of the word kitchen will clarify the intent of a wall switched lighting outlet in these rooms and correlate with the exception that requires a lighting outlet rather than a switched receptacle for kitchens and bathrooms.
PANEL ACTION: Reject.
PANEL STATEMENT: In reviewing the building codes, the panel does not find instances where kitchens are excluded from consideration as habitable rooms.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4454)

2- 221 - (210-70(a)(1)): Reject
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
RECOMMENDATION: Add new text to read as follows:
210.70(a)(1) Lighting Outlets Required, Habitable Rooms. At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom. Lighting outlets used to fulfill this requirement shall not have integral switching, or shall have integral switching disabled.
SUBSTANTIATION: The safety basis for the Section turns on the need to turn on a light to avoid stumbling or bumping into things. "Where are the bodies" does not really apply, because nobody is going to maintain records of the bumped shins cursed every evening, or even of the hips broken by people with osteoporosis who stumble and fall because there's no light. I have seen many instances where the people have inadvertently defeated the protection the light switch provides.
This proposal tries to maintain this protection. The part of the problem that we can reduce is related to the situation where a fixture came with a pull chain. This issue is especially common when paddle fans are used to replace existing light fixtures. Without independent wall switching, the fan is left on and the light turned off via its pull chain. Then the occupant leaves the room, perhaps turning the fan off at the wall switch, and, very commonly, forgetting to pull the chain on the light before leaving, to restore power to it. Subsequently, at night, someone returns, and has to grope their way to the fixture, after turning on the switch, and reach up for the light's pull chain, while not reaching up so high as to encounter the turning fan blades. This problem also occurs where a receptacle is employed to satisfy this section's requirement, in accordance with Exception No. 1. However, authorities having jurisdiction cannot do much about what homeowners do after final inspection.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements in 210-70(a)(1) cover the installation of the lighting outlet and not the luminaire itself.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1683)

2- 222 - (210-70(a)(1) Exception No. 1): Reject
SUBMITTER: Keith M. Whitesel, Whitesel Electric
RECOMMENDATION: Revise as follows:
In other than ~~kitchens and~~ bathrooms...
SUBSTANTIATION: Section 210-52(b)(1) Exception No. 1 clearly allows a switched receptacle in a kitchen.

PANEL ACTION: Reject.
PANEL STATEMENT: The requirement in 210-52(b)(1) is applicable to areas other than kitchens including pantries, breakfast rooms, dining rooms, etc. This exception prevents the replacement of the required wall switch controlled lighting outlet in kitchens with a switched receptacle.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #9)

9- 2 - (210-70(a)(1) Exception No. 2): Reject
NOTE: The following proposal consists of Comment 2-139 on Proposal 2-250 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 2-250 was:
Add new last sentence to 210-70 (a) Exception No. 3:
"The off position of the occupancy sensor shall remove all voltage from the controlled outlets or the sensor must be permanently engraved stating full voltage is present in the off position."
SUBMITTER: Douglas D. Myron, Mytech Corp.
RECOMMENDATION: Comments to the requirement that occupancy sensors in the "off" position remove all voltage from the supplied outlet.
Mytech supports the Panel's response of "Reject."
SUBSTANTIATION: Background: Occupancy sensors are control devices that turn lights on automatically when a room is occupied, and turns them off when the room is not occupied. First generation occupancy sensors were large surface mounted, 2 wire devices that contained an air gap switch, disconnecting voltage from the load when turning off the lights. The obtrusive style and appearance hindered market acceptance.
To reduce the size, cost and improve esthetics, occupancy sensor manufacturers began to eliminate the air gap switch using two different design techniques. Both of these techniques allows current (<.5 milli amps) to flow when the switch is in the off position to keep sensor electronics working.
Design Technique #1:
A 3-wire technique is used that removes line voltage from the load in off state and continuously applies .5 milli amps into conduit or building ground.
Design Technique #2:
A 2-wire technique is used and does not require conduit, building ground or neutral. However, when in the off state, the sensor is still powered and will supply less than .5 milli amps to the load.
Industry Direction:
Control devices are becoming more prevalent in homes and commercial buildings. Devices that typically performed simple functions are being replaced with high tech, multifunction products. To properly apply these new technologies requires education, training and new trade practices to keep pace with them. Our industry has worked very hard to maintain the safety of our products and have worked with UL to improve testing methodologies.
Comments:
• Developing a practice of relying only on the light switch to disconnect loads from the branch circuit is hazardous and should be handled with caution. In many applications, the light switch is not located in the immediate working area. It should always be a standard operating practice to treat loads deactivated in this manner as if full line voltage was applied.
• With proper education and training, it is possible with common instruments to identify devices that do not remove line voltage from the load.
• Mytech recommends that during installation of our product or maintenance to the lighting load, trip the circuit breaker. This is not only a safety issue but damage to the sensor can result if either device is misswired.
• Our switches in the off state are limited to less than the "Let Go" current of .5 milli amps.
• Without proper training, maintaining loads controlled by a simple 3-way switch can be just as hazardous. Without a voltmeter, it can be difficult to determine if voltage is or is not present at a load.
• Occupancy sensors are becoming small enough that adding legible labels to the front of the switch is not practical.
Conclusion:
Mytech supports the Panel's position of "Reject". This is a new technology and as our industry matures, so will its trade practices.

If the Panel has additional concerns or questions, I can bring them before the occupancy sensor committee of NEMA that meets every quarter.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 9-88a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #10)

9- 3 - (210-70(a)(1) Exception No. 2): Accept in Principle
NOTE: The following proposal consists of Comment 2-140 on Proposal 2-250 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 2-250 was:
Add new last sentence to 210-70 (a) Exception No. 3:
"The off position of the occupancy sensor shall remove all voltage from the controlled outlets or the sensor must be permanently engraved stating full voltage is present in the off position."
SUBMITTER: , Pass & Seymour/Legrand
RECOMMENDATION: We recommend the Panel accept in principle this proposal and replace the submitter's text with the following:
"An occupancy sensor that has a marked OFF position shall disconnect all ungrounded conductors when in the off position."
SUBSTANTIATION: The Panel, "Listed occupancy sensors in the "off" position are required to remove all voltage from the supplied outlet," is incorrect. There are several different listed occupancy sensors on the market that incorporate the equivalent of a standby condition when in the off position. These devices <u>do not</u> remove all voltage from the circuit when in the off position. There are UL product standards that recognize that certain types of control devices function in this manner. The suggested text in this comment directly reflects the requirement in the product standards which permits an "off" or equivalent marking only if the ungrounded conductors are disconnected. Accepting this text permits the listing organizations to determine the appropriate marking for this type of product.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 9-88a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #11)

9- 4 - (210-70(a)(1) Exception No. 2): Accept in Principle in Part
NOTE: The following proposal consists of Comment 2-141 on Proposal 2-250 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 2-250 was:
Add new last sentence to 210-70 (a) Exception No. 3:
"The off position of the occupancy sensor shall remove all voltage from the controlled outlets or the sensor must be permanently engraved stating full voltage is present in the off position."
SUBMITTER: James T. Dollard, Jr., Local Union #98 IBEW
RECOMMENDATION: Accept Proposal 2-250.
SUBSTANTIATION: The Panel voted unanimously to reject this proposal on the assumption that as written in the Panel Statement: "Listed occupancy sensors in the "off" position are required to remove all voltage from the supplied outlet. Refer the product standards."
This is not true. Listed occupancy sensors in the "off" position are NOT required to remove all voltage from the supplied outlet.
The product standards do allow for .5 ma to flow in the situation as described in the proposal.
UL Field Engineers and one manufacturer have stated so in writing.
210-70(a) Exception No. 3 allows for these sensors in all dwellings.

The word OFF must mean the removal of all voltage. The fact that the amount of current flow available is below the "let go" level is not acceptable. A homeowner receiving a shock in this situation may not suffer from the amount of current flow through his/her body, but the resulting fall from a ladder could put them in the hospital or perhaps the grave.
NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle in Part.
1. The panel accepts in principle that the "off" position disconnects ungrounded conductors.
2. The panel does not accept the engraving of the switch stating that full voltage is present in the off position.
PANEL STATEMENT: See panel action and statement on Proposal 9-88a. The panel refers the submitter to the current standards that do not require engraving. The panel would like to point out that if a switch is not marked with an off position, voltage often is present.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #12)

9- 5 - (210-70(a)(1) Exception No. 2): Reject
NOTE: The following proposal consists of Comment 2-142 on Proposal 2-250 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 2-250 was:
Add new last sentence to 210-70 (a) Exception No. 3:
"The off position of the occupancy sensor shall remove all voltage from the controlled outlets or the sensor must be permanently engraved stating full voltage is present in the off position."
SUBMITTER: Larry Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: NEMA supports continued rejection of the proposal.
SUBSTANTIATION: OSHA has established a "Tagout/Lockout" procedure to ensure worker safety during electrical equipment/machine installation, maintenance or service. While lockout of individual branch circuit breakers may not be feasible, individual breakers can be tagged to indicate that a particular branch circuit is being worked on.
It is also a widely accepted fact that in order to ensure that a device or piece of equipment is completely deenergized, the branch circuit breaker feeding the device or equipment must be turned off. Merely turning off a switch on the device or the equipment does not guarantee deenergization and is not a proper or safe means of performing electrical work.
If the worker involved in the cited incident had followed proper safety procedures and turned the appropriate circuit breaker "OFF", he would not have experienced a shock.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 9-88a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP205)

2- 226a - (210-70(a)(2)): Accept
SUBMITTER: CMP 2
RECOMMENDATION: Revise existing Section 210-70(a)(2) as follows:
"(2) Additional Locations. Additional lighting outlets shall be installed in accordance with a, b, and c.
a. At least one wall switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power.
b. For dwelling units, attached garages, and detached garages with electric power, at least one wall switch-controlled lighting outlet shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.
c. Where one or more lighting outlet(s) are installed for interior stairways, there shall be a wall switch at each floor level, and landing level that includes an entry way, to control the lighting outlet(s) where the stairway between floor levels has six risers or more.
Exception: In hallways, stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted."
SUBSTANTIATION: This section has been rewritten to improve clarity, and has integrated the changes accepted in other proposals.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1146)

2- 223 - (210-70(a)(2)): Accept in Principle
SUBMITTER: Kenneth Higashi, Honolulu, HI
RECOMMENDATION: Revise text to read:
"Where lighting outlets installed in interior stairway, there shall be a switch at each ~~floor level~~ entry or exit into the stairway to control the lighting outlet where the difference between ~~floor level~~ entries or exits is six steps or more."
SUBSTANTIATION: There are many homes that have entries into a stairway that's between floor levels. Entering into a darken stairway and going to the floor level to turn the light on may cause tripping.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 2-226a which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2021)

2- 224 - (210-70(a)(2)): Reject
SUBMITTER: Jerry Knoerr, Village of Greendale, Village of Mukwonago, WI
RECOMMENDATION: Add new text to read:
"The addition should be at a wall switch there shall be no more than 4 ft to the entrance of the stairway. In hallways the switch or switches shall be at the entrance of each end or each entrance of every hallway and shall be no more than _____ ft." Panel shall decide distance.
Also add that at all required exits a light switch controlling the interior lighting shall be provided.
SUBSTANTIATION: We are finding in a number of houses that they are combining the light switch with the hallway and stairs lighting so that people have to walk past open stairways without being able to turn on a light to see where they are going. They are saying that they have a switch at that level and therefore that is all the switching they need to control this area and the stairs.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-217.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2813)

2- 225 - (210-70(a)(2)): Reject
SUBMITTER: John E. Staires, Tulsa Code Seminars/Rep. Oklahoma Chapter IAEI
RECOMMENDATION: Remove the wording:
"~~and to provide illumination on the exterior side of outdoor entrances or exits with grade level access.~~"
Insert the wording:
"and to provide illumination on the exterior side of outdoor means of egress to grade level."
SUBSTANTIATION: As presently written, this sentence of 210-70(a)(2) does not provide for the situation where a second story or higher dwelling unit balcony or other platform has a staircase provided to grade level. The wording of this sentence would not require illumination for either the outdoor exit, the balcony or the staircase. This is obviously a life safety issue, due to the danger of exiting the dwelling unit over the staircase in the dark during normal conditions, and especially during emergency conditions.
PANEL ACTION: Reject.
PANEL STATEMENT: The necessity for an additional requirement to add exterior stairway lighting should be based on the type of stairway and is a design consideration.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3216)

2- 226 - (210-70(a)(2)): Reject
SUBMITTER: Jerry Feagans, Electrical Insp. Section, City of St. Louis, MO
RECOMMENDATION: Last sentence will read:
Where lighting outlets are installed in interior stairway, there shall be an illuminated wall switch at each floor level to control the lighting outlet where the difference between floor levels is six steps on more.
SUBSTANTIATION: The NEC already requires a wall switch at each floor level with BOCA's requirement for illuminated switches. As the code enforcement agency, it would be beneficial for us if the NEC had the same requirement. The illuminated switch makes it easier for the tenant to locate them in the dark.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: An illuminated switch is not needed to accomplish the necessary safety objectives. Providing an illuminated switch is not prohibited and is the prerogative of the designer.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3773)

2- 227 - (210-70(a)(2)): Reject
SUBMITTER: Joe Zsebe, City of Cudahy, WI
RECOMMENDATION: Revise text to read as follows:
(2) Additional Locations. At least one wall switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power~~,; and to provide illumination~~ Illumination shall be provided on the exterior side of outdoor entrances or exits with grade level access. A vehicle door in a garage or service door of a detached garage shall not be considered as an outdoor entrance or exit.
SUBSTANTIATION: The use of the semi colon is not a strong enough degree of separation for the subject of the paragraph. If the code panel is not intending the exterior of detached garage entrance and exit doors to have illumination then, a new sentence is in order to return to the subject of the paragraph, i.e., dwelling unit requirements only. Some authorities having jurisdiction interpret the current language as requiring illumination at grade level entrance or exits at detached residential garages.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has clarified the requirement for detached garages in the action taken on Proposal 2-226a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3793)

2- 228 - (210-70(a)(2)): Reject
SUBMITTER: John I. Williamson, Minnesota Board of Electricity
RECOMMENDATION: Modify this section as follows:
"Additional Locations. At least one wall switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power. At least one wall switch-controlled lighting outlet shall be installed to provide illumination on the exterior side of dwelling unit and attached garage outdoor entrances or exits with grade level access."
The remainder of the paragraph and the exception that follows remain unchanged.
SUBSTANTIATION: The previous sentence structure and wording has created confusion among authorities having jurisdiction. Some authorities having jurisdiction have interpreted this section to require a wall switch-controlled lighting outlet on the exterior side of entrances at detached garages.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has clarified the requirement for detached garages in the action taken on Proposal 2-226a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4166)

2- 229 - (210-70(a)(2)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
(2) Additional Locations. At least one wall switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power; and to provide illumination on the exterior side of outdoor entrances or exits with grade level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit. Where lighting outlets are installed in interior stairways connecting finished areas or areas with a second exit, there shall be a wall switch at each floor level to control the lighting outlet where the difference between floor levels is six steps or more.
SUBSTANTIATION: A three-way switch at the end of a stairway into an unfinished area without an exit has no basis in safety, only design, and as such is beyond the scope of the Code. Previous examples cited by the panel in rejecting this over the years, such as darkrooms or work areas, probably would constitute a connection to finished areas if they were extensive. Transient occupants of such spaces would not be turning the light off and leaving themselves in darkness. This allowance has been in place in Massachusetts since the advent of the sixstep rule, without incident.
PANEL ACTION: Reject.
PANEL STATEMENT: Work areas are not restricted to finished areas. Activities can occur in unfinished areas requiring switches at both levels.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #314)

2- 230 - (210-70(a)(3), 210-70(c)): Reject
SUBMITTER: Victor V. Timpanaro, Rep. Municipal Electrical Inspectors Assoc. of NJ, Inc.
RECOMMENDATION: Revise 210-70(a)(3) to read as follows:
(3) For attics, underfloor spaces, utility rooms and basements, at least one lighting outlet with fixture containing a switch or controlled by a wall switch shall be installed where these spaces are used for storage or contain equipment requiring servicing.
SUBSTANTIATION: Many inspectors have argued that a lighting outlet is the junction box containing the branch circuit conductors and no switch may be inserted therein, while admitting that some fixtures may contain a switching means as an integral part. This language will help to clarify.
PANEL ACTION: Reject.
PANEL STATEMENT: Adding the text "with fixture" does not add clarity. The present requirement is that the outlet is to be controlled by a wall switch or that it contain some type of switching means, which could include the switching means in a fixture.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #404)

2- 231 - (210-70(a)(3)): Reject
SUBMITTER: Amos D. Lowrance, Jr., City of Chattanooga, TN
RECOMMENDATION: Revise 210-70(a)(3) to read as follows:
(3) Storage or Equipment Spaces. For attics, underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch shall be installed where these spaces are used for storage or contain equipment requiring services. The control point for the lighting outlet required by this section shall be at the usual point of entry to these spaces. Additional lighting outlets may be permitted. The lighting outlet shall be provided at or near the equipment requiring services.
SUBSTANTIATION: As currently written, it is possible to have a single pole switch at the door and a pull chain on a lighting outlet controlled by the switch. When the service person pulls the chain on the outlet, then the switch no longer controls the lighting outlet.

PANEL ACTION: Reject.
PANEL STATEMENT: This recommendation would limit the control of the lighting outlet to a single location. There are instances where it may be preferred that the outlet be controlled from multiple points of entry, particularly in basements, utility rooms, and similar spaces.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2485)

2- 232 - (210-70(a)(3)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for action in Article 410. This action will be considered by the Panel as a Public Comment.
SUBMITTER: James M. Imlah, City of Hillsboro, OR
RECOMMENDATION: Revise as follows:
(3) Storage or Equipment Spaces. For attics, underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch shall be installed where these spaces are used for storage or contain equipment requiring servicing. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing. Lighting required for attics or underfloor spaces shall have approved guards or be enclosed.
SUBSTANTIATION: Many times work being done in these areas are of limited area and the higher risk of fixture damage becomes apparent. The damage to a bulb in a fixture has created a shock potential to person(s) working in those areas. In attics the breaking of a bulb has been known to starting the burning of dry combustible materials in the area from hot glass and light elements falling within the area. In underfloor spaces the issue is the added potential of shock hazard from damp or wet ground with many grounded surfaces such as metallic ducts and metallic piping. Please consider lighting guards for fixtures in these locations for protection of persons and property.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 210-70(a)(3) only covers the lighting outlet. The panel requests that the Technical Correlating Committee refer this proposal to Code-Making Panel 18 for action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4403)

2- 233 - (210-70(a)(4) (New)): Reject
SUBMITTER: Joseph Andre, City of Bellevue, WA
RECOMMENDATION: Add new section (a)(4) to read:
"For each of the following locations, a lighting fixture shall be installed to provide illumination: kitchens, bathrooms, hallways, stairways, attached garages, detached garages with electric power, and attics, underfloor spaces, utility rooms, and basements when a lighting outlet is required per 210.70(a)(3)."
SUBSTANTIATION: The current wording of Section 210-70(a), combined with the definition of a lighting outlet in Article 100, would permit a switch controlled receptacle or a box suitable for mounting a light fixture but with a blank cover to be installed in the locations identified in the proposed new text. It is improbable/impracticable to believe that a lamp would be installed in those locations, and a box without a fixture is also not the intent of this section. By mandating that there be illumination, the NEC would significantly reduce the hazard of tripping in an unlighted area.
The impact to the industry is minimal, as most installers recognize the intent and provide illumination in a completed installation.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement for illumination of habitable rooms is not within the purview of Article 210. The objective for habitable rooms is to provide a lighting outlet so that acceptable illumination can be provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1684)

2- 234 - (210-70(c)): Accept
SUBMITTER: Keith M. Whitesel, Whitesel Electric
RECOMMENDATION: Change title from "Other Locations" to: "Other Than Dwelling Units."
SUBSTANTIATION: Clarification that this section applies to these spaces since 210-70(a)(3) applies to dwelling units.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3943)

2- 235 - (210-70(c)): Reject
SUBMITTER: Jim Crocker, Insp. Div, City of Chattanooga, TN
RECOMMENDATION: Revise text to read as follows:
210.70(c). Lighting Outlets Required. For attics and underfloor spaces containing equipment requiring servicing, such as heating, air conditioning, and refrigeration equipment. At least one lighting outlet ~~containing a switch~~ or controlled by a wall switch shall be installed at each entrance in such places. At least one point of control shall be at the usual points of entry to these places. ~~The~~ A lighting outlet shall be provided at ~~or near~~ the equipment requiring servicing, and as needed illuminate the path from the entrance to the equipment.
SUBSTANTIATION: In larger and newer homes and commercial buildings, there are often more than one entrance to attic spaces and in some, the roof changes may shadow the path to the equipment as I have seen more than once. One building had as many as eight attic entrances with walk boards between each.
PANEL ACTION: Reject.
PANEL STATEMENT: Although the designer can provide for a switching arrangement that covers more than one entry point, the objective of the code requirement is to require the switch at the usual point of entry. 210-70(c) only requires that the lighting outlets be installed, as the provision to provide illumination is not covered by this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2796)

2- 236 - (210-70(c)(3)): Reject
SUBMITTER: Phillip David Martin, City of Chattanooga, TN/Rep. Public Works-Insp. Div, Chattanooga, TN
RECOMMENDATION: Revise as follows:
(c) Other Locations. For attic, above ceiling locations and underfloor spaces containing equipment requiring servicing such as heating, air-conditioning, refrigeration equipment, and sign transformers.
SUBSTANTIATION: Sign transformers are usually located above ceilings or attic spaces where the code may not require lighting.
PANEL ACTION: Reject.
PANEL STATEMENT: There are many types of electrical equipment, including transformers, junction boxes, etc. that do not fall under the provision of equipment requiring service. The objective of the requirement is to provide a lighting outlet for equipment that requires routine maintenance activities.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 215 — FEEDERS

(Log #2868)

2- 237 - (215): Reject
SUBMITTER: Gary Wright, Master Electrical Contractors Inc.
RECOMMENDATION: Revise text to read as follows:
Each ungrounded conductor shall be identified according to phase (i.e. A, B, C). 120/240V nominal shall be identified as black, red, blue, 480 volt nominal shall be identified as brown, orange, yellow. Conductors shall be permanently identified with a continuous outer sheath or with tape or with other permanent means.
SUBSTANTIATION: The primary reason for this proposal is to establish a uniform code with which to identify the ungrounded conductor and phase thereby eliminating potential hazards of misidentification. Thus creating a safer work environment. The realistic potential of these hazards exists because of the diversity within the industry.
PANEL ACTION: Reject.
PANEL STATEMENT: Proper voltage testing and circuit tracing techniques cannot be safely replaced by a color code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MERICLE: I vote no on the Panel Action. I agree with the submitter in his recommendation except that I believe the new text should read "277/480V", not just 480 volts. In past code cycles. there have been several proposals like this one and it appears there is a substantial amount of interest to use this color coding. The northeast has used and continues to use this identification with success. If it were mandated by the NEC the electrical industry would be a safer place to work. Color coding alone should not replace proper testing procedures, but it would alert an electrician that 277/480 is present. I realize that some industries, states and municipalities may have their own means of identification but with electricians traveling all over the country we would show consistency throughout.

(Log #4352)

2- 238 - (215-2, FPN No. 2): Reject
SUBMITTER: R. Gerald Irvine, Suffern, NY
RECOMMENDATION: Change FPN No. 2 to a requirement by inserting "shall be" before "sized" and deleting all after "5 percent" in the first sentence.
SUBSTANTIATION: Voltage drop limitations are necessary for proper equipment operation and for conservation of energy by reducing excessive line losses. ASHRAE (IESNA 90.1R Energy Conservation in New Buildings) also contains voltage drop limitations.
PANEL ACTION: Reject.
PANEL STATEMENT: Percentage of voltage drop is a design consideration based on conductor size, loading, and other factors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1021)

2- 239 - (215-2, FPN No. 4, No. 5, and No. 6 (New)): Reject
SUBMITTER: Charles W. Algood, A&A Electric Services Inc./Rep. L.U. 915 I.B.E.W.
RECOMMENDATION: Add FPN No. 4, No. 5, and No. 6 to read as follows:
FPN No. 4: See Section 310-10 for temperature limitations of conductors.
FPN No. 5: See Section 110-14(c) for temperature limitations of conductors.
FPN No. 6: See Section 310-15 for ampacity ratings of conductors.
SUBSTANTIATION: Two of these proposed FPNs are already present in Section 210-19(a). Since both sections address the selection of the correct conductors to carry noncontinuous and continuous loads, it is only good common sense that they also appear in Section 215-2.
The proposed FPN No. 5 is a "UL Greenbook", requirement on terminations, and is an essential factor in determining the correct conductor and its application at points of termination, and the use of higher temperature rated conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The addition of the fine print note does not improve usability.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3150)

2- 240 - (215-2, Exception): Reject
SUBMITTER: Aaron Emmendorfer, O.S.C. Electric
RECOMMENDATION: Delete the exception.
SUBSTANTIATION: This section deals with feeder wire sizing, not overcurrent protection of feeders. Current is current whether the overcurrent device is rated for 100 percent operation or not. This rule should be the same in all cases.
PANEL ACTION: Reject.
PANEL STATEMENT: Deletion of the exception would require that the conductor be sized at 125 percent of the continuous load when the overcurrent protection is listed for operation at 100 percent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #393)

2- 241 - (215-2(a)): Reject
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
RECOMMENDATION: Add the following to the last sentence of the paragraph:
"and where adjustment or correction factors are applied, the ampacity of the conductor shall not be less than 100 percent of the noncontinuous load plus 100 percent of the continuous load."
SUBSTANTIATION: The existing text seems to imply that is a "stand alone" statement and other NEC sections, such as the first paragraph of 240-3 and 240-3(d), do not apply if the ampacity of the conductor was greater than or equal to 125 percent of the continuous load plus 100 percent of the noncontinuous load before applying any adjustment or correction factors. There is no text to indicate the minimum conductor ampacity required after any adjustment or correction factors are applied. It is possible for the calculated conductor ampacity to be less than 100 percent of the continuous and noncontinuous loads after adjustment and correction factors are applied.
PANEL ACTION: Reject.
PANEL STATEMENT: The first sentence of 215-2(a) provides the text that establishes the minimum conductor ampacity by stating that it shall not be less than the load to be served.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #688)

2- 242 - (215-2(a)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read ad follows:
(a) General. Feeder conductors shall have an ampacity not less than required to supply the load as computed in Parts B, C, and D of Article 220. The minimum feeder conductor size before the application of any adjustment or correction factors, shall have an allowable ampacity ~~equal to or greater~~ not less than the noncontinuous load(s), plus 125 percent of the continuous load(s) or the ampacity specified for motor supply conductors in (Sections 430-22; 430-24; 430-25; 430-28; 440-32; 440-33; 440-34; and 440-35.) (Part B of Article 430 and Part D of Article 440,) whichever is greater.
(alternate choices in parentheses)
Exception No. 1: The correction factors for temperatures below 26°C (78°F) shall be permitted in determining the initial conductor ampacity.
Exception No. 2: Where the assembly, including any integral ~~the~~ overcurrent device(s) supplying ~~protecting~~ the feeder(s) is listed for operation at 100 percent of its rating, the ampacity of the feeder conductors shall ~~be permitted to~~ be not less than the sum of the noncontinuous load(s) ~~plus~~ and the continuous load(s),

plus the ampacity specified for motor supply conductors in (Sections 430-22; 430-24; 430-25; 430-28; 440-32; 440-33; 440-34; and 440-35.) (Part B of Article 430 and Part D of Article 440.)

(Alternate choices in parentheses)

Additional minimum sizes shall be as specified in (b), (c), and (d) under the conditions stipulated.

SUBSTANTIATION: Application of this section and Chapter 4 to the same noncontinuous, continuous, and motor loads can result in disparity between conductor sizes. Does Chapter 2 or 4 prevail? The examples I have provided indicate possible disparity.

The panel statement for Comment 1-174 in the 1998 ROC indicated motor loads continuing for three hours or more are not excluded from the definition of continuous load. This may be literally true but not in accordance with Articles 430 and 440 and common practice. Chapter 4 only requires the 125 percent factor for the largest motor (regardless of operating time), whereas if "continuous load," the factor would apply to all motors supplied by the feeder.

Since tap conductors on the supply side of a motor branch circuit overcurrent device is a feeder, per definition, the reference to Section 430-22 would clearly indicate it applies to that portion of the circuit conductors.

Proposed Exception No. 1 is to allow for increased ampacity rating where lower temperatures prevail. This could be critical for some "border-line" ampacities for installations underground or in controlled climate environments.

In Exception No. 2, wording is revised to clearly indicate nonfused switches, transfer switches, and clock-operated switches (listed for 100 percent of rating) can be used. Present wording suggests the assembly necessarily includes overcurrent devices. The word "supplying" supplants "protecting" to cover such assemblies and for technical correctness since overcurrent devices at the end of a tap limit protection to overloads. The reference to other chapters would correlate with ampacity requirements which in general do not permit 100 percent ampacity factor for continuous duty motors, which present wording appears to do, if the motors operate for less than three hours. Note that Section 430-24 requires motor conductor ampacity plus ampere rating of other loads, not conductor ampacity for continuous loads.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Part.

The panel accepts the portion of the recommendation changing "equal to or greater" to "not less", and rejects the remainder of the recommendation.

PANEL STATEMENT: The rejected portions of the proposal are rejected based on the following:

1) The first sentence is accurate as written in the present code. Computed load would imply that conductors serving loads could have some additional computed factor applied. Article 220 provides the necessary information for determining the load in question.

2) The changes relative to motor circuit conductors are unnecessary. 215-1 states that feeders are sized in accordance with Article 220. 220-3 states that Article 430 is used for motor loads.

3) The proposed Exception No. 1 is unnecessary, since 310-15 already allows this to be applied to determine conductor ampacity.

4) The wording for "integral" overcurrent devices is unnecessary. The present requirement is for "listed assemblies" which covers the various arrangements of overcurrent devices.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #4114)

2- 243 - (215-2(a)): Accept in Part

SUBMITTER: Truman C. Surbrook, Michigan State University

RECOMMENDATION: Revise the second sentence of the section as follows with the deletions and additions as indicated:

"The ~~minimum~~ feeder-circuit conductor ~~size, before the application of any adjustment or correction factors,~~ shall have an allowable ampacity ~~equal to or greater~~ not less than the noncontinuous load plus 125 percent of the continuous load."

SUBSTANTIATION: The phrase "before the application of any adjustment or correction factors" is particularly confusing to electricians making conductor ampacity selection when adjustment factors are being used. Some apply the adjustment factors to the allowable ampacity found in the appropriate table and then compare it with 100 percent of both continuous load and noncontinuous load, others compare the adjusted allowable ampacity to the sum of 100 percent of the noncontinuous load and 125 percent of the continuous load. By removing the confusing statement, it makes the section clear that the adjusted allowable ampacity of the conductor is not permitted to be less than the sum of 100 percent of the noncontinuous load plus 125 percent of the continuous load.

PANEL ACTION: Accept in Part.

The panel accepts the change of "equal to or greater" to "not less".

The remainder of the proposal is rejected.

PANEL STATEMENT: The text recommended for deletion is necessary for proper application of the section. The second sentence of 215-2(a) establishes the minimum conductor size permitted for a circuit supplying any continuous loads. Actual conductor allowable ampacity (relative to the load current) is determined by applying 310-15 including the adjustment factors. This allows the allowable ampacity calculation to take advantage of higher temperature ratings on conductor insulation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #4115)

2- 244 - (215-2(a), Exception): Accept in Principle

SUBMITTER: Truman C. Surbrook, Michigan State University

RECOMMENDATION: Revise the Exception as follows:

"Where the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the allowable ampacity of the feeder conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load, and not less than the rating of the overcurrent device."

SUBSTANTIATION: The addition of the word "allowable" ampacity should make it clear that it is the ampacity under the prevailing conditions including the application of adjustment factors if they apply.

The rule for sizing conductors when the overcurrent device is listed for 100 percent operation and one that is not such listed can lead to widely different conductor sized for the same identical load. At least in the case where the overcurrent device is listed for 100 percent operation, the minimum allowable ampacity of the conductor should not be permitted to be less than the rating of the overcurrent device. The following example illustrates the point.

Example: If a feeder supplies a continuous load of 130 amperes and the overcurrent device and enclosure are listed for operation at 100 percent of its rating then the overcurrent device is permitted to be rated at 150 amperes. In this case the conductor is permitted to be sized based upon an allowable ampacity not less than 100 percent of the continuous load. If copper conductors are used with 75°C insulation and terminations, the maximum conductor size required would be AWG #1 which is listed in Table 310-16 as 130 amperes. If the overcurrent device had not been listed for 100 percent operation, the minimum overcurrent device rating for this load would have been 175 amperes and the minimum conductor size would have been AWG #2/0. This seems to be a wide difference in minimum conductor size for the same identical load simply because one overcurrent device is rated for 100 percent operation and the other is not.

PANEL ACTION: Accept in Principle.

Revise the exception in the existing Code to read as follows:

Exception: Where the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the allowable ampacity of the feeder conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load. In no case shall the ampacity be less than the rating of the overcurrent device."

PANEL STATEMENT: The panel has accepted the submitter's recommendation relative to the use of "allowable" in the exception. The submitter's wording can be interpreted to be permissive relative to the minimum sizing compared to the overcurrent device. As such, the panel has revised the exception to accomplish the objective using clearer language.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #689)

2- 245 - (215-2(d) (New)): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for action in Article 225. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add a new paragraph (d) to read as follows:
(d) Feeder conductors covered by Article 225 shall have an ampacity not less than (1) 100-amperes 3-wire single-phase or 60-(70)- amperes 4-wire three-phase where supplying a one-family dwelling; (2) 60-amperes 3-wire single-phase or 30 (40) -amperes 4-wire three-phase where supplying an individual dwelling unit of a two-family or multifamily dwelling. The ampacity for a neutral conductor shall be permitted to be determined in accordance with Section 220-22. Conductor ratings specified in Table 310-15(b)(6) shall be permitted.
(ampacity figures in parentheses are alternate choices)
SUBSTANTIATION: Specific minimum ampacities for feeder conductors covered in Article 225 and supplying a dwelling unit do not appear to be covered in the Code. Section 230-42(b) in effect, requires minimum service conductor rating of 100 amperes 3-wire for a one-family dwelling and 60-amperes for dwelling units of two-family or multi-family dwellings.
Sections 225-39(c) and (d) requires a minimum disconnecting means rating of 100-amperes 3-wire for a one-family dwelling, and 60-amperes for units of two-family or multifamily dwellings as correlation with Section 230-79. Feeder conductors should also correlate with Section 225-39.
A 60-ampere 3-phase 4-wire 208y/120-volt system can supply a volt-ampere load midway between that of 120/240-volt and 208y/120-volt single-phase systems. Three-phase 4-wire systems for dwellings do not appear to be prohibited by the code.
PANEL ACTION: Reject.
PANEL STATEMENT: Code-Making Panel 2 does not agree that it is necessary to establish a minimum rating for feeders supplying a dwelling unit. The panel requests that the Technical Correlating Committee refer this proposal to Code-Making Panel 4 for action since this is under the scope of Article 225.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1780)

2- 246 - (215-3 Exception No. 2 (New)): Accept
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Add Exception No. 2 as follows:
"Exception No. 2: Overcurrent protection for feeders over 600 Volts, nominal shall comply with Part I of Article 240."
SUBSTANTIATION: Although the current rule applies to virtually all types of feeders, the rules for feeders of over 600 volts are not recognized in this section. This creates a conflict between Article 215 and Article 240.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #690)

2- 247 - (215-4(a)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Feeders with Common Neutral. ~~Feeders containing a common neutral shall be permitted to supply two~~ Two or three sets of 3-wire feeders, or two sets of 4-wire or 5-wire feeders shall be permitted to utilize a common neutral.
SUBSTANTIATION: Editorial. Present wording indicates feeders supplying feeders. Branch circuits may be supplied.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #691)

2- 248 - (215-5): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise last sentence to read as follows:
Such a diagram shall show the area in square feet of the building or other structure supplied by each feeder, the total ~~connected~~ computed load before applying demand factors... (remainder unchanged).
SUBSTANTIATION: Editorial. All loads are not connected loads, per se, such as those based on square foot area, or assigned to specific type circuits, or number of outlets. Connected loads are still computed and would be included.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the term "connected load" is consistent with the usage of the term elsewhere in the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1747)

2- 249 - (215-5): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise as follows:
215-5. Diagrams of Feeders. If required by the authority having jurisdiction, a diagram showing feeder details shall be provided prior to the installation of the feeders. Such a diagram shall show the area in square feet of the building or other structure supplied by each feeder, the total connected load before applying demand factors, the demand factors used, the computed load after applying demand factors, and the size and type of conductors to be used. If required by the authority having jurisdiction, the computed load after apply the demand factors and the date the computation was done, shall be posted at the point were the feeder receives its supply.
SUBSTANTIATION: In cases were the AHJ requires these diagrams/calculations the information is readily known and available at the original time of installation. This requires very little work to post this at the panelboard were the feeder originates when you already have the information. This is valuable information for people to know, This information is often lost or not available shortly after installation, the date the calculation was done is also pertinent information AHJ is often apprehensive about requiring a diagram of a feeder due to the time and expense involved in doing one. This information is needed to make a safe decision as to the adequacy of the existing system.
PANEL ACTION: Reject.
PANEL STATEMENT: The authority having jurisdiction can already require that this information be posted without changes in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #692)

2- 250 - (215-8): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Means of Identifying Conductor with the Higher Voltage to Ground. On a 4-wire delta-connected ~~secondary~~ system where the midpoint of one phase is grounded ~~to supply lighting and similar loads~~ the phase conductor having the higher voltage to ground shall be ~~identified~~ distinguished from the other phase conductors by a continuous outer finish that is orange in color along its entire length ~~or by tagging or other effective means~~ except that a conductor larger than No. 6 shall be permitted to be identified at the time of installation by a permanent distinctive orange marking that shall encircle the conductor insulation. Such identification shall be provided ~~placed~~ at each ~~point where a connection is made~~ conductor termination, at each junction point except conduit bodies that do not contain splices or unused hubs, and at intervals not exceeding 6 ft (1.83 m), but not less than one such intermediate marking, where installed in a wireway, auxiliary gutter, or cable tray. Such identification shall be provided ~~placed~~ in accordance with the above at each point where the grounded conductor is also present.

SUBSTANTIATION: This section permits field marking for conductors regardless of size which does not conform to field marking for grounded or grounding conductors. Are the safety considerations any less? Present wording infers that other phase conductors are not to be orange but requires an interpretation of intent since it is not specifically prohibited. The word "secondary" may be inferred as an on-site transformer, whereas the source of the feeder may be a service or generator. The word "system" is encompassing.

Proposal 5-20 in the 1998 ROP provided for marking that encircles the grounded conductor, the substantiation for which is applicable for all field marking.

Junction points such as pull boxes, and conductors in wire-ways, auxiliary gutters, and cable trays are amenable to future connections and marking at installation prior to later connections would be desirable. Conduit bodies with no splices or unused hubs are less likely tap points.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirement to identify the high-leg of a feeder is based on specific connection issues to equipment. Requirements to identify the grounded and grounding conductors are based on much more extensive concerns. Applying the grounded conductor rules to the high-leg marking is not substantiated by the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #1501)

2- 251 - (215-8): Reject

SUBMITTER: Larry D. Wendt, State of Idaho / Rep. I.A.E.I.

RECOMMENDATION: Revise text as follows:

215-8. Means of Identifying Conductor with the Higher Voltage to Ground. On a 4-wire, delta-connected secondary where the midpoint of one phase winding is grounded to supply lighting and similar loads, the phase conductor having the higher voltage to ground shall be identified by an outer finish that is orange in color or by tagging or other effective means. Such identification shall be placed at each point where a connection is made if the grounded conductor is also present. See Section 110-15.

SUBSTANTIATION: Means of identifying conductor with the higher voltage to ground is a requirement that should be in Section 110-15 for requirements for electrical installations where it would apply to all types of installations instead of this location. It would also streamline and simplify the code for easier usage.

Please coordinate with proposals on Sections 110-15, 210-4(d), 230-56, 384-3(e), and 384-3(f).

PANEL ACTION: Reject.

PANEL STATEMENT: The cross-reference from 215-8 back to the proposed section is unnecessary since the two items would be identical.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #4416)

2- 252 - (215-10): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.

SUBMITTER: Charles Meeker, Electro-Test, Inc.

RECOMMENDATION: Revise text to read as follows:

215.10. Ground-Fault Protection of Equipment. ~~Each f~~Feeder disconnect(s) ~~rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 600 volts phase to phase,~~ shall be provided with ground-fault protection of equipment in accordance with the provisions of Section 230.95.

SUBSTANTIATION: There are two reasons for proposing these changes.

1. The deleted words are redundant and unnecessary.
2. To eliminate conflict between proposed changes to 230-95.

The intent of the change is based on the hazards of arcing ground-faults which are determined by total system capacity, and not the size of an individual disconnect rating. Therefore, it is the equipment rating of 1000 amperes or greater that should be used to determine the need for ground-fault protection. For example, the number of individual disconnecting means, as allowed by 230-71, does not reduce the potential hazard to person or equipment of arcing ground-faults, if the rating of the equipment is still 1000 amperes or greater.

PANEL ACTION: Reject.

PANEL STATEMENT: The text in 215-10 is necessary for the application of ground fault protection on feeders. Should revisions be made to 230-95, Code-Making Panel 2 will review those and act accordingly.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #439)

2- 253 - (215-12 (New)): Reject

SUBMITTER: Glenn W. Zieseniss, Crown Point, IN

RECOMMENDATION: Add a new section stating the following:

215-XX. Access to Occupants. Each occupant shall have access to the occupant's supply disconnecting means as described in Article 225, Section 35.

SUBSTANTIATION: Section 240-24(b) addresses Overcurrent (OC) devices accessible to occupant(s). This new 215-xx would address a feeder disconnecting means, which may or may not be an OC device. If the feeder disconnecting means is located in another portion of a small, 3 or 4 unit apartment building (even if the owner of the building lives in one unit), he/she will not be available 24 hours a day every day of the year(s). The occupant needs access to the disconnecting means as per 225-35 as if it were in another building or structure.

By referring to the 225-35 section, this reduces the amount of words in the NEC.

PANEL ACTION: Reject.

PANEL STATEMENT: This requirement is addressed in Sections 225-35 and 240-24. It is not necessary to restate this in Article 215.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

ARTICLE 220 — BRANCH-CIRCUIT, FEEDER, AND SERVICE CALCULATIONS

(Log #453)

2- 254 - (220): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION:

1. In Section 220-3(b)(8)(a), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".
2. In Section 220-3(b)(8)(b), replace "1 ft (305 mm)" with "300 mm (1 ft)".
3. In Section 220-3(c)(1), replace "500 ft^2 (46.5 m^2)" with "46.5 m^2 (500 ft^2)".
4. In Section 220-12(b), replace "2 ft (610 mm)" with "600 mm (2 ft)".
5. In Section 220-30(b)(2), replace "3 volt-amperes per square foot (0.093 m^2)" with "33 volt-amperes/m^2 or 3 volt-amperes/ft^2".
6. In Section 220-31 2nd paragraph, replace "3 volt-amperes/ft2 (0.093 m^2)" with "33 volt-amperes/m^2 or 3 volt-amperes/ft^2".
7. In Section 220-31(2), replace "3 volt-amperes/ft^2 (0.093 m^2)" with "33 volt-amperes/m^2 or 3 volt-amperes/ft^2".
8. In Section 220-32(c)(2), replace "3 volt-amperes/ft^2 (0.093 m^2)" with "33 volt-amperes/m^2 or 3 volt-amperes/ft^2".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show the SI units as the preferred and the inch-pound units immediately following in parenthesis. The inch-pound numbers are not shown in parenthesis for items 5 through 8 since they are not a direct conversion. Separate loads for these items are given based on square meters and square feet

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BROWN: The use of "hard Conversions" should be reevaluated. The proposed metric measurements do not correlate with the respective English measurements as used in such documents as model building codes, and standards such as ANSI A117.1. The Technical Correlating Committee should correlate all of these metric changes in the NEC with those dimensions already accepted throughout the industry. Using the proposed dimensions and factors, it is possible to calculate a load that will be 2 percent higher then is now required.
COMMENT ON AFFIRMATIVE:
BECKER: Consideration should be given to using a metric load that is less than the 1 in.-pound load, to encourage trades people to use the SI units. In this case, 32 volt-amperes would be approximately 1 percent less than the soft conversion of 32.58 volt-amperes, compared to 33 volt-amperes being 2.3 percent greater.

(Log #3821)

2- 255 - (220): Reject
SUBMITTER: Philip Morgans, Riviera Electric
RECOMMENDATION: Section 220 should have two sections that cover standard and optional load calculations for apartment buildings including house loads.
SUBSTANTIATION: It is unclear about how to calculate loads for apartment buildings in regard to standard vs. optional calculation.
PANEL ACTION: Reject.
PANEL STATEMENT: No proposed text was provided in accordance with 4-3.3 of the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3837)

2- 256 - (220, Appendix D): Reject
SUBMITTER: Bill Kolson, Riviera Electric
RECOMMENDATION: Revise text to read:
"This change would allow users of the code, quick and easy reference to the examples ~~without having to leave the article to fix them~~ by having them located within the article they pertain to. This would greatly simplify the usage of Article 220 and would eliminate the need to reference code users to Appendix D.
SUBSTANTIATION: All of the example calculations for one family and multiple dwelling are located currently in Appendix D. When working these calculations using Article 220, it would be more time saving for the electrician to have these examples contained in the article they pertain to rather than having to flip to the back of the code book to use them.
PANEL ACTION: Reject.
PANEL STATEMENT: Appendix D contains examples, not mandatory code. The NEC Style Manual indicates that explanatory materials are to be in an Annex.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3840)

2- 257 - (220): Reject
SUBMITTER: Dean Hauck, Riviera Electric
RECOMMENDATION: The NEC should include a section in the code book that lists formulas that would be used in the field. Such as ohm's law, voltage drop, containers, capacitors, inductance etc. (using a perforated page would allow testing agencies to remove these for testing purposes). Having these formulas would help the electricians in the field.
SUBSTANTIATION: It is difficult to remember all these formulas, so having a section at lists all formulas for calculations would save a lot of time and money for our employers, not to mention correct calculations for safety and correct operation of electrical systems.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a design or engineering consideration as outlined in Section 90-1(c) and is not appropriate in the Code. In addition, this proposal does not conform to 4-3.3 of the Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1467)

2- 258 - (220-1 Exception No. 2 (New)): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Change the exception to Exception No. 1 and add Exception No. 2 to read:
Exception No. 2: Outdoor feeders over 600 volts as covered in Article 225, Part C.
SUBSTANTIATION: New proposals for Article 225 created by a task group to address over 600 volt issues in the code, if accepted, will make this new exception necessary.
This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities that have not historically been included in the NEC.
The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.
Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel questions adding an exception to remove calculations for over 600 volt feeders from the scope of Article 220. Should specific rules for calculating loads over 600 volts be necessary, the appropriate placement is in Article 220.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
ROCHE: Even though there is already one exception to the concept of all load calculations being in Article 200, I agree that the proper place for guidance for calculating loads for over 600 volt feeders should be in Article 220 instead of Article 225. Rules could be developed for all circuits over 600 volts, not just outside circuits. With this concept in mind, I suggest that the rules incorporated by CMP 4 action on Proposal 4-40b be moved into a new Part E of Article 220. Part E would be titled "E. Method of Sizing Conductors for Circuits Over 600 Volts".
This would also require coordination with CMP 4 actions on Proposals 4-4, 4-7, 4-7(a), 4-39, and 4-40(b).

(Log #3826)

2- 259 - (220-2(b)): Accept in Principle
SUBMITTER: Fred Deffenbaugh, Riviera Electric
RECOMMENDATION: Add text:
"It is permitted to drop a fraction of an ampere of less than 0.5."
SUBSTANTIATION: Except where computations result in a fraction of an ampere 0.5 or larger, such fractions shall be permitted to be dropped. (This is not clear).
PANEL ACTION: Accept in Principle.
Revise existing Section 220-2(b) to read as follows:
"Where computations result in a fraction of an ampere that is less than 0.5, such fractions shall be permitted to be dropped."
PANEL STATEMENT: The revised text meets the intent of the submitter and provides clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4426)

2- 260 - (220-2(b)(8)): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add a new sentence as follows:
"The length used for the computation shall be based on the portion that contains receptacle outlets.
SUBSTANTIATION: Multioutlet assemblies are commonly installed in department stores and office buildings as free standing, vertical "power poles". The multioutlet assemblies are commercially available as listed products with one or more receptacles located near the end intended to be supported from the floor. The entire length of the assembly may be 20 or 30 feet but the portion containing receptacles is typically less than 1 foot. The load is typically a cash register or office equipment. Presently one would have to use the entire length of the assembly (the majority of which contains no receptacles and therefore has no load) to determine the load computation. This application could be similar to installing a free standing conduit drop having a threaded "FS Type" Box, containing a receptacle, located near the floor. The computation in this case would only be 180 volt-amperes. See also the definition for Multioutlet Assembly in Article 100.
PANEL ACTION: Accept in Principle.
Add a new second sentence to the opening paragraph of existing Section 220-3(b)(8) to read as follows:
"For the purposes of this section, the computation shall be permitted to be based on the portion that contains receptacle outlets."
PANEL STATEMENT: The revised wording meets the intent of the submitter and provides clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4402)

2- 261 - (220-2(c) (New)): Reject
SUBMITTER: Richard W. Becker, Engineered Electrical Systems, Inc.
RECOMMENDATION: Add a paragraph to read:
(c) Load Calculations. Calculations shall be in units of kVA. Except where the computations result in a fraction of a kVA 0.05 or larger, such fractions shall be permitted to be dropped.
SUBSTANTIATION: This proposal deals with "significant digits". Calculations using Volt-Amperes are cumbersome and difficult to interpret. When kVA is rounded to one decimal point, loads less than 40 VA are rounded down and 50 VA and greater are rounded up. Statistically, the rounding results in an insignificant difference and makes the information much easier to process.
PANEL ACTION: Reject.
PANEL STATEMENT: This is an engineering consideration. There are other methods used to calculate loads, and the panel does not agree that units of kVA should be mandated.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #452)

2- 262 - (220-3(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the first sentence of Section 220-3(a) to read as follows:
"A unit load of not less than that specified in Table 220-3(a) for occupancies specified therein shall constitute the minimum lighting load. ~~for each square foot (0.093 m^2) of floor area.~~"
SUBSTANTIATION: Deleting the material noted in the proposal eliminates the need to revise it to the metric format. Also, the deleted material is not necessary since Table 220-3(a) includes the proper reference to square foot or square meter.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1444)

2- 263 - (220-3(a)): Reject
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Keep the first sentence as is.
Change the second sentence to read as follows:
"The floor area for each floor including finished basements and unfinished basements adaptable for future use shall be computed from the outside dimensions of the building, dwelling unit, or other area involved."
Keep the third sentence as is.
SUBSTANTIATION: The purpose of this proposal is to clarify what is already the intent of the "code". A previous CMP 2 has already indicated that unfinished basements must be included in the square footage calculations if they are adaptable for future use. Please see the 1995 NEC ROP 2-405. The actual wording change that I am proposing is that I have inserted the following ten words into that existing sentence: "including finished basements and unfinished basements adaptable for future use."
Including the basement or not including the basement when calculating square footage can make a tremendous difference (It can be twice as much). Something this significant should be clarified.
PANEL ACTION: Reject.
PANEL STATEMENT: The present code requirements are clear in their intent. The second sentence applies to all buildings, the third sentence applies to dwelling units.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1886)

2- 264 - (220-3(a)): Reject
SUBMITTER: Richard D. Thompson, Thompson Assoc.
RECOMMENDATION: Add to: Type of Occupancy; Unit load per square foot (volt-amperes)
Motion Picture and Television Production Soundstages and Approved Production Facilities 35
SUBSTANTIATION: NFPA 140, "Standard for Motion Picture and Television Production Soundstages and Approved Production Facilities" was adopted by the NFPA at their May 1999 annual meeting. In this new standard, Section 3-5 Electrical Requirements, states in 3-5.1 that "Soundstages and approved production facilities shall be provided with a minimum of 35 W/ft^2 (377 $W/m/^2$) dedicated for production lighting and power."
The NFPA Technical Committee that developed NFPA 140 consisted of representatives of the major film and television studios, fire departments, insurance underwriters, and knowledgeable industry personnel. In their deliberations, it was strongly urged to add to this fire code standard a minimum requirement for the electrical power used for set lighting. Typically, lighting fixtures in the 1000, 2000, 5000 and 10,000 watt sized are used in lighting motion picture and television productions. The committee found that many productions were and continue to be filmed in industrial buildings where the installed electrical service is woefully inadequate. Typically, portable generators are needed to augment the existing electrical service. This requirement in NFPA 140 does not preclude the use of portable generators, should the needs of the production exceed this minimum requirement.
It is the intent of this proposal to the 2002 NEC to incorporate this provision from NFPA 140 into the Electrical Code so as to facilitate the knowledge and information of this new requirement such that the AHJ, electrical engineers, building owners and studio operators can comply with this standard.
PANEL ACTION: Reject.
PANEL STATEMENT: NFPA 140, Section 3-5.1 deals with lighting and power requirements for these facilities. NEC Table 220-3(a) only applies to general lighting loads. The submitter's proposal would require the full 35 VA per sq. ft. for lighting only which the panel does not believe is the submitter's intent. The panel questions whether a sound stage is a general lighting load.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #454)

2- 265 - (Table 220-3(a)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Replace Table 220-3(a) with the following table:

Table 220-3(a) General Lighting Loads by Occupancy

Type of Occupancy	Unit Load Volt-Amperes per Square Meter	Unit Load Volt-Amperes per Square Foot
Armories and auditoriums	11	1
Banks	39[b]	3 1/2[b]
Barber shops and beauty parlors	33	3
Churches	11	1
Clubs	22	2
Court rooms	22	2
Dwelling units[a]	33	3
Garages – commercial (storage)	6	1/2
Hospitals	22	2
Hotels and motels, including apartment houses without provision for cooking by tenants[a]	22	2
Industrial commercial (loft) buildings	22	2
Lodge rooms	17	1 1/2
Office buildings	39[b]	3 1/2[b]
Restaurants	22	2
Schools	33	33
Stores	33	3
Warehouses (storage)	3	1/4
In any of the above occupancies except one-family dwellings and individual dwelling units of two-family and multi-family dwellings:		
Assembly halls and auditoriums	11	1
Halls, corridors, closets, stairways	6	1/2
Storage spaces	3	1/4

[a]See Section 220-3(b)(10).
[b]In addition, a unit load of 1 volt-ampere/ft^2 or 11 volt/amperes/m^2 shall be included for general-purpose receptacle outlets where the actual number of general-purpose receptacle outlets is unknown.

SUBSTANTIATION: The proposed revision is itended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to values of measurement. The inch-pound numbers are not shown in parenthesis since they are not a direct conversion. Separate unit loads are given based on square feet and square meters.
PANEL ACTION: Accept in Principle.
In the proposed table, in the row for "Schools", change the number in the "Volt-Amperes per Square Foot" column from "33" to "3".
In superscript "b" at the bottom of the table, delete the slash between "volt" and "amperes". In addition in "b" reverse the english and the metric units.
PANEL STATEMENT: The revisions to the table are editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BROWN: See my Explanation of Negative Vote on Proposal 2-254.

(Log #4133)

2- 266 - (Table 220-3(a)): Reject
SUBMITTER: David T. Brender, Cooper Development Assn. Inc.
RECOMMENDATION: In Table 220-3(a), change the Unit Load per Square Foot (Volt-Amperes) for Dwelling Units from 3 to 4-1/2.
SUBSTANTIATION: The current Unit Load per Square Foot for dwelling units has been at 3 in the Code for at least 30 years (1968 NEC). During this period, there has been an explosion of electrical products being used in dwelling units. Where, in the sixties, there might have been one TV, stereo, or hair dryer in a home, there are now multiple appliances throughout the dwelling. Recent research (International Telework Association and Council-report released October 27, 1999) indicates that 19.2 million people, or 10 percent of the workforce, now telecommute, supporting the growing residential use of computers, printers, fax machines, copiers, etc. In fact, 55 percent of all U.S. households now have one or more computers (Parks Associates, Forum99, October 1999), and this is expected to grow further to 75-80 percent within the new 10 years. Many other appliances VCRs, DVDs, room heaters, room air-conditioners, hair dryers, curling irons, exercise equipment, remote telephones, answering machines, etc., have become commonplace in dwellings. Electric chain saws, snow throwers, hedge clippers, edgers, leaf blowers, etc., have also proliferated in usage.
The Code should recognize this dramatic increase in electric requirements by revising the Code to accurately reflect the current and projected simultaneous electricity demands in dwellings. Even the increased value of 4-1/2 volt-amperes per square foot is modest compared to the amount of electrical products currently in use and the anticipated continuing increase in the coming decades. The dwellings being built today need to be able to handle the electrical load for up to 50 years from now.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not considered in his substantiation that utilization equipment manufactured today is more efficient than in the past. For such a change, the panel would need to review actual engineering field measurements to show that 3 VA/sq. ft. is insufficient.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2892)

2- 267 - (220-3(b)): Reject
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Add new subsections (11) to Section 220-3(b) to read as follows:
(8) For purposes of calculations and installation requirements, the following loads and branch circuit requirements may be used where the actual nameplate rating is not available.

	LOAD	CONDUCTOR AMPACITY	SINGLE PHASE NOMINAL VOLTAGE
Electric Clothes Dryer	5000 VA	30 Ampere	(120/240V)
Water heater	4500 VA	30 Ampere	(240V)
Dishwasher	1500VA	20 Ampere	(120V)
Garbage Disposal	720 VA	20 Ampere	(120V)
Evaporative Cooler	1200 VA	20 Ampere	(120V)
Compactor	1500 VA	20 Ampere	(120V)
Wall Mounted Oven or Counter Mounted	6000 VA	30 Ampere	(120/240V)
Cooking Units Range	12000 VA	50 Ampere	(120/240V)
Gas Fire Clothes Dryer	1500 VA	20 Ampere	(120V)
Clothes Washer	1500 VA	20 Ampere	(120V)
Microwave Ovens (Fixed)	1200 VA	20 Ampere	(120V)

NOTE: The above calculations are without appropriate NEC demands, which may be taken where permitted in the NEC. If appliances are installed having higher nameplate ratings than the minimum loads specified above, the conductors shall be increased to the proper size. Where limited storage capacity water heaters are specified, the nameplate rating of the unit(s) shall be used.

SUBSTANTIATION: These loads are necessary to allow for calculating loads prior to having the complete data on equipment that has not been purchased. These loads will allow for most equipment to be installed while having an electrical system that is designed with adequate ampacity. These values do not have to be used if the equipment planned for has already been specified and the values are known. Too many times designers choose values they are familiar with while not completely specifying the equipment being designed for.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a design issue. See Section 90-1(c). It is not possible for the code to anticipate all of the loads of available appliances.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3818)

2- 268 - (220-3(b)): Reject
SUBMITTER: Don Crawford, Riviera Electric
RECOMMENDATION: Delete this section.
SUBSTANTIATION: By deleting this section and only using 220-12(a) as reference this will eliminate duplication and/or duplication unnecessarily. This duplication is confusing and causes uncertainty.
PANEL ACTION: Reject.
PANEL STATEMENT: It is unclear which section the submitter wants to delete. It should be noted that Section 220-12(a) pertains to demand factors for computing feeder and service loads for show windows. Section 220-3(b)(7) is used to compute show window branch circuit loads.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2835)

2- 269 - (220-3(b)(1)): Accept
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Replace "strap" with "yoke":
(9) Receptacle Outlets. Except as covered in (10), receptacle outlets shall be computed at not less than 180 volt-amperes for each single or for each multiple receptacle on one ~~strap~~ yoke. A single piece of equipment consisting of a multiple receptacle comprised of four or more receptacles shall be computed at not less than 90 volt-amperes per receptacle.
SUBSTANTIATION: To be consistent with the text presently in Definitions Article 100 page 23 for "Receptacle" and as used elsewhere in the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1152)

2- 270 - (220-3(b)(3)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
"Motor Loads. Outlets for motor loads shall be computed based on maximum current ratings in accordance with the requirements in Sections ~~430-22 and 430-24 and Article 440.~~ 430-6(a), (b), (c), and (d), and the rated load current or branch-circuit selection current as covered in Section 440-2 for hermetic refrigerant motor-compressors."
SUBSTANTIATION: Sections 430-22 and 430-24 do not relate directly to load computations, but conductor ampacity, which is not the same, but separate considerations. While it is common to include the largest motor factor (25 percent) and continuous load factor (125 percent) to simplify calculations for panelboard, feeder, and service loads, those factors are technically for conductor ampacities, not load computations.
This section infers motor supply conductor ampacity constitutes the computed load which is misleading and incorrect.
If the requirements of Section 430-22(b) for a continuous duty motor for varying duty to have supply conductors of 200 percent of the motor nameplate current rating is used for load calculation there would be a phantom load increase of 100 percent for the branch circuit load. Section 220-14 for feeders and services does not reference Section 430-22 even though they may supply only a single branch circuit for such a motor.
The present reference to Article 440 is not specific; Code users should be directed to explicit sections that apply.
PANEL ACTION: Accept in Principle in Part.
Revise 220-3(b)(3) in the existing code by replacing "Article 440" with "Section 440-6".
The panel rejects the remainder of the proposal.

PANEL STATEMENT: The panel accepts in principle the part of the recommendation referencing a specific section in Article 440. The proper reference is 440-6. The panel rejects the remainder of the proposal because the references make it clear what rules to use. It is the intent of the panel to use the same rules for motor conductor calculations as load calculations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #693)

2- 271 - (220-3(b)(6)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(6) Sign and Outline Lighting Each branch circuit specified in Section 600-5(a) for ~~Sign~~ sign and outline lighting outlets shall be computed at not less than 1200 volt-amperes. ~~for each branch circuit specified in Section 600-5(a).~~
SUBSTANTIATION: Editorial. Section 600-5(a) allows one or more outlets on the sign circuit. Present wording can be interpreted as applying the minimum load to each outlet or the sum total of outlets. Proposal clearly assigns the load to the circuit.
PANEL ACTION: Reject.
PANEL STATEMENT: The present text is clear, and states specifically that the computed load is a minimum of 1200 va for each branch circuit specified in 600-5(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #694)

2- 272 - (220-3(c)(1), (2)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(1) Dwelling Units. General lighting ~~Loads~~ loads for structural additions to an existing dwelling unit or for a previously unwired portion of an existing dwelling unit ~~Either of which exceed 500 ft^2 (46.5m^2),~~ shall be computed in accordance with ~~(b)~~ (a). Loads for new circuits or extended circuits for other than general lighting in previously wired dwelling units shall be computed in accordance with ~~either (a) or~~ (b).
(2) Other than Dwelling Units. Loads for new circuits or extended circuits in other than dwelling units shall be computed in accordance with either (a) or (b), as applicable.
SUBSTANTIATION: The first sentence of (1) appears intended to apply to general lighting loads since the reference to (b) is apparently an oversight carried over from the 1996 code where (b) was titled Lighting Load for Listed (Specific) occupancies, which is now (a). Without such distinction, the addition or unwired portions are equally covered by the last sentence.
The present reference to (b) doesn't allow Table 220-3(a) to be used.
The present wording allows up to 500 sq ft to be wired without a load computation; at 3va/sq ft this could be a normally computed load of 1500 va. This exemption doesn't apply for the last sentence of (1) if (a) is selected, nor for (2) where (a) is selected. This is inconsistent and doesn't make sense.
If the intent is to apply a distinction between general lighting and other loads the reference to (a) should be deleted in the second sentence as that covers "other loads". If the intent is to permit either (a) or (b) the first sentence should be deleted as it is then superfluous and contradictory.
Present wording of (2) literally allows either (a) (general lighting) or (b) (other loads) to be used for computation without distinction of the type of load supplied.
PANEL ACTION: Accept in Principle in Part.
Revise exsiting section 220-3(c)(1) to read as follows:
"(1) Dwelling Units.
a. Loads for structural additions to an existing dwelling unit or for a previously unwired portion of an existing dwelling unit, either of which exceeds 46.5m2 (500 ft.^{2}), shall be computed in accordance with 220-3(a) and (b).
b. Loads for new circuits or extended circuits in previously wired dwelling units shall be computed in accordance with either 220-3 (a) or (b), as applicable."
The panel rejects the deletion of "Either of which exceed 500 ft2".
The panel accepts the suggested change in (2) of the proposal.
PANEL STATEMENT: The revised wording meets the intent of the submitter and provides clarity. New additions need to comply with both (a) and (b). No substantiation was given for deleting the 500 ft^2 exclusion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2162)

2- 273 - (220-4(c)): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Range Loads. It shall be permissible ~~acceptable~~ to apply demand factors for range loads in accordance with Table 220-19, including Note 4.
SUBSTANTIATION: Acceptable is not the proper word for a permissive rule. "Shall be permitted and shall be permissible indicate allowed optional or alternate methods." [NEC Style Manual 3.2.5.5 Voltage]; therefore, permissible should be used in this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1748)

2- 274 - (220-5 (New)): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Add new text to read as follows:
220-5. Diagrams of service(s). If required by the authority having jurisdiction, a diagram showing service details shall be provided prior to the installation of the service. Such a diagram shall show the area in square feet of the building or other structure supplied by each service, the total connected load before applying demand factors, the demand factors used, the computed load after applying demand factors, and the size and type of conductors to be used.
SUBSTANTIATION: There is a requirement for feeders in article 215-5 that is similar to this one but limited to feeders by the scope of article 215-1. Article 215 covers the installation requirements, overcurrent protection requirements, minimum size, and ampacity of conductors for feeders supplying branch-circuit loads as computed in accordance with Article 220. This requirement would allow the authority having jurisdiction to require a diagram of the service (load calculation) as is currently the case for feeders only. There are a lot of buildings that have a service and branch circuits only and no feeder's as in most dwellings and small commercial buildings and the requirements in 215-5 can not be applied. Please see other proposal on 230-5 and 215-5.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement for a diagram would not be appropriate in Article 220.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #455)

2- 275 - (220-12(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Section 220-12(a) to read as follows:
"(a) Show Windows. For show-window lighting, a load of not less than 660 volt-amperes/linear meter or 200 volt-amperes/linear foot shall be included for ~~each linear foot (305 mm) of~~ a show window, measured horizontally along its base.
FPN: See Section 220-3(b)(7) for branch circuits supplying show windows."
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.

The inch-pound numbers are not shown in parenthesis since they are not a direct conversion. Separate loads are given based on linear meters and linear feet.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3763)

2- 276 - (220-12(b)): Accept
NOTE: The Technical Correlating Committee directs that the panel clarify the action on the proposal, specifying where the new sentence is to be located. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Michael S. O'Boyle, Lightolier, Inc./Rep. American Lighting Assn.
RECOMMENDATION: Add last sentence from 1996 NEC 410-102 and relocate to Part A:
"Track Lighting. For track lighting in other than dwelling units or guest rooms of hotels or motels, an additional load of 150 volt-amperes shall be included for every 2 ft (610 mm) of lighting track or fraction thereof. Where multicircuit track is installed the load shall be considered to be divided equally between the track circuits."
SUBSTANTIATION: This load calculation requirement was relocated to Section 220-12 from Section 410-102 during the 1999 code cycle. The 1996 Section 410-102 requirement addressed both single circuit and multicircuit lighting track. Using that rule, 12 ft of single circuit lighting track would be considered a 900 VA load, each circuit of a 12 ft two-circuit lighting track would be considered a 450 VA load and each circuit of a 12 ft triple-circuit lighting track would be considered a 300 VA load. Presently, Section 220-12 does not address multicircuit lighting track. A98 NEC-ROP and A98 NEC-ROC do not reveal any substantiated reason for deleting the multicircuit calculation provision. Because separate branch circuits may supply a multicircuit lighting track, provisions should be given to separately calculate the load of each track circuit. Also, because the rule is associated with both branch circuits and feeders, it should appear in 220, Part A.
NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1153)

2- 277 - (220-14): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
Motors. Motor loads shall be computed based on maximum current ratings in accordance with Sections ~~430-24, 430-25, and 430-26.~~ 430-6(a), (b), (c), and (d), and the rated load current or branch-circuit selection current as covered in Section 440-2 for hermetic refrigerant motor-compressors.
SUBSTANTIATION: Sections 430-24, 430-25 and 430-26 do not relate directly to load computations, but conductor ampacity, which is not the same, but separate considerations. This section infers the 25 percent increase for motor supply conductors constitute part of the load, which is misleading and incorrect. Section 430-22(b) should also apply to service and feeder conductors where they supply a motor (no other load) since they see the same heating effects as the branch-circuit portion of the supply conductors. Section 430-26 is deleted as that is a separate section which stands alone, again relating to ampacity, but does not specifically affect computed load. Section 440-2 is referenced as rated load or branch-circuit selection current appears to be the constituted load, as inferred by Sections 440-7, 440-33, and 440-34.
PANEL ACTION: Accept in Principle in Part.
At the end of existing Section 220-14, add "and 440-6 for hermetic refrigerant motor compressors."
The panel rejects the remainder of the proposal.
PANEL STATEMENT: The panel accepts in principle the part of the recommendation referencing a specific section in Article 440. The proper reference is 440-6. The panel rejects the remainder of the proposal because the references make it clear what rules to use. It is the intent of the panel to use the same rules for motor conductor calculations as load calculations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #695)

2- 278 - (220-15, Exception): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception: Where reduced loading of the conductors results from units operating on duty-cycle, intermittently, or from all units not operating at ~~one~~ the same time, the authority having jurisdiction may grant permission for feeder and service conductors to have an ampacity less than 100 percent, provided the conductors have an ampacity sufficient for the load so determined.
SUBSTANTIATION: Editorial. Since service conductors would see the same reduced loading in addition to any other diversity, they should be included. Though service conductors would be computed based on feeder reduced load (normally), the text is a precise statement requiring 100 percent computation and the exception doesn't address the service conductors.
PANEL ACTION: Accept in Part.
The panel accepts the proposal, with the exception of the insertion of the word "sufficient".
PANEL STATEMENT: The word "sufficient" is not necessary, and is not in compliance with 2.2.1 of the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3239)

2- 279 - (220-16(a)): Reject
SUBMITTER: Edward J. Fox, Jr., Orange County Bldg Div., FL
RECOMMENDATION: Reference to 1996 NEC Article 220-4(b) which has been rewritten, the following should be added at the end of the existing paragraph in 220-16(a):
220-16(a): There shall be a maximum or two duplex receptacles installed on each of the two required small appliance receptacle branch circuits for counter tops in the kitchen.
SUBSTANTIATION: If an electrical contractor wires a residence and does so with the minimum code as is stated in the 1996 NEC, and the 1999 NEC, he would only be required to have two circuits for small appliances in the kitchen area and be in compliance.
With the many different appliances available today, when the customer plugs in a coffee maker, a microwave, a griddle, a toaster, and etc., and all on the same circuit; that circuit breaker will trip due to an overloaded circuit. We feel that this could be unsafe because what the owner might do to correct this problem. Why create an unsafe condition that could be avoided and also have room for expansion later if needed.
The above article provides a higher degree of safety and flexibility for the consumers.
By providing fewer receptacles per circuit, there is less of a chance of any overload or the use of extension cords.
This proposal is very exact as to the requirements of this article.
By adding the loads of typical kitchen equipment it is very apparent that two outlets per circuit provides the additional capacity needed.
By providing a better electrical system up front, the citizens are not impacted by additional cost later due to adding more circuits to handle an ever increasing demand.
People entertain more and spend more time in the kitchen area and have a greater demand for kitchen related equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: Insufficient substantiation has been provided to show that the current requirements are inadequate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2857)

2- 280 - (220-16(c) (New)): Reject
SUBMITTER: Bill F. Neitzel, Madison, WI
RECOMMENDATION: Add new subsection:
(c) Bathroom Circuit Load. A load of not less than 1500 volt-amperes shall be included for each 2-wire bathroom branch circuit installed as required by Section 210-11(c)(3). This load shall be permitted to be included with the general lighting load and subjected to the demand factors provided in Table 220-11.
SUBSTANTIATION: The recognition of the loads associated with "bathroom accessories" has prompted Article 210-11 to address these loads with a 20-ampere branch circuit. These loads are substantial enough to warrant being addressed in Article 220. With the increase in the number of bathrooms found in residences, there is also increased loading on services and feeders.
PANEL ACTION: Reject.
PANEL STATEMENT: Insufficient substantiation has been provided to show that the current requirements are inadequate. The load for bathrooms is taken into consideration in Table 220-3(a). The requirement for the 20 ampere circuit for the bathroom does not add any additional load to the feeder or service.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3819)

2- 281 - (220-18): Reject
SUBMITTER: Denise Cribbs, Riviera Electric
RECOMMENDATION: Revise text to read as follows:
"The load for household electric clothes dryers in a dwelling unit shall be 5000 watts (VA) or the nameplate rating whichever is larger for each dryer unless using optional calculation (220-30)."
SUBSTANTIATION: In 220-18 it states to use 5 kw or nameplate rating whichever is greater with no reference optional calculation. Then if you go to 220-30 for optional calculation it tells you to use nameplate rating so which code do you go by?
PANEL ACTION: Reject.
PANEL STATEMENT: Article 220, Part B and Part C are stand-alone sections and should be considered separately. See section 220-30(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4167)

2- 282 - (Table 220-18): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise the table as follows:

Table 220-18. Demand Factors for Household Electric Clothes Dryers

Number of Dryers	Demand Factor
1-4	100%
5	85%
6	75%
7	65%
8	60%
9	55%
10	50%
11	47%
12-22	[47 - (Number of dryers over 11)]%
23	35%
24-42	[35- 0.5(Number of dryers over 23)]%
43 and over	25%

SUBSTANTIATION: Applying the existing table to installations involving 1 through 42 electric clothes dryers results in no fewer than 14 different connected load combinations where a marginal increase of an additional 5 kW clothes dryer results in either no change (one instance) or an actual reduction (13 instances) in the calculated load. In other words, out of the first 42 possible dryer connections, fully one third of them result in a paradoxical load calculation, one in which you reduce, in absolute terms, your calculated load by adding to the connected load. We might entertain this anomaly if correcting it required hopeless complexity. It doesn't. The proposed table has fewer lines than the one it replaces, and every additional dryer produces an increase in load. Over all, the new table stays right with the basic parameters of the existing table, generally running slightly over the old numbers (in the direction of safety). There are a few instances where it computes slightly below the old values, but not significantly.
The table below shows the paradoxical points in the existing table with asterisks, together with all the possible combinations together with how many kilowatts at which each dryer combination would calculate (based on 5 kW dryers). The worst case shortage is less than 1 kW. In every case, those "shortages" are actually phantoms, because they always occur for the dryer combination just below the point in the old table where you start getting free dryers (additional connected load = lower calculated load).
CMP 2 should take this modest step to produce a better, more coherent and defensible Code. This proposal, along with the one from the Massachusetts Electrical Code Advisory Committee on Table 220-36, essentially rid Article 220 of tables that force users into paradoxical load calculations. They would join Table 220-11, which never had this problem since its inception in the 1950s, and Table 530-19(a), which got rid of its paradoxical calculations in 1990 by this submitter's proposal.

Number of Clothes Dryers	Table 220-18 Demand Factor		Proposal Demand Factor	
1	100	5.0kW	100	5.0kW
2	100	10.0	100	10.0
3	100	15.0	100	15.0
4	100	20.0	100	20.0
5*	80	20.0	85	21.3
6	70	21.0	75	22.5
7	65	22.8	65	22.8
8	60	24.0	60	24.0
9	55	24.8	55	24.8
10	50	25.0	50	25.0
11*	45	24.8	47	25.9
12	45	27.0	46	27.6
13	45	29.3	45	29.3
14*	40	28.0	44	30.8
15	40	30.0	43	32.3
16	40	32.0	42	33.6
17	40	34.0	41	34.9
18	40	36.0	40	36.0
19	40	38.0	39	37.1
20*	35	35.0	38	38.0
21*	35	36.8	37	38.9
22	35	38.5	36	39.6
23	35	40.3	35	40.3
24	35	42.0	34.5	41.4
25*	32.5	40.6	34	42.5
26	32.5	42.3	33.5	43.6
27	32.5	43.9	33	44.6
28	32.5	45.5	32.5	45.5
29	32.5	47.1	32	46.4
30*	30	45.0	31.5	47.3
31*	30	46.5	31	48.1
32	30	48.0	30.5	48.8

Number of Clothes Dryers	Table 220-18 Demand Factor		Proposal Demand Factor	
33	30	49.5	30	49.5
34	30	51.0	29.5	50.2
35*	27.5	48.1	29	50.8
36*	27.5	49.5	28.5	51.3
37*	27.5	50.9	28	51.8
38	27.5	52.3	27.5	52.3
39	27.5	53.6	27	52.7
40*	25	50.0	26.5	53.0
41*	25	51.3	26	53.3
42*	25	52.5	25.5	53.6
43	25	53.8	25	53.8
44	25	55.0	25	55.0
45	25	56.3	25	56.3

PANEL ACTION: Reject.
PANEL STATEMENT: The existing table is easier to use. No data was provided to substantiate this change, or some of the higher demand factors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2586)

2- 283 - (Table 220-19): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise Table 220-19 as follows.
(Table shown below)
SUBSTANTIATION: To make the Code more user friendly.
PANEL ACTION: Accept in Principle.
In the proposed table, move "Demand Factor (Percent) (See Notes)" to be over both columns A and B.
PANEL STATEMENT: Editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

Table 220-19. Demand Loads for Household Electric Ranges, Wall-Mounted Ovens, Counter-Mounted Cooking Units, and Other Household Cooking Appliances over 1 3/4 kW Rating (Column C to be used in all cases except as otherwise permitted in Note 3.)

Number of Appliances	Column A (Less than 3 1/2 kW Rating)	Demand Factor (Percent) (See Notes) Column B (3 1/2 kW to 8 3/4 kW Rating)	Maximum Demand (kW) (See Notes) Column C (Not over 12 kW Rating)
1	80	80	8
2	75	65	11
3	70	55	14
4	66	50	17
5	62	45	20
6	59	43	21
7	56	40	23
8	53	36	23
9	51	35	24
10	49	34	25
11	47	32	26
12	45	32	27
13	43	32	28
14	41	32	29
15	40	32	30
16	39	28	31
17	38	28	32
18	37	28	33
19	36	28	34
20	25	28	35
21	34	26	36
22	33	26	37
23	32	26	38
24	31	26	39
25	30	26	40
26-30	30	24	15 kW + 1 kW for
31-40	30	22	each range
41-50	30	20	25 kW + 3/4 kW for
51-60	30	18	each range
61 and over	30	16	

(Log #3444)

2- 284 - (Table 220-19): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise Table 220-19 as follows:

Table 220-19. Demand Loads for Household Electric Ranges, Wall-Mounted Ovens, Counter-Mounted Cooking Units, and Other Household Cooking Appliance over 1 3/4 kW Rating (Column C to be used in all cases except as otherwise permitted Note 3.)

Number of Appliances	Column A (Less than 3 1/2 kW Rating)	Demand Factor (Percent) (See Notes) Column B (3 1/2 kW to 8 3/4 kW Rating)	Maximum Demand (kW) (See Notes) Column C (Not over 1 kW Rating
1	80	80	8
2	75	65	1
3	70	55	1
4	66	50	1
5	62	45	2
6	59	43	2
7	56	40	2
8	53	36	2
9	51	35	2
10	49	34	2
11	47	32	2
12	45	32	2
13	43	32	2
14	41	32	2
15	40	32	3
16	39	28	3
17	38	28	3
18	37	28	3
19	36	28	3
20	25	28	3
21	34	26	3
22	33	26	3
23	32	26	3
24	31	26	3
25	30	26	4
26-30	30	24	15kW+1 kW for
31-40	30	22	each range
41-50	30	20	25kW+3/4 kW for
51-60	30	18	each range
61 and over	30	16	

SUBSTANTIATION: To make the Code more user friendly.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 2-283.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2587)

2- 285 - (Table 220-19 Notes): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise text to read as follows:

Notes:

1) Over 12 kW through 27 kW ranges all of same rating. For ranges individually rated more than 12 kW but more than 27 kW, the Maximum demand of Column C shall be increased 5 percent for each additional kilowatt of rating or major fraction thereof by which the rating of individual ranges exceed 12 kW.

2) Over 8 3/4 through 27 kW ranges of unequal ratings. For ranges individually rated more than 8 3/4 kW and of different ratings, but none exceeding 27 kW, an average value of rating shall be computed by adding together the ratings of all ranges to obtain the total connected load (using 12 kW for any range rated less than 12 kW) and dividing by the total number of ranges. Then the maximum demand in Column C shall be increased 5 percent for each kilowatt or major fraction thereof by which this average value exceeds 12 kW.

3) Over 1 3/4 kW through 8 kW. In lieu of the method provided in Column C, it shall be permissible to add the nameplate ratings of all household cooking appliances rated more than 8 3/4 kW and multiply the sum by the demand factors specified in Column A or B for the given number of appliances. Where the rating of cooking appliances for that column and the results added together.

4) Branch-Circuit Load. It shall be permissible to compute the branch-circuit load for one range in accordance with Table 220-19. The branch-circuit load for a counter-mounted cooking unit and not more than two wall-mounted ovens, all supplied from a single branch circuit and located in the same room, shall be computed by adding the nameplate rating of the individual appliance and treating this total as equivalent to one range.

5) This table also applies to household cooking appliances rated over 1 3/4 kW and used in instructional programs.

FPN No. 1: See Table 220-20 for commercial cooking equipment.

FPN No. 2: See the examples in Appendix D.

SUBSTANTIATION: To realign the notes to match new Table 220-19.
PANEL ACTION: Accept in Principle.
Revise the existing code to read as follows:

"Notes: 1. Over 12 kW through 27 kW ranges all of same rating. For ranges individually rated more than 12 kW but not more than 27 kW, the maximum demand in Column C shall be increased 5 percent for each additional kilowatt of rating or major fraction thereof by which the rating of individual ranges exceeds 12 kW.

2. Over 8 3/4 kW through 27 kW ranges of unequal ratings. For ranges individually rated more than 8 3/4 kW and of different ratings, but none exceeding 27 kW, an average value of rating shall be computed by adding together the ratings of all ranges to obtain the total connected load (using 12 kW for any range rated less than 12 kW) and dividing by the total number of ranges. Then the maximum demand in Column C shall be increased 5 percent for each kilowatt or major fraction thereof by which this average value exceeds 12 kW.

3. Over 1 3/4 kW through 8 3/4 kW. In lieu of the method provided in Column C, it shall be permissible to add the nameplate ratings of all household cooking appliances rated more than 1 3/4 kW but not more than 8 3/4 kW and multiply the sum by the demand factors specified in Column A or B for the given number of appliances. Where the rating of cooking appliances falls under both Column A and Column B, the

demand factors for each column shall be applied to the appliances for that column, and the results added together.
4. Branch-Circuit Load. It shall be permissible to compute the branch-circuit load for one range in accordance with Table 220-19. The branch-circuit load for one wall-mounted oven or one counter-mounted cooking unit shall be the nameplate rating of the appliance. The branch-circuit load for a counter-mounted cooking unit and not more than two wall-mounted ovens, all supplied from a single branch circuit and located in the same room, shall be computed by adding the nameplate rating of the individual appliances and treating this total as equivalent to one range.
5. This table also applies to household cooking appliances rated over 1 3/4 kW and used in instructional programs.
FPN No. 1: See Table 220-20 for commercial cooking equipment.
FPN No. 2: See the examples in Appendix D."
PANEL STATEMENT: The panel has corrected the editorial errors in the notes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3445)

2- 286 - (Table 220-19 Notes): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Notes to Table 220-19 to read:
Notes: 1) Over 12 kW through 27 kw ranges all of same rating. For ranges individually rated more than 12 kW but more than 27 kW, the Maximum demand of Column C shall be increased 5 percent for each additional kilowatt of rating or major fraction thereof by which the rating of individual ranges exceed 12 kW.
2) Over 8 3/4 through 27 kW ranges of unequal ratings. For ranges individually rated more than 8 3/4 kW and of different ratings, but none exceeding 27 kW, an average value of rating shall be computed by adding together the ratings of all ranges to obtain the total connected load (using 12 kW for any range rated less than 12 kW) and dividing by the total number of ranges. Then the maximum demand in Column C shall be increased 5 percent for each kilowatt or major fraction thereof by which this average value exceeds 12 kW.
3) Over 1 3/4 kW through 8kW. In lieu of the method provided in Column C, it shall be permissible to add the nameplate ratings of all household cooking appliances rated more than 8 3/4 kW and multiply the sum by the demand factors specified in Column A or B for the given number of appliances. Where the rating of cooking appliances for that column and the results added together.
4) Branch- Circuit Load. It shall be permissible to compute the branch - circuit load for one range in accordance with Table 220-19. The branch-circuit load for a counter - mounted cooking unit and not more than two wall-mounted ovens, all supplied from a single branch circuit and located in the same room, shall be computed by adding the nameplate rating of the individual appliance and treating this total as equivalent to one range.
5) This table also applies to household cooking appliances rated over 1 3/4 kW and used in instructional programs.
FPN No. 1: See Table 220-20 for commercial cooking equipment
FPN No. 2: See the examples in Appendix D.
SUBSTANTIATION: To realign the note to match the new Table 220-19.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 2-285.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #609)

2- 287 - (220-19, FPN): Accept in Principle
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Remove FPN referring to Example D5(a) and change to a parenthetical statement after the second sentence of the section. Should read:
Where two or more single-phase ranges are supplied by a 3-phase, 4-wire feeder or service, the total load shall be completed on the basis of twice the maximum number connected between any two phases. (See Example D5(a) in Appendix D)
SUBSTANTIATION: Promote understanding. As written, FPN appears to refer to entire section when, in fact, example mentioned only covers 2 or more ranges supplied by 3-phase, 4-wire feeder. Change still maintains code standards and language.
PANEL ACTION: Accept in Principle.
In the existing code, move the third sentence to become the second sentence. Move the current second sentence into a new second paragraph. The fine print note remains unchanged.
PANEL STATEMENT: The revised wording meets the intent of the submitter and provides clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #13)

2- 288 - (220-22): Accept in Principle
NOTE: The following proposal consists of Comment 2-162 on Proposal N/A in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE.
SUBMITTER: Edwin C. Denham, Denham Consulting Engineers Inc.
RECOMMENDATION: Rewrite the last sentence to read as follows:
There shall be no reduction of:
(a) The neutral capacity for that portion of the load that consists of nonlinear loads,
(b) The grounded conductor of a 3-wire circuit which consists of 2-phase wires and the neutral wire, where the supply is from a 4-wire, 3-phase, wye-connected system.
SUBSTANTIATION: The present sentence is a "run-on" sentence, and is unclear unless read by a textual scholar. The sentence should be diagramed as submitted or broken into two separate sentences which would add additional text to an already cumbersome article. Some code officials are reading this text as justification of no deration of any neutral in a commercial project etc.
PANEL ACTION: Accept in Principle.
Rewrite the last sentence of the proposed wording into two sentences to read as follows:
"There shall be no reduction of the neutral capacity for that portion of the load that consists of nonlinear loads supplied from a 4-wire, wye-connected, 3-phase system. There shall be no reduction in the capacity of the grounded conductor of a 3-wire circuit consisting of two phase wires and the neutral of a 4-wire, 3-phase, wye-connected system."
PANEL STATEMENT: These are two separate requirements. The wording has been revised to reflect this intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4071)

2- 289 - (220-30): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./ Rep. Edison Electric Inst./Electric Light & Power Group
RECOMMENDATION: This is a companion proposal to change Appendix D, Example No. D2(c).
Change paragraph (c) of 220.30 as follows:
(c) Heating and Air-Conditioning Load. Include the largest of the following ~~six~~ five selections (load in kVA).
(1) 100 percent of the nameplate rating(s) of the air conditioning and cooling including heat pump compressors.
~~(2) 100 percent of the nameplate ratings of the heat pump compressors and supplemental heating unless the controller prevents the compressor and supplemental heating from operating at the same time.~~
(2) ~~(3)~~ 100 percent of the nameplate rating(s) of electric thermal storage and other heating systems where the usual load is expected to be continuous at the full nameplate value. Systems qualifying under this selection shall not be calculated under any other selection in (c).
(3) ~~(4)~~ 65 percent of the nameplate rating(s) of the total central electric space heating including heat pump compressors. If the heat pump compressor is prevented from operating at the same time as the supplementary heat, it does not need to be added to the supplementary heat for the total central space heat load. ~~, including integral supplemental heating in heat pumps where the controller prevents the compressor and supplemental heating from operating at the same time.~~

(4) ~~(5)~~ 65 percent of the nameplate rating(s) of electric space heating if less than four separately controlled units.
(5) ~~(6)~~ 40 percent of the nameplate rating(s) of electric space heating if four or more separately controlled units.
SUBSTANTIATION: In the 1999 NEC a major change was made in calculations without adequate technical substantiation. This change impacts load calculations for single family dwellings with heat pumps when the compressor and supplemental heating is operating at the same time (normal installation) by counting the central space heat at 100 percent rather than at 65 percent as had been done by the Optional Method since the 1971 NEC. This change was made with no historical load data to justify the change. It significantly increases the main panel size and service entrance conductors on many homes and apartments thus increasing the cost with no improvements in safety. Also, the 1999 calculations are very erratic depending on whether or not the heat pump can be on at the same time as the supplementary heat. Based on the NFPA 70 A98 ROP Proposal 2-319 was rejected because it did not further clarify the present wording. See the NFPA 70 A98 ROC for Comments 2-164 and 2-165 that were accepted in principle as editorial revision to enhance clarity. In Proposal 2-319, the submitter stated that "These changes have no impact on the result of the calculation, only on the format of this section". In reality the example for the Optional Calculation using 220-30 in the 1996 and 1999 NEC is identical except for counting the central electric space heating at 100 percent in the 1999 NEC!

Numerous load surveys have been submitted by various utility companies throughout the years to verify the diversified demand of electric heat. Going back to the 1971 NEC and following codes as well, the key statement was, "Use the larger of the air conditioning load or the diversified demand of the heating load." Using 100 percent for the air conditioning and cooling, including heat pump compressors (from 1971 to 1996) meant that a heat pump could be used for cooling with or without supplemental electric heat and that the summer load could thus be greater than the winter load. Central Electric Space Heating, which was calculated at 65 percent, could include a heat pump compressor as well as integral supplemental heat, i.e., "strip" or electric resistance heat. All of the authors writing books on calculations have included resistance heat at 65 percent. A heat pump is more efficient (lower demand, higher heat output) than straight resistance heat. Also, heat pump systems are designed to turn off the heat pump if the outdoor temperature drops too low preventing continuous operation of the heat pump and the full backup resistance heat. Therefore the diversified demand for a residence would be less if the heat pump and strip heat were on at the same time.

This is exactly opposite to the 1999 changes!! Appendix D Example No. 2(c) of the 1996 NEC added the heat pump load of 5.76 kVA and the 15 kVA and multiplied the total by 65 percent for a total of 13.49 kVA. However, example D2(c) of the 1999 NEC uses a total of 20.76 kVA. The statement that "If supplementary heat is not on at the same time as heat pump, heat pump kVA need not be added to total." would mean that one would use 65 percent of 15 kVA which would be 9.75 kVA. It is reasonable to assume that the winter heat diversified demand is based on the heat loss of the home with a particular thermostat setting. If more electric heat is installed than needed (or it is not divided into two or more stages) then it will just cycle more often, but essentially have the same electrical demand. However, look at the differences in calculations for the 1999 NEC when using a 5 kW heat pump and various amounts of supplemental heat.

Assume: Heat Pump plus Supplemental Diversified Demand		
Supplemental Heat		Heat Only
1971-96 NEC	1999 NEC	
	5 + 15 = 20 kVA	
13.0 kVA	20.0 kVA	
		15 kVA
9.75 kVA	9.75 kVA	
		20 kVA
13.0 kVA	13.0 kVA	
	5 + 20 = 25 kVA	
16.25 kVA	25 kVA	
		20 kVA
13.0 kVA	13 kVA	
		25 kVA
16.25 kVA	16.25 kVA	

Thus, based on the 1999 NEC if one uses a 25 kVA central electric heating system with a heat pump, the load is 25 kVA, but if one uses 5 kVA of supplemental heat to replace the heat pump, then the diversified demand drops to 16.25 kVA. If one has 20 kVA of supplemental heat the demand is 13 kVA, but if a 5 kW heat pump is added, the demand jumps to 25 kVA. If one has a 15 kVA system calculated at 9.75 kVA, the demand more than doubles to 20 kVA if a 5 kVA heat pump is added. The 25 kVA heat pump system could actually have a lower demand than the 25 kVA supplemental heat only system that is calculated at 16.25 kVA!!

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The current text is a clarification of the technical substantiation from previous cycles. A change in the current text would require new substantiating data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MOORE: The Panel Statement is in error. The current 1999 text clearly was not a clarification of the technical substantiation from previous cycles. This was adequately shown in the substantiation (the same central space heating load for 25 kW can range from 16.25 kW to 25 kW). The current text in the 1999 NEC was a major change without any substantiation. If the substantiation of the 1971 NEC (1. 40 percent of the nameplate ratings of electric space heating for 4 or more separately controlled units; 2. 65 percent of nameplate ratings of electric space heating if less than 4 separately controlled units; and 3. 65 percent of the name plate rating of central electric space heating) was sufficient to use, then it is adequate to justify 65 percent for any type of electric space heating installation. This calculation is for the feeder or service to the dwelling, not a branch circuit. Therefore, it should be obvious that a combination central space heating installation with a heat pump and supplemental heat on at the same time will have a lower demand than a central resistance heat system. The 2002 NEC should revert back to what was in the 1996 NEC if the Panel cannot clarify without making unsubstantiated technical changes.

(Log #14)

2- 290 - (220-30(a)): Accept in Part
NOTE: The following proposal consists of Comment 2-166 on Proposal 2-319 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 2-319 was:
Revise Section 220-30. Optional Calculation -- Dwelling Unit, as shown.
(a) Feeder and Service Load. For a dwelling unit having the total connected load served by a single 3-wire, 120/240-volt or 208Y/120-volt set of service-entrance or feeder conductors with an ampacity of 100 or greater, it shall be permissible to compute the feeder and service loads in accordance with Table 220-30 for the loads in (b) and (c) instead of the method specified in Part B of this article. Feeder and service-entrance conductors whose demand load is determined by this optional calculation shall be permitted to have the neutral load determined by Section 220-22.
(b) General Loads. The loads identified in Table 220-30 as "other load" and as "remainder of other load" shall include the following:
(1) 1500 volt-amperes for each 2-wire, 20-ampere small appliance branch circuit and each laundry branch circuit specified in Section 220-16.
(2) 3 volt-amperes per sq ft (0.093 sq m) for general lighting and general-use receptacles.
(3) The nameplate rating of all appliances that are fastened in place, permanently connected, or located to be on a specific circuit, ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and water heaters.
(4) The nameplate ampere or kVA rating of all motors and of all low-power-factor loads.
(c) Other Loads. Include the largest of the following five selections in Table 220-30.
(1) 100 percent of the nameplate rating(s) of the air conditioning and cooling. including

(2) Heat pump compressors and supplemental heating unless the controller prevents both the compressor and supplemental heating from operating at the same time.

(3) 100 percent of the nameplate ratings of electric thermal storage and other heating systems where the usual load is expected to be continuous at the full nameplate value. Systems qualifying under this selection shall not be figured under any other selection in this table.

(4) 65 percent of the nameplate rating(s) of the central electric space heating, including integral supplemental heating in heat pumps where the controller prevents both the compressor and supplemental heating from operating at the same time.

(5) 65 percent of the nameplate rating(s) of electric space heating if less than four separately controlled units.

(6) 40 percent of the nameplate rating(s) of electric space heating of four or more separately controlled units.

Table 220-30. Optional Calculation for Dwelling Unit Load in kVA

100 percent of the first 10kVA of all other load.
40 percent of the remainder of all other load.

SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in Principle in part (first sentence) revised.

(a) Feeder and Service Load. For a dwelling unit having the total connected load served by a 3-wire, 120/240-volt or 208Y/120-volt set of service ~~entrance~~ or feeder conductors with an ampacity of 100 or greater, or a 4-wire 208Y/120-volt set of service or feeder conductors with an ampacity of 60 or greater, it shall be permissible to compute the service and feeder loads in accordance with Table 220-30 ~~for the loads in (b) and (c)~~ instead of the method specified in Part B of this article.

SUBSTANTIATION: To apply provisions of this section to 4-wire 3-phase systems with a volt-ampere capacity substantially equal to the systems indicated and also to apply the provisions to supply (service) conductors which are not service-entrance conductors, per the Fine Print Note to definition of service-entrance conductors, underground system in Article 100.
PANEL ACTION: Accept in Part.
The panel accepts the deletion of the word "entrance", and rejects the remainder of the proposal.
PANEL STATEMENT: Insufficient substantiation has been provided to extend the optional method to 3-phase services.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4439)

2- 291 - (220-30(a)): Reject
SUBMITTER: George T. Anderson, Antioch, CA
RECOMMENDATION: Revise text to read as follows:

(a) Feeder and Service Load. For a dwelling unit having the total connected load served by a single 3-wire, 120/240-volt 208Y/120-volt set of service entrance or feeder conductors with an ampacity of 200 or greater.

SUBSTANTIATION: Today's technology and optional appliances have increased our need for extra circuits:
1. Electronic equipment performs "cleaner" on its own circuit.
2. Audio equipment as above.
3. Spas of 2 pole 40 to 60 amperes.
4. Landscape and "garden" lighting.
5. Future automotive recharging.

PANEL ACTION: Reject.
PANEL STATEMENT: Insufficient substantiation has been provided to justify a change in the minimum ampacity of the conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1445)

2- 292 - (220-30(b)(2)): Accept in Principle
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Keep the sentence as is.
Add the following two sentences to read as follows:
"The floor area for each floor including finished basements and unfinished basements adaptable for future use shall be computed from the outside dimensions of the dwelling unit. The computed floor area shall not include open porches, garages, or unused or unfinished spaces not adaptable for future use."

SUBSTANTIATION: The purpose of this proposal is to clarify what is already the intent of the "code". A previous CMP 2 has already indicated that unfinished basements must be included in the square footage calculations if they are adaptable for future use. Please see the 1995 NEC ROP 2-405.

It should be stated here as well as in 220-3(a). Since this is an "optional" method of calculating loads for dwelling units, it should be able to stand alone without requiring a person to go back to 220-3(a) and find out the meaning of a square foot. These optional calculations (part C) are the most widely used for dwelling units.

I am actually proposing two changes: 1) Adding this square-footage statement to this part of the "code" so that it can stand alone, and 2) I have inserted ten words into the sentence that is not currently in 220-3(a) as follows: "including finished basements and unfinished basements adaptable for future use". I have also submitted a proposal on 220-3(a) to add those same ten words, thus making them similar to each other.

Including the basement or not including the basement when calculating square footage can make a tremendous difference (it can be twice as much). Something this significant should be clarified.
PANEL ACTION: Accept in Principle.
Add a second and third sentence to the existing code text to read as follows:
"The floor area for each floor shall be computed from the outside dimensions of the dwelling unit. The computed floor area shall not include open porches, garages, or unused or unfinished spaces not adaptable for future use."
PANEL STATEMENT: The revised text is extracted from Section 220-3(a). This will provide clarity for this optional calculated method pertaining strictly to dwelling units.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3898)

2- 293 - (220-30(c)(2)): Reject
SUBMITTER: Leonard L. Johnson, Dept. of Insp, Licenses & Permits, Howard Cnty, MD
RECOMMENDATION: Revise text to read as follows:

(2) 100 percent of the nameplate rating(s) of the heat pump compressors and 65 percent of the supplemental heating unless the controller prevents the compressor and supplemental heating from operating at the same time.

SUBSTANTIATION: If the supplemental heat is interlocked so it will not operate at the same time as the compressor a 65 percent demand is allowed as stated in 220-30(c)(4). If the system is connected so the compressor will operate at the same time as the supplemental heat the only additional load [above that stated in 220-30(c)(4)] that would be added to the service or feeder is the compressor load. 100 percent of the compressor load is the only additional load that could be justified. Note: If 100 percent of the supplemental heat is required in 220-30(c)(2) than 100 percent of the heat should be required in 220-30(c)(4).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 2-289.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP210)

2- 294a - (220-31): Accept
SUBMITTER: Technical Committee on National ECMP 2
RECOMMENDATION: Revise Section 220-31 to read as follows:
"220-31. Optional Calculations for Additional Loads in an Existing Dwelling Unit. This section shall be permitted to be used to determine if the existing service or feeder is of sufficient capacity to serve additional loads. Where the dwelling unit is served by a 120/240-volt or 208Y/120-volt, 3-wire service, it shall be permissible to compute the total load in accordance with (a) or (b).

(a) Where Additional Air-Conditioning Equipment or Electric Space-Heating Equipment is not to be Installed. The following formula shall be used for existing and additional new loads.

Load (kVa) Percent of Load

First 8 kVa of load at 100
Remainder of load at 40

Load calculations shall include:

(1) General lighting and general-use receptacles at 33 volt-amperes/m2 or 3 volt-amperes/ft2 as determined by Section 220-3(a).

(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit and each laundry branch circuit specified in Section 220-16.

(3) Household range(s), wall-mounted oven(s) and counter-mounted cooking unit(s).

(4) All other appliances that are permanently connected, fastened in place, or connected to a dedicated circuit, at nameplate rating.

(b) Where Additional Air-Conditioning Equipment or Electric Space-Heating Equipment is to be Installed. The following formula shall be used for existing and additional new loads. The larger connected load of air-conditioning or space-heating, but not both, shall be used.

Air-conditioning equipment	100%
Central electric space-heating	100%
Less than four separately controlled space-heating units	100%
First 8 kVa of all other loads	100%
Remainder of all other loads	40%

Other loads shall include:

(1) General lighting and general-use receptacles at 33 volt-amperes/m2 or 3 volt-amperes/ft2 as determined by Section 220-3(a).

(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit and each laundry branch circuit specified in Section 220-16.

(3) Household range(s), wall-mounted oven(s) and counter-mounted cooking unit(s).

(4) All other appliances that are permanently connected, fastened in place, or connected to a dedicated circuit, including four or more separately controlled space-heating units, at nameplate rating."

SUBSTANTIATION: The entire section has been revised in order to provide clarity.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #697)

2- 294 - (220-31): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first paragraph to read as follows:

For an existing dwelling unit presently being served by an existing 3-wire 120/240 volt, or 3- or 4-wire 208y/120 volt ~~3-wire~~ service, it shall be permissible to compute load calculations as follows:.

SUBSTANTIATION: Three-phase 4-wire systems are not explicitly prohibited by code and should be included.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 2-290.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #705)

2- 295 - (220-31(1) through (5)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

(1) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit and each laundry branch circuit specified in Section 220-16.

(2) ~~Lighting~~ General lighting and ~~portable appliances~~ general-use receptacles at 3 volt-amperes/ft^2 (0.093m2)

(3) The nameplate rating of all appliances that are fastened in place, permanently connected, or located to be on a specific circuit, ~~Household~~ range(s), ~~or~~ wall-mounted oven(s) ~~and~~ counter-mounted cooking unit(s), clothes dryers, and water heaters.

(4) ~~All other appliances fastened in place, including four~~ Four or more separately controlled space-heating units, at nameplate ratings.

(5) The nameplate ampere or kVA rating of all motors and of all low power-factor loads.

SUBSTANTIATION: Editorial. Present (1) assigns a 1500 volt-ampere load to all 20-ampere appliance circuits, including appliances fastened in place, permanently connected, etc., not just small appliances and laundry circuits. This is not required elsewhere in the code, and may be inappropriate. Proposed (1) and (3) correlate with the second paragraph.

Present (2) appears intended to apply to general lighting and general-use receptacles as indicated in (b)(2).

Present (3) is not specific whether nameplate ratings as specified in (b) (3) is intended or whether demand factors of Table 220-19 may be used, which would permit a double demand factor. The proposal is more comprehensive.

Proposed (5) covers motors such as pool or spa pumps, etc., which may not be considered appliances, per se and clarifies that such loads (existing or to be added) are included in the 40 percent demand. Application of the demand factor can be critical in determine whether a service is adequate to add a spa or pool pump motor. Section (b)(5) makes it clear that the section permits the 40 percent demand to apply to motors not covered by (b)(3).

PANEL ACTION: Accept in Principle in Part.
The panel accepts the concept of the proposal in principle, however, rejects the proposed wording "(5)".
PANEL STATEMENT: See panel action and statement on Proposal 2-294a.

The proposed (5) is rejected because it is already covered by (4).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #699)

2- 296 - (220-32(a), (c)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

(a) Feeder and Service Load. It shall be permissible to compute the load of a feeder and ~~or~~ service ~~load~~ that supplies more than one dwelling unit of a multifamily dwelling in accordance with Table 220-32 instead of Part B of this article where all the following conditions are met.

(1) No change.

(2) No change

Exception: No change

(3) Each dwelling unit is equipped with either electric space heating or air conditioning, or both. Feeders and service ~~entrance~~ conductors whose demand load is determined by this optional calculation shall be permitted to have the neutral load determined by Section 220-20.

Add new paragraph:

Where dwelling units that do not comply with (1), (2), and (3) are also supplied, that portion of the feeder and service load shall be computed in accordance with Part B of this article.

(c) ~~Connected~~ Computed Loads. The ~~connected~~ computed load to which the demand factors of Table 220-32 apply shall include the following (remainder unchanged).

SUBSTANTIATION: One must infer this section is intended to apply where more than one unit is supplied by the same service or feeder. However, it does not literally exclude application to individual services/feeders for each unit, as permitted by Section 230-2(b)(1).

In (a)(3) there does not appear to be a valid reason to limit neutral load determination to only service-entrance conductors and not include service-laterals and service-drops; demand loads also affect these conductors.

The proposed new paragraph would clarify that this section may apply where some units do not comply with conditions (1), (2) and (3). It may be interpreted by present wording that this is not permitted.

In (c) the loads of (1) and (2) are not "connected" loads but computed loads. A computed load may encompass connected and computed loads.

PANEL ACTION: Accept in Principle in Part.
In the proposal, change (a) to read as follows:
"(a) Feeder or Service Load. It shall be permissible to compute the load of a feeder or service that supplies more than two dwelling units of a multifamily dwelling...".
Revise the second sentence of proposed (3) to read as follows:
"(3) Feeder and Service conductors whose demand...".
The panel rejects the remainder of the proposal.
PANEL STATEMENT: The revisions will correct the discrepancies pointed out by the submitter. The proposed new paragraph is unnecessary as it is already implied. The panel does not accept the revision to (3)(c) as "connected load" is consistent with other parts of the article.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #698)

2- 297 - (220-32(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise 220-32(c) to read as follows:
The ~~connected~~ computed load to which the demand factors of Table 220-32 apply shall include the following:.
(remainder unchanged)
SUBSTANTIATION: Editorial. The loads assigned to small appliance branch circuits, laundry receptacle circuits, general-use receptacle circuits, sign circuits, etc., are not "connected" loads. These circuits have a code-assigned computed load. Nameplate ratings of other utilization equipment which is connected would be included since they are also "computed."
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the term "connected" is consistent with wording elsewhere in the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #700)

2- 298 - (220-33): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Optional Calculation Two Dwelling Units. Where ~~two~~ dwelling units of a two-family dwelling are supplied by a ~~single~~ common service or feeder and the computed load undr Part B of this article exceeds that for three identical units computed under Section 220-32, the lesser of the two loads shall be permitted to be used.
SUBSTANTIATION: Editorial Clarification. "Two dwelling units" is not definitive; it also covers two one-family dwellings. The definition of dwelling unit does not specify the number of families. Proposal is based on assumption that a two-family dwelling is intended. A single common service that supplies each unit of a two-family dwelling directly by branch circuits should be included.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 220-33 is intended to apply either to a two-family dwelling, or two dwelling units of a multifamily dwelling, not just a two-family dwelling.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #701)

2- 299 - (220-34): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Optional Method-Schools. The calculation of a feeder ~~or~~ and service which supplies the total load for a school~~s~~ building(s) shall be permitted in accordance with Table 220-34 in lieu of Part B of this article where ~~equipped with~~ the feeder or service supplies electric space heating or air conditioning or both, and other loads such as power and lighting. The ~~connected~~ computed load to which the demand factors shall apply include ~~all of the exterior and interior lighting, power, water heating, cooking, other loads, and~~ the larger of the air-conditioning or space heating and all other loads supplied.
Feeders and service~~s entrance conductors~~ whose demand load is dertermined by this optional calculation shall be permitted to have the neutral load determined by Section 220-22. Where the building or structure load is calculated by this optional method a feeder~~s~~ within the building or structure that does not supply the total load shall have an ampacity as determined in Part B of this article; however, the ampacity of an individual feeder shall not be required to be larger than the ampacity for the feeder or service supply conductors as calculated by this section. ~~entire building.~~
For the purposes of this section, total load shall not include load supplied by a feeder or service of a different class.
This section shall not apply to portable classroom buildings.
Table 220-34 Optional Method - Demand Factors for Feeders and services - ~~Entrance Conductors~~
(remainder unchanged)
SUBSTANTIATION: The word "or" between feeder and service can literally suggest a choice of one or the other but not both. Present literal wording of the first sentence indicates a feeder (singular) for schools, which may be comprised of multiple buildings. Revised wording is clear to permit application to one feeder for multiple buildings or separate feeders for each.
This section is not clear whether the feeder or service is intended to supply the total load, as is specified or inferred by similar sections concerning optional calculations, which usually involve diversity. Present wording specifies the school must be "equipped" with electric space heating and/or air conditioning, not that such load must be supplied by the feeder or service being calculated. A feeder or service of one class (e.g. 208y/120 volt 3-phase) supplying the loads indicated, except with no heating or cooling load would qualify if the building is equipped with an air conditioning system supplied by a different class of feeder or service (e.g., 460-volt 3-phase).
"Connected" is changed to "computed" since some loads such as general lighting and general-use receptacles may be computed as unit loads. Such loads and connected loads are "computed".
The word "service" in the first sentence includes service-equipment, service-entrance, service-drop, and service-lateral conductors, all of which relate to the calculation. The second paragraph limits Section 220-22 to service-entrance conductors which doesn't correlate with that section which uses the encompassing word "service".
"All other loads suplied" obviates the need for listing specific loads, and includes interior or exterior loads. Air conditioning equipment is frequently located other than within a building, such as on the roof or in a side yard, which the literal present wording does not include.
"Feeders within the building" appears intended to apply to feeders derived from the service or feeder supply conductors to the building and which supply only a portion of the total load. The proposal attempts to make that clearer. The ampacity of such feeders is not "permitted" by Part B but required (Sections 220-1, 220-10).
The proposed third paragraph would permit application of this section to feeders or services of different classes which do not supply the total load but would otherwise qualify
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not improve clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #456)

2- 300 - (Table 220-34): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Replace Table 220-34 with the following table:

Table 220-34. Optional Method — Demand Factors for Feeders and Service-Entrance Conductors for Schools

Connected Load (VA/m^2)	Connected Load (VA/ft^2)	Demand Factor (Percent)
The first 33 VA m^2 at	The first 3 VA/ft^2 at	100
Plus,		
Over 33 to 220 VA m^2 at	Over 3 to 20 VA ft^2 at	75
Plus,		
Remainder over 220 VA m^2 at	Remainder over 20 VA/ft^2 at	25

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to values of measurement. The inch-pound numbers are not shown in parenthesis since they are not a direct conversion. Separate connected loads are given based on square feet and square meters.
PANEL ACTION: Accept in Principle.
In the table, insert slashes after "VA" in 4 places. In addition, add the word "plus" in two places as it is shown in the first column.
PANEL STATEMENT: The panel accepts the proposal with editorial revisions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #419)

2- 301 - (220-35): Reject
SUBMITTER: Jack D. Echols, Baltes/Valentino California, Inc.
RECOMMENDATION: Add to 220-35:
"When adding load to a generator, the weekly log of generator peak loads may be used in lieu of a high kw demand provided the load is established at 125 percent of peak similar to the high kw demand value. Loads shall be determined during full load testing procedures and recorded as called for by 700-4(d) and 700-4(e) and certified by the building owner by a competent representative or building official."
SUBSTANTIATION: Problem: The local authority has no legal means to permit adding loads to an existing generator except by interpretation, something many of them are reluctant to use.
PANEL ACTION: Reject.
PANEL STATEMENT: The appropriate sections of Chapter 7 are clear in their application and should be used. The recommendation could create a conflict with the basic requirement of 700-5(a) that requires the generator to have capacity to supply all emergency loads simultaneously.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4279)

2- 302 - (220-35, Exception): Reject
SUBMITTER: Stan Price, Electric League of the Pacific Northwest
RECOMMENDATION: Section 220-35.
Paragraph 1, Exception.
Add a second paragraph as follows:
"Loads that do not vary with time or that can be operated at their maximum load, such as motors driving mechanical equipment or lighting systems, shall be permitted to be measured instantaneously."
SUBSTANTIATION: Loads that do not vary with time or that can be operated at their maximum load, such as motors driving mechanical equipment or lighting systems, do not benefit from recordings lasting 30 days.
Motor driven equipment generally is designed to a calculated maximum design horsepower, is then equipped with the next higher standard motor horsepower rating above the maximum design requirement, and then applied in applications that are safely below the maximum design number. The NEC requires that the Nameplate rating of the motor be used for load calculations. In general practice the measured load for many of these units will be 60 percent - 70 percent of nameplate rating. This difference is cumulative throughout the electrical system and results in a calculated number that is approximately 50 percent higher that actual. Prudent engineering adds a margin of safety on top of this number which then results in a system design that is approaching twice the
actual demand load. The purpose of electrical calculations is to accurately predict the peak demand. A summation of actual demand provides the most accurate information that can be obtained.
Lighting loads are an example of an existing load that can be effectively isolated for purposes of measurement. If an entire lighting system can be operated independent of all other loads, the instantaneous measurement provides the best available information on this portion of the total load and eliminates the need to count and document hundreds of individual light fixtures.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not understand how this would apply to a typical office building or retail business due to the nature of the equipment and appliances involved.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #619)

2- 303 - (220-35(1), Exception): Reject
SUBMITTER: Bruce Fairweather, Electrical Safety Inc.
RECOMMENDATION: Sixth line. after the words "ammeter or", delete the term "power meter".
SUBSTANTIATION: Many electricians use the utility billing demand data to determine existing loading. Unless there is power factor correction the use of a power meter is not going to provide the detail required for determining existing loads.
The electric utility tariff details the rolling average demand time used for billing. Normally I have found industrial plants on fifteen minute rolling averages and commercial users on thirty minute averages. From a billing demand perspective there isn't much difference in these kilowatt over time measurements. Where we all miss the boat is where there is a large amount of inductive load (rarely do we find a problem due to capacitance)and a corresponding low power factor. Most power meters, like utility demand meters measure KW. In my years in the utility business it was not unusual to have a service burn down due to overload although the demand meter was registering a KW in range of the amperage of the service conductors. This was a major problem with small grocery stores that continued to add refrigeration units to their electric plant. Come summer their demand diversity became non-exsistant. Coupled with an already low power factor it was not unusual to find that a 50 KW billing demand was actual.
PANEL ACTION: Reject.
PANEL STATEMENT: There are many types of devices that can be employed to achieve the end results. The term "power meters" includes kVA meters.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #702)

2- 304 - (220-36): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Optional Calculation ~~New~~ restaurants. Calculation of a service ~~load~~ or feeder load, where the service or feeder serves the total load for a ~~new~~ restaurant shall be permitted in accordance with Table 220-36 in lieu of Part B of this article.
The overload protection of the service ~~entrance~~ conductors shall be in accordance with Sections 230-90 and 240-3.
Feeder conductors shall not be required to be of greater ampacity than the service ~~entrance~~ conductors.
Service ~~entrance~~ or feeder conductors whose demand load is determined by this optional calculation shall be permitted to have the neutral load determined by Section 220-22.
Table 220-36 Optional Method-Demand Factors for Service ~~Entrance~~ and Feeder Conductors for ~~New~~ Restaurants
(remainder of table unchanged)
Note: Add all electrical loads, including both electric space heating and air conditioning ~~cooling~~ loads to compute the total connected computed load.
SUBSTANTIATION: There doesn't seem to be a safety reason to limit this section to new restaurants. It should be just as applicable for existing restaurants where remodeling/rewiring takes place.
Electrical wiring doesn't discern any difference.
The first sentence refers to service load, which includes service-drops, service laterals, and service equipment, then three ensuing paragraphs are limited to specific types of service conductors. There is a pertinent relationship to these other designated types of service conductors. Section 230-90 relates overload protection to (ALL) service conductors.
There is no text which clearly identifies specific type heating and cooling loads specified in the table note and an inference is required. Specificity would be helpful to code users.
PANEL ACTION: Accept in Part.
The panel accepts the deletion of the word "entrance" in 4 places.
The panel accepts the revision of "service load or feeder" to "service or feeder load".
The panel rejects the remainder of the proposal.
PANEL STATEMENT: Insufficient substantiation has been provided to justify extending the optional method to rewiring existing restaurants. The panel rejects the revision to the "Note" because all heating and cooling loads must be included.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4168)

2- 305 - (Table 220-36): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise the title and the body of the table to read as follows. (Table shown below)
SUBSTANTIATION: It isn't often that an improvement in technical accuracy can be combined with an increase in simplicity and usability. This proposal provides just that. By simply carrying out the calculations in the corresponding proposal submitted in the 1999 cycle ahead of time for the user, the relevant load calculations can be done with a single multiplication, as given in the revised table. Even the original proposal submitters agree that the methodology in the original proposal was technically accurate and fairly represented their data plots presented to the panel.
This user-friendly proposal involves only four break points instead of six, and completely avoids the paradoxical sizing problem that has caused seminar and application questions across the country. Remember, the reason for going to six rows in the 1996 NEC was to avoid problems involved when the paradoxical load problem crossed standard switch sizes. The problem remains in the 1999 NEC, where a 324 kVA would require an 80% demand factor (720A on a 208Y/120V system), but a 326 kVA similar restaurant saves 86A on its feeder calculation by adding the additional load. This proposal is a much simpler approach that avoids the problem entirely.
The panel objected to the lack of substantiation for this table in the previous comment period. By that logic, Table 220-36 shouldn't be in the Code, since the data supporting this table is the identical data that the restaurant group and EPRI used in the original submittal. For clarity on this point please find enclosed the data as plotted by EPRI as part of the original submittal for the 1996 cycle, with various test plots analyzed on the margins of the calculation cut points. This methodology fits the data curves just as well as the original 1996 NRA/EPRI/EEI proposal, with no paradoxical results on feeder calculations. This revised table has been in the Massachusetts Electrical Code ever since without any reported objections.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel accepts the submitter's revision in addition to the revisions made in Proposal 2-304.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #706)

2- 306 - (220-40(a)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise last sentence to read as follows:
Where the dwelling has electric heat and the farm has electric grain drying systems, Part C of this article shall not be used to compute the dwelling load where the dwelling and farm load are supplied by a common service.
SUBSTANTIATION: Editorial. Where separate services are provided in accordance with Section 230-2(d), this restriction does not appear to be necessary.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

Table 220.36. Optional Method—Permitted Load Calculations for Service-Entrance and Feeder Conductors for New Restaurants

Total Connected Load (kVA)	All Electric Restaurant Calculated Loads (kVA)	Not All Electric Restaurant Calculated Loads (kVA)
0 – 200	80%	100%
201 – 325	10% (amount over 200) + 160.0	50% (amount over 200) + 200.0
326 – 800	50% (amount over 325) + 172.5	45% (amount over 325) + 262.5
Over 800	50% (amount over 800) + 410.0	20% (amount over 800) + 476.3

(The note remains as in the 1999 NEC without change.)

(Log #703)

2- 307 - (220-40(b)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Other than Dwelling Unit. For each farm building or load ~~supplied by~~ where a service or feeder is installed to supply two or more separate branch circuits, the load for feeders and services ~~service entrance conductors and service equipment~~ shall be computed in accordance with demand factors not less than indicated in Table 220-40.
(FPN): No change.
SUBSTANTIATION: Editorial. The present wording infers the supply to a farm building may be two or more branch circuits. Section 225-8(a) limits such supply to one branch circuit, with 6 exceptions. If application of any exception involves a separate service there could be two or more branch circuits, but supplied by different services, and the table demand factors shouldn't be applicable.
This section does not literally apply to service-laterals and service drops. The proposed word "service" encompasses all such supply conductors and service equipment.
PANEL ACTION: Accept in Principle.
Revise the existing code text to read as follows:
"(b) Other Than Dwelling Unit. Where a feeder or service supplies a farm building or other load having two or more separate branch circuits, the load for feeders, service conductors, and service equipment...".
PANEL STATEMENT: The revised wording meets the intent of the submitter and provides clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #704)

2- 308 - (220-41): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence to read as follows:
Where supplied by a common service ~~The~~ the total load of the farm for service ~~entrance~~ conductors and service equipment shall be computed in accordance with the farm dwelling unit load and demand factors specified in Table 220-41.
SUBSTANTIATION: Editorial. This section appears intended to apply where dwelling unit and farm loads are supplied by a common service, but not where separate services are provided. The computed load should also apply to service-lateral and service drop conductors.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 225 — OUTSIDE BRANCH CIRCUITS AND FEEDERS

(Log #515)

4- 2 - (225): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 225-4, replace "10 ft (3.05 m)" with "3.0 m (10 ft)".
2. In Section 225-6(a)(1), replace "50 ft (15.2 m)" with "15 m (50 ft)".
3. In Section 225-6(b), replace "40 ft (12.2 m)" with "12 m (40 ft)".
4. In Section 225-7(c), replace "3 ft (914 mm)" with "900 mm (3 ft)".
5. In Section 225-14(c), replace "4 in. (102 mm)" with "100 mm (4 in.)".
6. In Section 225-14(d), replace "1 ft (305 mm)" with "300 mm (1 ft)".
7. In Section 225-14(d)(1), replace "30 in. (762 mm)" with "750 mm (30 in.)".
8. In Section 225-14(d)(2), replace "24 in. (610 mm)" with "600 mm (24 in.)" and replace "30 in. (762 mm)" with "750 mm (30 in.)".
9. In Section 225-18, replace "10 ft (3.05 m)" with "3.0 m (10 ft)"; "12 ft (3.66 m)" with "3.7 m (12 ft)"; "15 ft (4.57 m)" with "4.5 m (15 ft)"; and "18 ft (5.49 m)" with "5.5 m (18 ft)".
10. In Section 225-19(a), replace "8 ft (2.44 m)" with "2.5 m (8 ft)" and replace "3 ft (914 mm)" with "900 mm (3 ft)".
11. In Section 225-19(a) Exception No. 2, replace "4 in. (102 mm)" with "100 mm (4 in.)"; "12 in. (305 mm)" with "300 mm (12 in.)"; and "3 ft (914 mm)" with "900 mm (3 ft)".
12. In Section 225-19(a) Exception No. 3, replace "18 in. (457 mm)" with "450 mm (18 in.)"; "6 ft (1.83 m)" with "1.8 m (6 ft)"; and "4 ft (1.22 m)" with "1.2 m (4 ft)".
13. In Section 225-19(a) Exception No. 4, replace "3 ft (914 mm)" with "900 mm (3 ft)".
14. In Sections 225-19(b), (c) and (d), replace "3 ft (914 mm)" with "900 mm (3 ft)" throughout.
15. In Section 225-19(e), replace "50 ft (15.2 m)" with "15 m (50 ft)"; "6 ft (1.83 m)" with "1.8 m (6 ft)"; and "8 ft (2.44 m)" with "2.5 m (8 ft)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #351)

4- 3 - (225-1): Reject
SUBMITTER: Kenneth W. Birringer, University of Michigan/Rep. Univ. of Michigan Facilities Planning and Design
RECOMMENDATION: Revise to read as follows:
"This article covers requirements for outside branch circuits and feeders run on or between buildings, structures, or poles on the premises or on a multi-building campus-style complex; and electric ... or poles."
SUBSTANTIATION: With the exception of a few sections, the NEC is based on a model of a single utility service supplying a single premises. This proposed change combined with two others provides means by which the Authority Having Jurisdiction can apply the NEC with consistency to non-utility, inter-building power distribution systems at multi-building campus-style complexes including universities and industrial complexes.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no evidence that the existing wording has caused confusion in the application of the Code rules. The concept is already covered by the scope of Article 225.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP407)

4- 3a - (225-2): Accept
SUBMITTER: CMP 4
RECOMMENDATION: Add "Table 225-2 Other Articles" above the existing list of articles.
Amend the existing text to read: "225-2. Other Articles. Application of other articles, including additional requirements to specific cases of equipment and conductors, are shown in Table 225-2."
SUBSTANTIATION: To conform with the NFPA NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1468)

4- 4 - (225-3): Accept in Principle
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Change 225-3 to read:
3. Sizing of Outdoor Conductors
a. 600 volt nominal or less
The sizing of conductors for outdoor branch circuits shall be based on load as determined by Section 220-3. The sizing of conductors for outdoor feeders shall be based on load as determined by Part B of Article 220.
b. Over 600 volts nominal
The sizing of conductors for outdoor branch circuits shall be based on load as determined by Section 220-3.
Sizing of conductors for outdoor feeders shall be determined by Section 225-49 (New).
SUBSTANTIATION: This proposal must be considered in concert with companion proposals to add Sections 225-48 and 225-49. It has long been the practice at utilities and at supervised installations to size feeder conductors based on connected transformer capacity and load characteristics. This proposal addresses these accepted practices.
This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a Task Group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.
The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger (CMP 13); William T. Beutler, P.E.; William Long, NEMA.
Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)
PANEL ACTION: Accept in Principle.
Change title of Section 225-3 to read:
"Calculation of Loads 600 Volts Nominal or Less."
Retain the existing wording of this section.
PANEL STATEMENT: The change in title clearly identifies that Section 225-3 applies only to calculating loads for systems 600 volts or less. Calculation of loads for systems over 600 volts has been incorporated into Part C (III) of Article 225.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2800)

4- 5 - (225-3(b)): Reject
SUBMITTER: George Ritchie, City of Phoenix, AZ
RECOMMENDATION: Revise text to read:
"Feeder conductors shall have an ampacity not less than required to supply the load as computed in Parts B, C, and D of Article 220."
SUBSTANTIATION: This would allow the same optional calculations and method for computing farm loads as is already allowed by Article 215-2(a). Currently the NEC does not allow "outside" feeders the same latitude as feeders covered in Article 215 with regard to load calculations.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text of 220-10 adequately addresses the submitter's concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #708)

4- 6 - (225-4 and Exception No. 2 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Conductor Covering. Where within 10 ft (3.05 m) of any building or structure other than supporting poles or towers, open individual (aerial) conductors shall be insulated ~~or covered.~~ Conductors ~~in cables or raceways,~~ except Type MI cable, shall be of the rubber-covered type or thermoplastic type, and, in wet locations, shall comply with Section 310-8. ~~Conductors for festoon lighting shall be of the rubber-covered or thermoplastic type.~~
Exception No. 1: No change.
Exception No. 2: Bare conductors shall be permitted in accordance with Section 411-5(c).
SUBSTANTIATION: There is no code table which references open single "covered" conductor data for temperature rating, sunlight resistance, wet location, dimension, material, etc., and they are apparently not a listed product. This creates a problem with Sections 110-2, 110-3, 110-11, 240-3, 310-8, 310-11, raceway fill tables, etc. I believe "covered" conductors in the past applied to one individually encased in asphaltic-impregnated material and commonly referred to as "weatherproof", when the majority of insulated conductors was Type R. This type conductor was widely used for overhead distribution but is seldom used tody, and may not even be available. If a covered conductor does not provide insulating qualities why should it be an optional choice for insulation?
Deletion of "in cables or raceways" removes a limitation of insulation type and wet location requirements and implies the requriements to the open individual conductors and also festoon conductors (open or cables) which are not literally covered. It becomes a general requirement which makes the last sentence superfluous.
Exception No. 2 removes a conflict With Section 411-5(c).
PANEL ACTION: Reject.
PANEL STATEMENT: There are ampacities provisions for covered conductors in Table 310-21 and Section 310-15(b)(3). Covered conductors are used for installations over 600 volts. The conductors described in the proposed exception are not branch circuit conductors per the Article 100 definition, therefore are not covered in Article 225.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #352)

4- 7 - (225-5): Accept in Principle
SUBMITTER: Kenneth W. Birringer, University of Michigan/Rep. Univ. of Michigan Facilities Planning and Design
RECOMMENDATION: Revise to read as follows:
"The ampacity of outdoor branch-circuit and feeder conductors shall be in accordance with Sections 310-15 and 310-60 based on loads ... of Article 220.
SUBSTANTIATION: The existing wording only addresses conductors rated 0-2000 volts. The proposed wording extends the ampacity requirements to conductors rated 2001 to 35,000 volts which often exist in nonutility, inter-building power distribution systems at multi-building campus-style complexes including universities and industrial complexes.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns have been addressed by the panel's actions on Proposals 4-7a and 4-40b.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP401)

4- 7a - (225-5): Accept
SUBMITTER: CMP 4
RECOMMENDATION: Change title of Section 225-5 to read "Size of Conductors 600 Volts, Nominal or Less."
Retain the existing wording of this section.
SUBSTANTIATION: The change in title clearly identifies that Section 225-5 applies only to determining conductor ampacities for systems 600 volts or less. Determination of conductor ampacity for systems over 600 volts has been incorporated into Part C (III) of Article 225.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1051)

4- 8 - (225-6): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 225-6(a) as follows:
(1) For 600 volts, nominal, or less, ~~No. 10~~ 10 AWG copper or ~~No. 8~~ 8 AWG aluminum for spans up to 50 ft (15.2 m) in length and ~~No. 8~~ 8 AWG copper or ~~No. 6~~ 6 AWG aluminum for a longer span, unless supported by a messenger wire
(2) For over 600 volts, nominal, ~~No. 6~~ 6 AWG copper or ~~No. 4~~ 4 AWG aluminum where open individual conductors and ~~No. 8~~ 8 AWG copper or ~~No. 6~~ 6 AWG aluminum where in cable
225-6(b) - change "No. 12" to "12 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #15)

4- 9 - (225-8): Reject
NOTE: The following proposal consists of Comment 4-4 on Proposal 4-10a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-10a was:
Revise Section 225-8 to read as follows:
225-8. More than One Building or Other Structure.
(a) Number of Supplies. Where more than one building or other structure is on the same property and under single management, each building or other structure served shall be supplied by one feeder or branch circuit. For the purpose of this section a multiwire branch circuit shall be considered a single circuit.
Exception No. 1: For fire pumps.
Exception No. 2: For emergency, legally required standby, optional standby, or parallel power production systems.
Exception No. 3: By special permission, in multiple-occupancy buildings where there is no available space for supply equipment accessible to all occupants.
Exception No. 4: Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 600 volts or less, or by special permission.
Exception No. 5: By special permission, for a single building or other structure sufficiently large to make two or more supplies necessary.
Exception No. 6: For different characteristics, such as for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.
Exception No. 7: For large capacity multibuilding industrial installations under single management, where it is ensured that the disconnecting can be accomplished by establishing and maintaining safe switching procedures.
(b) Disconnecting Means. Means shall be provided for disconnecting all ungrounded conductors supplying or passing through the building or structure.
(c) Location. The disconnecting means shall be installed either inside or outside of the building or structure served or where the conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors.
Exception No. 1: For large capacity multibuilding industrial installations under single management, where it is ensured that the disconnecting can be accomplished by establishing and maintaining safe switching procedures, the disconnecting means shall be permitted to be located elsewhere on the premises.
Exception No. 2: Buildings or other structures qualifying under the provisions of Article 685.
Exception No. 3: Poles or groups of poles used as lighting standards where disconnecting means are remote.
(d) Maximum Number of Disconnects.
(1) General. The disconnecting means for each supply permitted by (a) above shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six disconnects per supply grouped in any one location.
Exception: For the purpose of this section, disconnecting means used solely for the control circuit of the ground-fault protection system, installed as part of the listed equipment, shall not be considered a supply disconnecting means.
(2) Single-Pole Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with "handle ties" or a "master handle" to disconnect all conductors of the supply with no more than six operations of the hand.
(e) Grouping of Disconnects.
(1) General. The two to six disconnects as permitted in (d) above shall be grouped. Each disconnect shall be marked to indicate the load served.
Exception: One of the two to six disconnecting means permitted in (d) above, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.
(2) Additional Disconnecting Means. The one or more additional disconnecting means for fire pumps or for emergency, legally required standby, or optional standby supplies permitted by (a) above shall be installed sufficiently remote from the one to six disconnecting means for normal supply to minimize the possibility of simultaneous interruption of supply.
(3) Access to Occupants. In a multiple-occupancy building, each occupant shall have access to the occupant's supply disconnecting means.
Exception: In a multiple-occupancy building where electric supply and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the disconnecting means supplying more than one occupancy shall be permitted to be accessible to authorized management personnel only.
(f) Suitable for Service Equipment. The disconnecting means specified in (b) above shall be suitable for use as service equipment.
Exception: For garages and outbuildings on residential property, a snap switch or a set of 3-way or 4-way snap switches suitable for use on branch circuits shall be permitted as the disconnecting means.
(g) Identification. Where a building or structure is supplied by more than one feeder or branch circuit, or by any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each feeder and branch circuit disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See Section 230-2(b).
Exception No. 1: A plaque or directory shall not be required for large capacity multibuilding industrial installations under single management, where it is ensured that disconnection can be accomplished by establishing and maintaining safe switching procedures.
Exception No. 2: This identification shall not be required for branch circuits installed from a dwelling unit to a second building or structure.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in principle revised as follows:
~~More than~~ One or More Buildings or Other Structures. ~~Where more than one building or other structure is on the same property and under single management, each~~ Each building or other structure served shall be supplied by not more than one feeder or one branch circuit. For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.
SUBSTANTIATION: The requirements of this section do not apply where there is only one building or structure supplied from a remote service such as pedestal type or unit substation, nor where a second building is supplied from one under a different management such as a leased or rented second building.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are covered in the panel's actions on Proposals 4-18 and 4-17a. The panel reaffirms that the concept of single management means the responsible party for the electrical supply system and does not agree that multiple leases or tenants conflicts with the term "single management."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #709)

4- 10 - (225-10): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Wiring on Buildings. The installation of outside wiring on surfaces of building or other structures shall be permitted for circuits of not over 600 volts, nominal, as open wiring on insulators, as multiconductor Type UF, Type SE Type MC cable, as Type MI cable, as messenger supported wiring...
(remainder unchanged)
SUBSTANTIATION: "Multiconductor cable" is not specific; it can include Type UF and SE, but specificity would be better for code users (see my proposals for Sections 338-3 and 339-3).
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements for the specific wiring methods in Chapter 3 provide adequate guidance and the proposed addtional wording does not enhance the understanding of this requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP410)

4- 10a - (225-18): Accept
SUBMITTER: CMP 4
RECOMMENDATION: In Section 225-18 make the clearance references list items (1)-(4) in accordance with the NFPA NEC Style Manual.
Delete the existing Fine Print Note.
SUBSTANTIATION: The panel action is to comply with the NFPA NEC Style Manual. The deletion of the FPN is a result of the panel's action on Proposals 4-44 and 4-45.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4100)

4- 11 - (225-18): Reject
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Add new text as follows:
225-18. Clearance from Ground. The vertical clearances of all branch circuit and feeder conductors shall be based on conductor temperature of 60°F (15°C), no wind, with final unloaded sag in the wire, conductor, or cable. Overhead spans of open conductors and open multiconductor cables of not more than 600 volts, nominal, shall conform to the following:.
SUBSTANTIATION: It is clear that the clearance requirements for this section is shared with Rule 230-24 Clearances for Service Drop Conductors. The conditions under which measurements are based should be stated in 225-18 as they are in 230-24. To promote consistency within the code, the above wording should be added to eliminate any confusion when installing and tensioning outside branch circuits or feeders.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is not enforceable. The similar wording has been removed from Section 230-24, see panel action on Proposal 4-68a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP411)

4- 11a - (225-19(d)): Accept
NOTE: The Technical Correlating Committee understands that the metric values are those accepted in Proposal 4-2.
SUBMITTER: CMP 4
RECOMMENDATION: In Section 225-19(d) amend as follows:
"(D) Final Spans. Final spans of feeders or branch circuits shall comply with (1), (2) and (3).
(1) Clearance From Windows. Final spans to the building they supply or from which they are fed shall be permitted to be attached to the building, but they shall be kept not less than 3 ft (914 mm) from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.
Exception: Conductors run above the top level of a window shall be permitted to be less than the 3 ft (914 mm) requirement above.
(2) Vertical Clearance. The vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 225-18.
(3). Building Openings. The overhead branch-circuit and feeder conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they will obstruct entrance to these building openings."
Delete the existing Fine Print Note.
SUBSTANTIATION: The panel action is to comply with the NFPA NEC Style Manual. The deletion of the FPN is a result of the panel's action on Proposals 4-44 and 4-45.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2912)

4- 12 - (225-19(d)): Reject
SUBMITTER: Donald A. Ganiere, Ottawa, IL
RECOMMENDATION: Delete text as follows:
(d) Final Spans. Final spans of feeders or branch circuits to a building they supply or from which they are fed shall be permitted to be attached to the building, but they shall be kept not less than 3 ft (914 mm) from windows ~~that are designed to be opened~~, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations. Vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 225-18.
SUBSTANTIATION: Windows are used for fire department access whether they are designed to open or not. Fire departments need clear access to windows for victim rescue, building ventilation, and application of fire streams. Conductors are permitted to be installed in locations that unduly interfere with fire department operations by the existing code wording. Keeping conductors at least 3 ft away from all windows will increase fire fighter safety and will make the placement of ladders for emergency rescue and fire fighting faster.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position that this section does not apply to fixed glass assemblies. There has been no technical substantiation provided to conclusively support that the placement of the final spans within three feet of windows, which are designed not to be opened, is unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #710)

4- 13 - (225-21): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete this section or revise:
~~Multiconductor~~ Cables on Exterior Surfaces of Buildings. ~~Supports for multiconductor cables.~~ Cables on exterior surfaces of buildings or other structures shall be supported in accordance with the applicable cable article. ~~as provided in Section 230-51.~~
SUBSTANTIATION: Editorial. The support requirements for cables, interior or exterior, are specified in the applicable cable articles, as are the requirements for raceways, which are not noted. Present wording does not cover single-conductor cables such as Type MI, nor structures which are not buildings. This article cover feeders and branch circuits; Section 230-51 applies to service conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The current requirements cover the similar applications between Article 225 and Article 230 for multiconductor cables. The proposal goes beyond editiorial and the panel affirms that 230-51 does apply to outside feeders and branch circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:
SUMRALL: I agree with the Panel's Action and statement on this proposal. Over the course of 4 days we, the Panel, addressed 37 such proposals from this submitter. I kept the time expended on this submitter's proposals. Six hours and forty-seven minutes were expended to debate the concerns this submitter asked us to consider. 24.4 percent of all our issues came from this one submitter. Several times, 15 to 25 minutes were used to debate superfluous, smirching proposals.

(Log #707)

4- 14 - (225-22): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Raceways on Exterior Surfaces of Building or Other Structures.
Raceways, boxes, fittings, and other enclosures in wet locations on exterior surfaces of buildings or other structures shall be raintight and arranged to drain.
SUBSTANTIATION: Raceways on exterior surfaces may be in a damp location rather than wet, per Article 100 definitions of damp and wet locations. Exposed to weather and unprotected will normally be a wet location. The inference is that boxes and fittings are required to be raintight to assure the raintight requirement for raceways. The proposal would correlate with Section 370-15 which requires boxes, conduit bodies, and other fittings to be listed for use, where in wet locations, but does not apply that requirement for damp locations. The proposal would correlate with that section. Other structures are included to apply the requirements to other than buildings.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the addition of the words "or Other Structures" to the title and text of the section.
The panel rejects the remainder of the proposed wording.
PANEL STATEMENT: Acceptance of the change to the title and text clarifies the application of this section. It is not necessary to reiterate the requirements of Article 370 for boxes and fittings installed in wet locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #120)

4- 15 - (225-26): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.
NOTE: The following proposal consists of Comment 4-34 on Proposal 4-44d in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-44d was:
Delete the exception in its entirety.
SUBMITTER: Melvin K. Sanders, TECo., Inc.
RECOMMENDATION: CMP 3 Task Group supports the Panel Action of CMP 4 to delete the present Exception.
SUBSTANTIATION: It is the position of CMP 3 Task Group Raymond W. Weber, Richard P. Owen and Melvin K. Sanders, Secretary, on ROP 4-44(d) that it is within the purview of CMP 4 to determine the support requirements for wiring methods in Article 225.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel affirms its position that there are applications under the purview of Article 305 where the support of temporary branch circuits or feeders by vegetation is appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #121)

4- 16 - (225-26): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.
NOTE: The following proposal consists of Comment 4-35 on Proposal 4-44d in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-44d was:
Delete the exception in its entirety.
SUBMITTER: James T. Pauley, Square D Co.
RECOMMENDATION: The Panel should reject the proposal and keep the exception.
SUBSTANTIATION: The Panel Statement makes note that Article 305 does not provide a variation to the rule. Article 305 never needed a rule to state this because 225-26 had the exception. By deleting the exception the panel has removed the entire permission for this practice without any justification. It is common to run temporary wiring through vegetation and the panel should keep the exception.
PANEL ACTION: Accept in Principle.
Revise this section to read:
"225.26. Vegetation as Support.Vegetation, such as trees, shall be permitted only for the support of temporary wiring, as covered in Article 305."
PANEL STATEMENT: The revised wording incorporates the exception into the main requirement. The panel intends that vegetation be used for support of only temporary branch circuits and feeders.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SUMRALL: In the era of temporary this and temporary that, many exceptions to the reference of Chapter 3 are extended beyond the time tables. This will eventually cause 90-1 to become ineffective for the Authority Having Jurisdiction and cause injury to wandering children and uninformed adults.

(Log #1488)

4- 17 - (225-26, Exception): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered for correlation with the action on Proposal 3-132. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Craig Schumann, Dept. of Energy
RECOMMENDATION: The exception should be deleted in that there is nothing in Article 305 that discusses vegetation.
SUBSTANTIATION: There is nothing in Article 305 that discusses vegetation.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel affirms its position that there are applications under the purview of Article 305 where the installation of temporary branch circuits or feeders in vegetation is appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP402)

4- 17a - (225-30): Accept
SUBMITTER: CMP 4
RECOMMENDATION: Modify Section 225-30 to read:
"Where more than one building or other structure is on the same property and under single management, each additional building or other structure served, that is on the load side of the service disconnecting means, shall be supplied by one feeder or branch circuit unless permitted in (a) through (e). For the purpose of this section, a multiwire branch circuit shall be considered a single circuit."
SUBSTANTIATION: The panel's action clarifies that assemblies such as service pedestals, substations, or similar equipment are considered to be structures. Structures are an assembly of parts or components arranged in a logical form or manner for a useful purpose. This action also clarifies that this section is applicable to buildings or other structures supplied by circuits on the load side of the service disconnecting means.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #711)

4- 18 - (225 Part B, and 225-30): Reject
NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Part B. ~~More than~~ One or More Buildings or Other Structures.
Number of Supplies. ~~Where more than one building or structure is on the same property and under single management each~~ Each building or structure served, other than a service or meter pedestal, unit substation, or the like, shall be supplied by one feeder or branch circuit unless otherwise permitted in (a) through (e) below. For the purpose of this section a multiwire branch circuit shall be considered a single circuit.
SUBSTANTIATION: The requirements of this section do not apply where there is only one building or structure on the property, nor where a second building is supplied from one under different management, such as a leased second building, nor where one of the buildings is on different property. The requirement for single management and same property do not appear to be relevant to electrical safety if other pertinent code rules are observed, and such considerations may be better left to other codes and regulations.
In Comment 4-4 in the 1998 ROC, the panel indicated service pedestals and structures. Literally true perhaps, but not in the context of apparent intent of this section. They would be electrically served, but if the supply is service conductors, not served by one feeder or branch circuit.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel actions on Proposals 4-9 and 4-17a address the submitter's concerns. The panel clarifies through its action that Part A covers a single structure and Part B covers multiple structures, including service pedestals and similar electrical equipment. The submitter's concerns are adequately covered by the existing text in Part B of Article 225.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP416)

4- 18a - (225-30(a)(4)): Accept
NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. There is presently no definition for "Standby Systems." This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 4
RECOMMENDATION: Amend the text in 225-30(a)(4) to read:
(4) Standby systems.
SUBSTANTIATION: The panel's action clarifies that a standby system is permissible. This action eliminates the confusion with Article 702 requirements.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4398)

4- 19 - (225-30(a)(6) (New)): Reject
SUBMITTER: Monte R. Ewing, State of Wisconsin
RECOMMENDATION: Add new paragraph (6) to read as follows:
(6) Multi-occupancy buildings or structures related in use to multi-family dwellings shall be permitted to have one set of branch circuit conductors installed from a dwelling unit to the second building or structure's occupied space.
SUBSTANTIATION: This has always been common practice for individual dwelling branch circuits to be installed to the matching detached garage stall in compliance with NEC 210-25. The present language in 225-30 does not provide for this common wiring method. The provision in 225-30(b)(1) would only apply when there is no common place on the building where the tenant disconnects could be grouped. With detached garages that is almost never the problem. The problem to avoid is multiple branch circuits and disconnects all being grouped at one place rather than one per tenant space similar to service conductors NEC 230-40 Exception No. 1. The provision to install individual branch circuit conductors to respective detached garage units has been incorporated into the State of Wisconsin Electrical Code and I feel that it needs to be addressed in the National Electrical Code.
PANEL ACTION: Reject.
PANEL STATEMENT: To permit this application without limitation on the number of branch circuits to a building or structure raises concerns over the location of multiple individual disconnecting means. The submitter's proposed language implies that the disconnecting means will be located in the individual spaces in the detached structure. This type of installation could pose a problem for emergency personnel where it is necessary to disconnect all power.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2171)

4- 20 - (225-30(b)): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise to read as follows:
By special permission, additional feeders or branch circuits shall be permitted for the following:.
SUBSTANTIATION: This is not a complete sentence like 225-30(a). Revise the subsection to make it a complete sentence. This change will also provide parallel construction in accordance with the NEC Style Manual 3.3.5 which states, "Parallel Construction means stating similar requirements in similar ways for greater consistency."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4169)

4- 21 - (225-30(e)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
"Additional feeders or branch circuits shall be permitted to supply large capacity multibuilding industrial or institutional installations under single management where documented safe switching procedures are established and maintained for disconnection."
SUBSTANTIATION: The new 1999 NEC rule allows multiple supplies on a far broader range of buildings and structures that was ever properly substantiated, the only limitation being safe switching procedures as interpreted by the authority having jurisdiction. The concept in the original proposal simply involved expanding industrial to industrial plus institutional, which was appropriate. The 1999 NEC is far too broad given the multiplicity of jurisdictions subject to the NEC. Note that the use of this language to justify additional sources of supply [new Section 225-30(e)] is a new concept that goes beyond the traditional allowance for remote switching (to be in Section 225-32 Exception No. 2). This limitation has been in the Massachusetts Electrical Code for ten months with no reported objections.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation to disallow or not permit applications of these requirements wherever documented safe switching procedures are established and maintained.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3937)

4- 22 - (225-30(f)): Reject
SUBMITTER: William F. Laidler, South Shore Voc Tech School
RECOMMENDATION: Add a new paragraph (f) to read as follows:
(f) One and Two Family Dwellings. For one and two family dwellings additional feeders or branch circuits shall be permitted to supply other buildings (such as garages and outbuildings) on the property. Where such installations comply with Section 250-32(a) and do not exceed six branch circuits the documented safe switching procedures of Section 225-30(e) need not be established.
SUBSTANTIATION: The present wording is commonly interpreted to restrict multiple branch circuits from supplying out buildings on residential property such as garages and sheds. Section 250-32(a) recognizes the practice of one or more branch circuits supplying a second building without regard to type of occupancy. Under these situations if only one branch circuit supplies a structure and has provisions for equipment grounding a grounding electrode is not required. For residential properties it is very common to add branch circuits to such structures over a period of time. Limiting this practice (without reported safety issues) would be economically restrictive.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not substantiated that the existing Code text has had a limiting effect for these types of structures. The installation of a feeder with subsequent redistribution is a commonly used option. The panel intends that there be a limit on the number of branch circuits to a detached building or structure.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP404)

4- 22a - (225-31 and 225-32): Accept
NOTE: The Technical Correlating Committee directs that the word "utilized" be changed to "used" in accordance with the NEC Style Manual.
SUBMITTER: CMP 4
RECOMMENDATION: Combine Sections 225-31 and 225-32. The revised text incorporates the accepted actions in Proposals 4-24, 4-25, and 4-27.
Revise text to read:
"225-31. Disconnecting Means. Means shall be provided to disconnect all ungrounded conductors that supply or pass through a building or structure in accordance with (1) and (2).
(1) Readily Accessible Location. The branch circuit or feeder disconnecting means shall be installed at a readily accessible location in accordance with (a) or (b).
(a) Outside. Where the branch circuit or feeder disconnecting means is installed outside a building or structure it shall be on or within sight of the building or structure supplied.
(b) Inside. Where the branch circuit or feeder disconnecting means is installed inside, it shall be nearest the point of entrance of the supply conductors.
(2) Conductors Considered Outside. For the purposes of this section, the requirements of Section 230-6 shall be permitted to be used."
Modify Exception No. 1 (Proposal 4-25), maintain existing Exceptions Nos. 2-4, and add new Exception No. 5 (Proposal 4-27).
SUBSTANTIATION: The proposed wording provides clarity, resolves concerns relative to the location of disconnects and resolves the issue that conductors considered outside of a building per 230-6 do not require a disconnect.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CARRICK: This Panel's intent for outside locations was that the disconnect should be within sight of the building and within 50 ft. It was thought that the definition of "within sight of" would specify the 50 ft limit; however, the definition in Article 100 is for two pieces of equipment. A building is usually not considered a piece of equipment. This proposal would be acceptable if the words "and within 50 ft" were added after "within sight".

(Log #2054)

4- 23 - (225-31, Exception): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add an Exception to read as follows:
Exception: Where the ungrounded conductors comply with Section 230-6.
SUBSTANTIATION: Fire pump feeders or services that pass under or through a building should not have disconnects or overcurrent protection installed in the feeder or service where large complexes need these requirements.
Emergency power circuits should have this same exception.
By allowing the exception requirements in section 225-32 does not allow exception to 225-31.
The compliance to Article 695-4 will be complied with out having a conflict since this article does not exempt Article 225.
See also Section 695-4(b) for only supervised systems.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel action on Proposal 4-22a adequately address the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1818)

4- 24 - (225-32): Accept in Principle
NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Brad Spencer, Burgess & Niple, Ltd.
RECOMMENDATION: Revise to read as follows:
The disconnecting means shall be installed either ~~inside or~~ outside of the building or structure served or where conductors pass through the building or structure or inside nearest the point of entrance of the conductors. The disconnecting means shall be at a readily accessible location ~~nearest the point of entrance of the conductors.~~ For the purposes of this section, the requirements in Section 230-6 shall be permitted to be utilized.
SUBSTANTIATION: The existing text leads one to conclude that the disconnecting means, if installed outside, must be located nearest the point of entrance of the conductors. Situations sometimes arise in which the best location for the outdoor disconnecting means is not necessarily nearest the best point of entrance of the conductors. For example, one may want to place a disconnecting means on the front of a structure but run the conductors along the outside of the structure and enter from another side. The current wording unnecessarily restricts the designer or installer from doing this. Furthermore, the proposed change to the text will make it similar to Article 230, Section 70(a) which deals with the location of service equipment disconnecting means.
PANEL ACTION: Accept in Principle.
Amend the proposal to read:
"The disconnecting means shall be installed at a readily accessible location either outside of the building or structure or inside nearest the point of entrance of the conductors. For the purposes of this section, the requirements of Section 230-6 shall be permitted to be utilized."
PANEL STATEMENT: The panel agrees in principle with the submitter's proposed text and has reworded it to enhance clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2326)

4- 25 - (225-32 Exception No. 1): Accept
NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add the following underlined text.
Exception No. 1: For installations under single management, where documented safe switching procedures are established and maintained for disconnection, and where the installation is monitored by qualified individuals, the disconnecting means shall be permitted to be located elsewhere on the premises.

SUBSTANTIATION: The exception was modified in the last code cycle to include any facility that could establish safe switching procedures. Prior to this change, only industrial facilities enjoyed this benefit, mainly due to its having a staff of qualified individuals that were familiar with the installation and could ensure that safe switching procedures were followed. Unfortunately it does not appear that same criteria carried over from the previous code. Generally speaking, for a facility to qualify for this exception prior to the 1999 NEC, it would have had a staff of qualified individuals. Presently there is no requirement for a qualified staff, which could quite easily lead to unsafe switching procedures or none at all. To assure safe switching procedures it is crucial for a qualified individual to be on staff at all times, otherwise there is no mechanism to assure that any procedure could be followed by an individual not familiar with the installation.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4170)

4- 26 - (225-32 Exception No. 1): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
"For large capacity multibuilding industrial or institutional installations under single management where documented safe switching procedures are established and maintained for disconnection, the disconnecting means shall be permitted to be located elsewhere on the premises."
SUBSTANTIATION: The major 1999 NEC expansion of the rule allows multiple supplies on a far broader range of buildings and structures that was ever properly substantiated, the only limitation being safe switching procedures as interpreted by the AHJ. The concept in the original proposal simply involved expanding industrial to industrial plus institutional, which was appropriate. The 1999 NEC is far too broad given the multiplicity of jurisdictions subject to the NEC. It potentially reaches a single-family house with a detached garage, which is rather far afield from the limitation to "large capacity multibuilding industrial," a limitation that had been in the Code since it first appeared in the 1984 edition. This limitation has been in the Massachusetts Electrical Code for ten months with no reported objections.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation to disallow or not permit applications of these requirements wherever documented safe switching procedures are established and maintained.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #434)

4- 27 - (225-32 Exception No. 5 (New)): Accept
NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal as it relates to Proposal 4-22a. This action will be considered by the Panel as a Public Comment.
SUBMITTER: C. John Beck, Pacific Gas & Electric Co.
RECOMMENDATION: Add new Exception No. 5 to 1999 NEC Section 225-32, to read as follows:
Exception No. 5: For outdoor emergency, legally required standby, or optional standby generator sets, the disconnecting means, when listed as suitable for use as service equipment, shall be permitted to be located at the generator set.
SUBSTANTIATION: A98 ROC Comment 4-14 was held in accordance with Section 3-4.6.2.2 NFPA Regulations Governing Committee Projects. The Technical Correlating Committee requested that a Task Group of members of Panels 4 and 15 review this issue and develop an agreed upon proposal for the 2002 NEC Development Cycle. The above proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Article 225 regarding location and suitability for use as service equipment, NEC Section 225-32, the original Comment 4-14 (NFPA 70-A98 ROC), and the State of Wisconsin documentation (as submitted by Mr. Bey to NFPA). The above proposal is the Task Group's response to Comment 4-14 (NFPA 70 - A98 ROC), identifies and addresses the issues raised by both Mr. Bey and the state of Wisconsin, maintains consistency with the current requirements of Article 225, and fulfills the direction of the Technical Correlating Committee. The proposal recognizes the need to permit a disconnecting means to be located at an outdoor generator set and establishes the requirement for that installation.
The Task Group participants consisted of:
Tom Adams (CMP 4); Peter Amos (CMP 15); John Beck (Chairman CMP 4 & Task Group Chair); Bob Duncan (Chairman, CMP 15); John Kovacik (CMP 15); Bill Lewis (CMP 4); and, Mark Sumrall (CMP 4).
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #712)

4- 28 - (225-33(a), Exception): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception: For the purposes of this section, disconnecting means used solely for the control circuit of the ground-fault protection system, or the control circuit of the power-operated supply disconnecting means, installed as part of the listed equipment, shall not be considered a supply disconnecting means.
SUBSTANTIATION: Disconnects for control circuits of power-operated supply disconnecting means are a reasonable inclusion with GFPE system disconnects.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #16)

15- 3 - (225-34(b)): Accept in Principle in Part
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.
NOTE: The following proposal consists of Comment 4-14 on Proposal 4-10a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-10a was:
Revise Section 225-8 to read as follows:
225-8. More than One Building or Other Structure.
(a) Number of Supplies. Where more than one building or other structure is on the same property and under single management, each building or other structure served shall be supplied by one feeder or branch circuit. For the purpose of this section a multiwire branch circuit shall be considered a single circuit.
Exception No. 1: For fire pumps.
Exception No. 2: For emergency, legally required standby, optional standby, or parallel power production systems.
Exception No. 3: By special permission, in multiple-occupancy buildings where there is no available space for supply equipment accessible to all occupants.
Exception No. 4: Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 600 volts or less, or by special permission.
Exception No. 5: By special permission, for a single building or other structure sufficiently large to make two or more supplies necessary.
Exception No. 6: For different characteristics, such as for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.
Exception No. 7: For large capacity multibuilding industrial installations under single management, where it is ensured that the disconnecting can be accomplished by establishing and maintaining safe switching procedures.
(b) Disconnecting Means. Means shall be provided for disconnecting all ungrounded conductors supplying or passing through the building or structure.
(c) Location. The disconnecting means shall be installed either inside or outside of the building or structure served or where the

conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors.

Exception No. 1: For large capacity multibuilding industrial installations under single management, where it is ensured that the disconnecting can be accomplished by establishing and maintaining safe switching procedures, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 2: Buildings or other structures qualifying under the provisions of Article 685.

Exception No. 3: Poles or groups of poles used as lighting standards where disconnecting means are remote.

(d) Maximum Number of Disconnects.

(1) General. The disconnecting means for each supply permitted by (a) above shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six disconnects per supply grouped in any one location.

Exception: For the purpose of this section, disconnecting means used solely for the control circuit of the ground-fault protection system, installed as part of the listed equipment, shall not be considered a supply disconnecting means.

(2) Single-Pole Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with "handle ties" or a "master handle" to disconnect all conductors of the supply with no more than six operations of the hand.

(e) Grouping of Disconnects.

(1) General. The two to six disconnects as permitted in (d) above shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six disconnecting means permitted in (d) above, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.

(2) Additional Disconnecting Means. The one or more additional disconnecting means for fire pumps or for emergency, legally required standby, or optional standby supplies permitted by (a) above shall be installed sufficiently remote from the one to six disconnecting means for normal supply to minimize the possibility of simultaneous interruption of supply.

(3) Access to Occupants. In a multiple-occupancy building, each occupant shall have access to the occupant's supply disconnecting means.

Exception: In a multiple-occupancy building where electric supply and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the disconnecting means supplying more than one occupancy shall be permitted to be accessible to authorized management personnel only.

(f) Suitable for Service Equipment. The disconnecting means specified in (b) above shall be suitable for use as service equipment.

Exception: For garages and outbuildings on residential property, a snap switch or a set of 3-way or 4-way snap switches suitable for use on branch circuits shall be permitted as the disconnecting means.

(g) Identification. Where a building or structure is supplied by more than one feeder or branch circuit, or by any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each feeder and branch circuit disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See Section 230-2(b).

Exception No. 1: A plaque or directory shall not be required for large capacity multibuilding industrial installations under single management, where it is ensured that disconnection can be accomplished by establishing and maintaining safe switching procedures.

Exception No. 2: This identification shall not be required for branch circuits installed from a dwelling unit to a second building or structure.

SUBMITTER: Lawrence A. Bey, Onan Corp.

RECOMMENDATION: Add new text to read:

Exception No. 4: Outdoor emergency and legally required standby generator sets where disconnecting means are located at the generator set.

SUBSTANTIATION: Where emergency and standby generators are outdoors and have circuit breakers at the generator, an additional disconnecting means nearest the point of entrance of the conductors introduces a single point of failure. Standard practice for the reliability of a simple system is to feed a distribution panel or automatic transfer switch directly from the generator. Most outdoor generator sets are located close to the building they serve, typically within 25 feet. Refer to the letter from the State of Wisconsin, Safety and Building Division.

NOTE: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle in Part.

Add new text to 225-32 read:

Exception No. 5: For outdoor emergency, legally required standby, or optional standby generator sets, the disconnecting means when listed as being suitable for use as service equipment, shall be permitted to be located at the generator set.

PANEL STATEMENT: The panel agrees with the revised text as developed by the joint CMP 4 and CMP 15 task group. The revised text meets the intent of the submitter. The intent of the exception is to permit the disconnect to be located at the generator provided that the location is readily accessible nearest the point of entrance of the conductors.

The part rejected is the location of the code. The requirement belongs in 225-32 not 225-34.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #3147)

4- 29 - (225-36): Reject

SUBMITTER: Michael Krumnauer, Vasso, MI

RECOMMENDATION: Add to the end of the first section:

"Where the supply conductors are not protected on the supply end with overcurrent protection meeting the requirements of Section 240-3."

SUBSTANTIATION: There is no need to place a restrictive condition on a disconnect on the load end of a feeder just because it supplies another building.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 225-36 does not require redundant overcurrent protection for the supply conductors at the building disconnecting means. This section only requires a specific listing of the equipment. The term "suitable for use as service equipment" does not imply that overcurrent protection is mandatory.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4286)

4- 30 - (225-36): Accept

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Revise as follows:

Where the installation is made in accordance with Section 250-32(b)(2) ~~The~~ the disconnecting means specified in Section 225-31 shall be suitable for use as service equipment.

SUBSTANTIATION: The standard to qualify a disconnecting means as suitable for service equipment has basically three provisions. Fist there must be a barrier between the unfused "service" conductors and the conductors protected by the "service overcurrent protection." This is commonly referred to as separation of unfused with protected conductors or wire. Second, is that provisions are provided for connecting a grounding electrode conductor and third is that provisions are made to bond the grounded circuit conductor to the enclosure and equipment grounding conductors with a "main bonding jumper." When the definition of service was changed in the 1987 code, then the circuit to a second building became a feeder all the way and was no longer a s"ervice." This required many of the requirements from Article 230 to be moved to Article 225 over several code cycles since this circuit was a feeder. In making these revisions and with the confusion on how the old Section 250-24 was written, the requirement to make the disconnect rated as suitable for service equipment had some reason. With the 1999 Section 250-32 clarifying when grounding and bonding is required on the grounded circuit conductor, this section needs to be updated. With regard to what the rated equipment provides: 1) the feeder conductors are in fact not "unfused" like a service since they must be protected as required by the NEC. In addition, the product standards for disconnects (fused switches and enclosed circuit breakers) have a line side lug barrier provided. The ability to install a grounding electrode connection to the enclosure is provided in disconnecting means that are not service equipment rated. Lastly, bonding of the grounded circuit conductor (neutral) is only allowed

in limited case by Section 250-32(b)(2) in the 1999 NEC. Many incorrect installations take place because the main bonding jumper provided with service rated equipment is inadvertently installed because it was supplied. Strict enforcement of this requirement has caused many installations to purchase specially rated equipment that was not really required. For example, an industrial or commercial installation with a feeder going to a MCC in a pump building, the MCC was required to be rated for service equipment even though the feeder was only three phase three wire from a system that was high impedance grounded. Because this was caught in the field, the modification expense and then reevaluation by the testing laboratory delayed the work, caused unneeded expense and did not provide any additional safety. This modification to this section will define when equipment rated as suitable for service entrance is needed and when standard disconnecting means, not rated for service entrance can be utilized.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #713)

4- 31 - (225-36, Exception): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception: For garages and outbuildings on residential property a snap switch(es), including ~~or a set of~~ 3-way and 4-way ~~snap switches~~ types shall be permitted as the disconnecting means.
SUBSTANTIATION: Editorial. Section 225-33 permits up to six switches; "a" snap switch (singular) and a "set" (singular) of 3-way or 4-way switches infer that up to six sets of single throw snap switches or six sets of 3-way/4-way switches or a combination of such switches are not permitted.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-35a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3854)

4- 32 - (225-36, Exception): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise as follows:
225-36. Suitable for Service Equipment. The disconnecting means specified in Section 225-31 shall be suitable for use as service equipment.
Exception: For garages and outbuildings at a one-family dwelling ~~on residential property,~~ a snap switch ~~or a set of 3-way or 4-way snap switches~~ suitable for use on branch circuits shall be permitted as the disconnecting means.
SUBSTANTIATION: The term "residential property" is not defined in Article 100, is far too broad and can include large apartment complexes. Some interpret the term to apply to any property where a person may "reside" which includes hotels and motels.
It seems the present permission to use a set of 3-way or 4-way switches for the disconnecting means at a garage or outbuilding violates the concept of disconnection of power at the building for safety where one may be working on an electrical system. The 3-way or 4-way switch at a remote location can accidentally be operated which will energize the system being worked on and create a safety hazard. It should not be necessary to show a body count or history of electric shock incidents to recognize that this change in the code is necessary.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any accident data to support the elimination of a long standing Code requirement, nor has he provided substatiation for the limitation to one-family dwellings.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2327)

4- 33 - (225-36 Exception No. 2 (New)): Accept in Principle
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new Exception as follows:
Exception No 2: The disconnecting means shall not be required to be configured as service equipment.
SUBSTANTIATION: There is presently much confusion about this section's requirement to be suitable for use as service equipment. Much of it stems from why this requirement exists to how the disconnect(s) to a second building must be installed.
Many manufacturers, designers, and code officials believe this section requires the disconnect(s) at a second building must be installed as if it were a service. In some aspects this is correct, such as the electrodes at the second building, but in many situations this does not make sense. As an example; A 277/480 volt wye electrical service entrance section with a 3000 ampere main switch with Ground Fault Protection (GFP) serves a 1600 amp feeder to a second building disconnect. The disconnect at the second building must be suitable for use as service equipment, but does it mean that it must have GFP (because it must be installed as service equipment) at that second building in spite of 215-10? The installation of GFP at the second building would not seem to be required due to 215-10, but since the equipment must be suitable for use as service equipment, many believe that if it were to have a single main, the main must have GFP because of requirements of 230-95 for services. It also has been argued that the nationally recognized test labs will not label such a piece of equipment to be suitable for use as service equipment without the main having GFP.
Requiring GFP in this example does not seem to provide any additional safety to the electrical system, in fact it may harm the system by nullifying the upstream GFP if it is not installed correctly, or a designer may elect to use the six switch rule to be used. In either case it seems that these two situations may be less desirable than having a single main without GFP.
Is it the intent of the present article to require all disconnects for a second building/structure to have all of the miscellaneous parts required by the manufacturer for a service to be installed, or was it the intent that this equipment was to merely be suitable for use as service equipment so that any and all necessary and or required equipment could easily be added at the time of installation?
The intent of this proposal is to show that the equipment must be suitable for use as service equipment, the disconnecting means is not mandated to have all of the requisite equipment to be used as service equipment. If the proposal is rejected it will show that the intent of this article is to require all of the equipment that falls under it, to be installed as service equipment.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concern has been addressed by the panel's action on Proposal 4-30. The requirement is now required only under the conditons specified by Section 250-32(b)(2).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2328)

4- 34 - (225-36 Exception No. 2 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new Exception as follows:
Exception No. 2: Ground Fault Protection shall not be required where ground-fault protection of equipment is provided on the supply side of the feeder.
SUBSTANTIATION: Ground Fault Protection should not be required at this disconnect if it already has protection upstream. This would parallel the exceptions in 215-10 and 240-13.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are currently addressed by Sections 215-10 Exception No. 3 and 240-13 (2).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP408)

4- 34a - (225-37): Accept
SUBMITTER: CMP 4
RECOMMENDATION: In Section 225-37 delete the last sentence "See Section 230-2(e)."
SUBSTANTIATION: The action is taken to comply with the NFPA NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #714)

4- 35 - (225-37): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Identification. Where a building or structure is supplied by more than one feeder or branch circuit ~~has~~ or any combination of feeders, branch circuits, ~~or services passing through it or~~ supplying it, a permanent plaque or directory shall be installed at each feeder or branch-circuit disconnect location specified in Section 225-32 (excluding the exceptions) denoting all other services feeders, or branch circuits supplying that building or structure and the area served by each. See Section 230-2(e).
This section shall not apply to disconnect locations immediately adjacent to each other.
Exception No. 1: No change.
Exception No. 2: This identification shall not be required for ~~branch~~ circuits from a dwelling unit to a second building or structure.
SUBSTANTIATION: Editorial. The first sentence is revised to conform to the clearer wording of the 1996 NEC; two or more branch circuits may not be interpreted as a combination.
Reference to Section 225-32 would clarify the identification plaque is intended for disconnects at the building served (where provided) and not at the locations permitted by the exception for Section 225-32. If those exceptions relieve the requirements for a disconnect at the building served, it appears the safety consideration would also not merit a plaque at these locations. Identification is required by other code rules.
Service conductors (unprotected) are not permitted by Section 230-3 to pass through buildings unless encased in concrete or brick per Section 230-6. This is not a common procedure but if employed does not appear to warrant a disconnect any more than open service conductors passing over the roof or attached to the eaves or side of the building, which would not require the disconnect.
This section appears related to occupant or firefighter awareness of existence and location of multiple power source disconnect means. It is possible and feasible to locate all different supply disconnects at one location since the limitation to six applies to each supply. If so grouped they are readily discernible and there are no remote locations to warrant the plaque requirement. Such disconnects are required to be identified by Section 110-22.
In Exception No. 2, the limitation to branch circuits still applies plaque requirements to feeders, services, or combinations. Many second buildings may have a feeder or service in addition to a branch circuit, such as a 240 volt 2-wire service for a workshop welder. Since the occupant of a dwelling unit is likely to be fully aware of these supplies a plaque does not seem warranted.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed revision does not enhance the clarity of this section and proposes more than editorial changes. The present Code wording adequately addresses the identification requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP405)

4- 35a - (225-38): Accept
SUBMITTER: CMP 4
RECOMMENDATION: Modify Section 225-38 by adding the following text:
"225-38. Disconnect Construction. Disconnecting means shall meet the requirements of (a) through (d).
Exception: For garages and outbuildings on residential property, snap switches or sets of 3-way or 4-way snap switches shall be permitted as the disconnecting means"
Delete the existing exception to 225-36.
SUBSTANTIATION: The additional text clarifies that all of the requirements of this section apply to disconnecting means. The relocation of the existing exception places it in a more appropriate section and exempts these devices from the requirements to be indicating and simultaneously open all poles. The wording of the exception has been modified to permit multiple snap switches and multiple sets of three-way or four-way switches as disconnecting means.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #715)

4- 36 - (225-38(b), (d) Exception (New)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Simultaneously Opening of Poles. Each building or structure ~~disconnecting means~~ disconnect shall simultaneously disconnect all ungrounded supply conductors that it controls, from the building or structure wiring system.
(d) Indicating. The building or structure disconnecting means shall plainly indicate whether it is in the open or closed position.
Exception: Three-way and 4-way snap switches permitted in the exception for Section 225-36 shall not be required to be indicating.
SUBSTANTIATION: Editorial. The disconnecting means of (a) may consist of up to six devices. It is not practical to have six devices comply with the rule.
The exception is proposed for correlation with Section 225-36.
PANEL ACTION: Accept in Principle in Part.
Reject the revision to the first sentence of the requirement. The panel accepts the concept of the proposed exception.
PANEL STATEMENT: The term "disconnecting means" is the correct terminolgy. The submitter's concerns have been addressed by the panel's action on Proposal 4-35a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #716)

4- 37 - (225-39): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Rating of Disconnect. The ~~feeder or branch circuit~~ building or structure disconnecting means shall have a rating not less than the maximum computed load to be carried, as determined in Article 220. In no case shall the rating be lower than specified in (a), (b), (c), or (d) below.
(a) ~~One Circuit Installation. For installations to supply only limited loads of a single branch circuit, the branch circuit disconnecting means shall have a rating of not less than 15 amperes.~~
Branch circuit Installation. Where the supply conductors consist of one or more branch circuits each disconnect shall have a rating of not less than 15 amperes.
(b) ~~Two Circuit Installations. For installations consisting of not more than two 2-wire branch circuits, the feeder or branch circuit disconnecting means shall have a rating of not less than 30 amperes.~~
Feeder Installations. Where the supply conductors consist of one or more feeders each disconnect shall have a rating of not less than 30-amperes where (1) two or more 2-wire branch circuits are supplied by a 2-wire feeder; (2) more than two 2-wire branch circuits are supplied by a 3-wire feeder; (3) two or more 3-wire branch circuits are supplied by a 3-wire feeder or; (4) two or more 4-wire branch circuits are supplied by a 3-phase, 4-wire feeder.
(c) One Family Dwelling. For, a one-family dwelling the ~~feeder~~ disconnecting means shall have a rating of not less than 100 amperes single-phase 3-wire or 60-amperes 3-phase 4-wire.
(d) ~~All Others. For all other installations, the feeder or branch circuit disconnecting means shall have a rating of not less than 60 amperes.~~
Other Dwelling Units. For an individual dwelling unit of a two-family or multifamily dwelling the disconnecting means shall have an ampere rating of not less than 60 (70) - amperes 3-wire single-phase or 30 (40) - amperes 4-wire three-phase
(ampere figures in parentheses are alternates)

SUBSTANTIATION: The disconnecting means covered in this section apparently refer to the building or structure disconnects of Sections 225-31 through 225-39. Since supply conductors are feeders and/or branch circuits, references to feeder or branch circuit disconnecting means can be confusing and misleading as it applies to the disconnects at the feeder or branch circuit source of supply. A snap switch which disconnects the building wiring branch circuit supply conductors is not a branch circuit disconnecting means any more than a snap switch controlling a lighting fixture. A disconnect which may disconnect the building wiring from a feeder is not a feeder disconnect unless it supplies a feeder.

"Maximum computed" may be technically more correct since "load" can be considered with or without demand factors.

The present (a) refers to one circuit. Section 225-30 indicates more than one branch circuit may constitute supply conductors. "Limited" load is not defined and is somewhat meaningless in this application. All branch circuits supply a limited load, which can vary such as a 15-ampere 120-volt circuit and a 15-ampere 480/277 volt circuit. The intent is not clear whether a limit other than the circuit capacity is intended.

Since "disconnecting means" may consist of six snap switches it may be construed that the aggregate value of their ratings comply, i.e., three 5-ampere rated switches meet the 15-ampere minimum. "Each disconnect" clarifies that sum ratings such as permitted in Section 230-80 do not apply for snap switches.

The present (b) could apply to two separate 2-wire branch circuit supplies (where permitted by Section 225-30) even if their ampacities are less than 30-amperes, and it doesn't apply where there are more than two separate branch circuit supplies. It appears (d) would then apply. This subsection literally applies to a disconnect at the feeder or branch circuit source since the conductors on the line side of the building disconnects are feeders or branch circuits. A 3-wire feeder supplying the two 2-wire 15-ampere branch circuits could be size No. 14 or 12 yet this section requires a 30-ampere disconnecting means.

In (c) provision should be made for 3-phase 4-wire feeders (208y/120 v) which are not prohibited and can accommodate slightly less volt-amperes than a 120/240 volt 3-wire system but more than a 208y/120 volt 3-wire system. Section 220-30 refers to 208 y/120 volts 4-wire feeders.

Present (d) becomes unnecessary with the proposal for (c) which covers minimum disconnecting means ratings for feeders, which tracks the ampacity requirements of Section 215-2. If more than two branch circuit supplies are provided in accordance with Section 225-50, present (d) requires a 60-ampere rated disconnect even if the branch circuits are rated 15-amperes. If a 3-wire feeder supplies two or more 3-wire branch circuits Section 215-2(a) permits a minimum feeder ampacity of 30; this section requires a minimum 60-ampere rated disconnecting means.

The proposal for (d) fills a void not presently covered. Section 230-79(d) requires a minimum 60-ampere rating for service disconnecting means for such dwelling units and seems appropriate for feeders for 3-wire systems. It provides for disconnecting means rating where the system is 3-phase 4-wire.

(See my proposal for Section 230-79).

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed language is adding requirements that have not been adequately substantiated. The existing text is clear in stating the requirements for the rating of the disconnecting means.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3855)

4- 38 - (225-41 (New)): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for information.

SUBMITTER: J. Philip Simmons, Olympia, WA

RECOMMENDATION: Move the text of existing Section 240-13 to become a new Section 225-41 as follows:

225-41. Ground-Fault Protection of Equipment. Ground-fault protection of equipment shall be provided in accordance with the provisions of Section 230-95 for solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 600 volts phase-to-phase for each individual device used as a building or structure main disconnecting means rated 1000 amperes or more.

Exception No. 1: The provisions of this section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Exception No. 2: The provisions of this section shall not apply to fire pumps.

Exception No. 3: The provisions of this section shall not apply if the disconnecting means is protected on the supply side by service or feeder ground-fault protection.

SUBSTANTIATION: Part B of Article 225 deals with disconnecting means for buildings and structures on the premises that are supplied from a service in another building or structure. The requirements for ground fault protection of equipment in Section 240-13 for building disconnecting means should be located here in Article 225 where the other requirements for building or structure disconnecting means are located. This should improve the structure of the code and make the code more "user friendly."

PANEL ACTION: Reject.

PANEL STATEMENT: CMP 4 believes that this requirement is appropriately located in Section 240-13. This action is referred to CMP 10 for review.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1469)

4- 39 - (225-48): Accept in Principle

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for information.

SUBMITTER: William M. Lewis, Eli Lilly and Co.

RECOMMENDATION: Add new section to read:

225-48 Supervised Installations.

For the purposes of Part C, the term supervised installation is defined as the portions of a facility where all of the following conditions are met:

1. Conditions of design, and installation are provided under engineering supervision.
2. Qualified persons provide maintenance, monitoring and servicing of the system.
3. The premises has at least one service that is more than 600 volts nominal.

SUBSTANTIATION: Existing load calculations as covered in Section 220 are impractical for outdoor feeders over 600 volts.

This proposal must be considered in concert with companion proposals to add Sections 225-49, 225-3, and Exception No. 2 to 220-1. It has long been the practice at utilities and at supervised installations to size feeder conductors based on connected transformer capacity and load characteristics. This proposal addresses these accepted practices.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volts systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA).

PANEL ACTION: Accept in Principle.

Modify the proposed section to read:

"225-48 Supervised Installations.

For the purposes of Part C, the term supervised installation is defined as the portions of a facility where all of the following conditions are met:

1. Conditions of design, and installation are provided under engineering supervision.
2. Qualified persons <u>with documented training and experience in over 600 volt systems,</u> provide maintenance, monitoring and servicing of the system.

~~3. The premises has at least one service that is more than 600 volts nominal. "~~

PANEL STATEMENT: Working on systems over 600 volt requires special qualifications and training. The modification to (2) is made to emphasize that point. Paragraph (3) is deleted as superfluous because it is located in Part C of Article 225. The panel refers their action on modifying the definition of qualified person to CMP 1 as the definition (as accepted in Proposal 1-178) needs to be expanded to better cover over 600 volt installations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
ZINNANTE: I oppose the proposal as written. The NEC as stated in Article 90 is not intended as a design specification. I always thought that the locator state codes and ordinances as well as the Authority Having Jurisdiction determined who was qualified to perform electrical maintenance, monitoring and servicing. No where in the code do we define what a journeyman electrician or an apprentice electrician is and what documentation is required to distinguish them. Why should the NEC now start inserting these requirements. The assumption by the Code is that the person installing, servicing and monitoring, by definition is qualified.
COMMENT ON AFFIRMATIVE:
CARRICK: This definition should be placed in the over 600 volt section of Article 100.
SUMRALL: I applaud the Panel's decision to include a definition of the term "qualified" in this section, for installations over 600 vac. 90-1 specifically spells out the primary purpose of the NEC, and that is "THE PRACTICAL SAFEGUARDING OF PERSONS AND PROPERTY." By adapting this proposal, the Panel reaffirms 90-1 is still upheld as the high standard of the electrical industry. Over the past 12 months, thousands of dollars have been spent on medical, rehabilitation and funeral expenses. Though the NEC cannot regulate human error, it can continue to be a well-intentioned document to provide guidance in a fast and ever-changing industry.

(Log #1470)

4- 40 - (225-49): Accept in Principle
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Add a new Section 225-49 to read as shown:
225-49. Sizing of conductors for outdoor feeders.
Sizing of conductors for outdoor feeders shall be sized in accordance with A or B below:
A. The sizing of conductors for outdoor feeders supplying only other feeders shall be based on the following:
1. Each segment of feeders beyond the service equipment shall be based on the total of the nameplate ratings of the transformers supplied by that segment of feeders.
2. The sizing of conductors for outdoor feeders supplying a combination of feeders, utilization equipment or other loads shall be based on the total of the nameplate ratings of the transformers supplied by that segment of feeders plus the maximum rating of the other equipment.
B. For supervised installations as defined in Section 225-48, conductor sizing shall be permitted to be determined by qualified persons using the requirements of this Code or under engineering supervision.
SUBSTANTIATION: This proposal must be considered in concert with companion proposals to add Sections 225-48, 225-3, and Exception No. 2 to 220-1. It has long been the practice at utilities and at supervised installations to size feeder conductors based on connected transformer capacity and load characteristics. This proposal addresses these accepted practices.
This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.
The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger (CMP 13); William T. Beutler, P.E.; William Long, NEMA
Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns have been addressed by the panel's action on Proposal 4-40b.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP406)

4- 40a - (225-50): Accept
SUBMITTER: CMP 4
RECOMMENDATION: Delete section 225-50.
SUBSTANTIATION: These requirements are adequately expressed in Section 110-34(c).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP409)

4- 40b - (225-50, 51, and 52): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for inclusion of the material in Articles 210 and 215 to cover over 600 volt branch circuits, feeders, and supervised installations, in general. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 4
RECOMMENDATION: Add the following text at the beginning of Part C and renumber accordingly in the present order.
"PART C. Over 600 Volts
225-50. Proposal 4-39 as modified.
225-51 Sizing of Outdoor Circuits.
Outdoor circuit conductors shall be sized in accordance with (A), (B) or (C):
(A) Sizing of Conductors for Outdoor Branch Circuits. The ampacity of branch circuit conductors shall not be less than 125 percent of the designed potential load of utilization equipment that will be operated simultaneously.
(B) Sizing of Conductors for Outdoor Feeders.
The ampacity of outdoor feeder conductors shall be in accordance with the following:
(1) The ampacity of feeders supplying only transformers shall not be less than the sum of the nameplate ratings of the transformers supplied by the feeder.
(2) The ampacity of feeders supplying a combination of transformers and utilization equipment shall be not less than the sum of the nameplate ratings of the transformers and 125 percent of the designed potential load of the utilization equipment that will be operated simultaneously.
(C). Sizing of Conductors in Supervised Installations. For supervised installations as defined in 225-50, branch circuit and feeder conductor sizing shall be permitted to be determined by qualified persons under engineering supervision.
225-52. Ampacities. The ampacity of conductors shall be in accordance with Section 310-15 and Section 310-60 as applicable."
SUBSTANTIATION: This action provides necessary direction for sizing conductors for installations over 600 volts. The concepts of Proposals 4-7 and 4-40 have been incorporated into the panel proposal.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CARRICK: Conductors used for over 600 volt branch circuits and feeders can be used at 100 percent of their ratings. There is concern that the authority having jurisdiction will try to enforce 225-51 A and B as a minimum even in supervised installations when engineers have determined that conductors smaller than those specified in 225-51 A and B would be suitable. This was not the Panel's intent.

(Log #717)

4- 41 - (225-50): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Warning Signs. Signs with the words "Danger ~~Warning~~ High Voltage-Keep Out" shall be posted in plain view ~~where unauthorized persons might come in contact with live parts~~ for electrical installations covered in Section 110-31.
Or alternatively: WARNING SIGNS. Signs with the words "DANGER HIGH-VOLTAGE KEEP OUT" shall be posted in plain view at entrances to rooms and other guarded locations that contain exposed live parts ~~where~~ forbidding unqualified persons to enter. ~~might come in contact with live parts.~~
SUBSTANTIATION: Editorial. The present wording infers unauthorized persons may have access to rooms, screened or fenced area, etc., where there are live parts. Section 110-31 indicates area

or enclosures for other than metal-enclosed installations (possible live parts) shall deter access by unqualified persons and Section 110-34(c) indicates deterence to areas with live parts. Where building disconnect means as as covered by Sections 225-51 and 225-52 may be inside a building, Sections 110-31(a)(1) and (c) require installations accessible to unauthorized persons to be metal-enclosed, locked, or in a location where access is controlled by a lock.

The word "danger" is proposed in lieu of "warning" to correlate with Sections 110-34(c); 230-203; 490-53; and 490-55.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel's action on Proposal 4-40a has removed this wording from Article 225 as Section 110-34(c) adequately covers the requirement for signage.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1831)

4- 42 - (225-50): Reject

SUBMITTER: Buster R. Falls, City of Orlando, FL

RECOMMENDATION: Replace "warning" with "danger."

SUBSTANTIATION: Corrects use of term that will be the same throughout the code.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel's action on Proposal 4-40a has removed this wording from Article 225 as Section 110-34(c) adequately covers the requirement for signage.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3261)

4- 43 - (225-50): Reject

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise the 225-50 with the additions (underlined) as shown. The entire text is shown for clarity, but only those changes shown underlined are part of this proposal.

225.50. Warning Signs. Signs with the <u>following</u> words <u>or equivalent</u>, "WARNING - HIGH VOLTAGE - KEEP OUT" shall be posted in plain view where unauthorized persons might come in contact with live parts."

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel's action on Proposal 40a has removed this wording from Article 225 as Section 110-34(c) adequately covers the requirement for signage.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1471)

4- 44 - (225-60): Accept in Principle

SUBMITTER: William M. Lewis, Eli Lilly and Co.

RECOMMENDATION: Add new Section 225-60 as shown:

225-60. Clearances Over Roadways, Walkways, Rail, Water, Open Land.

(a) 22kV Nominal to Ground or Less.

(Table shown below)

(b) Over 22kV Nominal to Ground. Clearances for the above categories shall be increased by 0.4 in. (10 mm) per kV above 22000 volts.

(c) For special cases such as where crossings will be made over lakes, rivers, or areas utilizing large vehicles such as mining operations, specific designs shall be engineered considering the special circumstances and shall be approved by the authority having jurisdiction.

SUBSTANTIATION: The existing NEC does not give clearance requirements for feeders over 600 volts. The proposal addresses this oversight and is in harmony with the NESC.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)

PANEL ACTION: Accept in Principle.

Amend the proposed text and table as follows:

"(a) 22kVNominal to Ground or Less. The clearances over roadways, walkways, rail, water and open land for conductors and live parts up to 22kV nominal to ground or less shall be not less than the values shown in Table 225-60."

After (c) add the following Fine Print Note:

"Fine Print Note: For additional information see National Electrical Safety Code, ANSI C2-1997."

Add these metric values to the proposed table:

13.5 ft-4.1m
14.5 ft-4.4m
17 ft-5.2m
18.5 ft-5.6m
26.5 ft-8.1m

PANEL STATEMENT: The panel's action complies with the NFPA NEC Style Manual and the FPN has been added to provide additional guidance.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

Open Land Subject to Vehicles, Cultivation, or Grazing	Roadways, Driveways, Parking Lots and Alleys`	Walkways	Rail	Spaces and Ways for Pedestrians and Restricted Traffic	Water Areas Not Suitable for Sail Boating
18.5	18.5 ft	13.5 ft	26.5 ft	14.5 ft	17 ft

(Log #1472)

4- 45 - (225-61): Accept in Principle
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Add new Section 225-61 to read as shown:
225-61. Clearances Over Buildings and Other Structures.
(a) 22kV nominal to ground or less.

Clearance of Conductors or Live Parts From:	Horizontal	Vertical
Building Walls, Projections, and Windows	7.5 ft	
Balconies, Catwalks, and Similar Areas Accessible to People	7.5 ft	13.5 ft
Over or Under Roofs or Projections Not Readily Accessible to People		12.5 ft
Over Roofs Accessible to Vehicles But Not Trucks		13.5 ft
Over Roofs Accessible to Trucks		18.5 ft
Other Structures	7.5 ft	

(b) Over 22kV Nominal to Ground. Clearances for the above categories shall be increased by 0.4 inches per kV above 22000 volts.
SUBSTANTIATION: The existing NEC does not give clearance requirements for feeders over 600 volts. The proposal addresses this oversight and is in harmony with the NESC.
This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.
The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.
Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)
PANEL ACTION: Accept in Principle.
Add the following to the proposed text:
(a) 22kV Nominal to Ground or Less. The clearances over buildings and other structures for conductors and live parts up to 22 kV nominal to ground or less shall be not less than the values shown in Table 225-61.
After (b) add the following Fine Print Note:
Fine Print Note: For additional information see National Electrical Safety Code, ANSI C2-1997
Add these metric values to the proposed table:
7.5 ft.-2.3m
12.5ft.-3.8m
13.5 ft.-4.1m
18.5ft.-5.6m
PANEL STATEMENT: The panel's action complies with the NFPA NEC Style Manual and the FPN has been added to provide additional guidance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 230 — SERVICES

(Log #516)

4- 46 - (230): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Sections 230-6(1) and (2), replace "2 in. (50.8 mm)" with "50 mm (2 in.)" throughout.
2. In Section 230-9 first paragraph and the Exception, replace "3 ft (914 mm)" with "900 mm (3 ft)" throughout.
3. In Section 230-24, replace "60°F (15°C)" with "15°C (60°F)".
4. In Section 230-24(a), replace "8 ft (2.44 m)" with "2.5 m (8 ft)" and replace "3 ft (914 mm)" with "900 mm (3 ft)".
5. In Section 230-24(a) Exception No. 2, replace "4 in. (102 mm)" with "100 mm (4 in.)"; "12 in. (305 mm)" with "300 mm (12 in.)"; and "3 ft (914 mm)" with "900 mm (3 ft)".
6. In Section 230-24(a) Exception No. 3, replace "18 in. (457 mm)" with "450 mm (18 in.)"; "6 ft (1.83 m)" with "1.8 m (6 ft)"; and "4 ft (1.22 m)" with "1.2 m (4 ft)".
7. In Section 230-24(a) Exception No. 4, replace "3 ft (914 mm)" with "900 mm (3 ft)".
8. In Section 230-24(b), replace "10 ft (3.05 m)" with "3.0 m (10 ft)"; "12 ft (3.66 m)" with "3.7 m (12 ft)"; "15 ft (4.57 m)" with "4.5 m (15 ft)"; "12-ft (3.66-m)" with "3.7 m (12 ft)"; and "18 ft (5.49 m)" with "5.5 m (18 ft)".
9. In Section 230-26, replace "10 ft (3.05 m)" with "3.0 m (10 ft)".
10. In Section 230-43(15), replace "6 ft (1.83 m)" with "1.8 m (6 ft)" throughout.
11. In Section 230-50(b) and its Exception, replace "10 ft (3.05 m)" with "3.0 m (10 ft)" throughout.
12. In Section 230-51(a), replace "12 in. (305 mm)" with "300 mm (12 in.)" and replace "30 in. (762 mm)" with "750 mm (30 in.)".
13. In Section 230-51(b), replace "15 ft (4.57 m)" with "4.5 m (15 ft) and replace "2 in. (50.8 mm)" with "50 mm (2 in.)".
14. In Section 230-54(c) Exception, replace "24 in. (610 mm)" with "600 mm (24 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP412)

4- 46a - (230-2(a)(4)): Accept
NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. There is presently no definition for "Standby Systems." This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 4
RECOMMENDATION: Amend the text in 230-2(a)(4) to read: "(4) Standby systems."
SUBSTANTIATION: The panel's action clarifies that a standby system is permissible. This action eliminates the confusion with Article 702 requirements.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #718)

4- 47 - (230-2(a)(4)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete: ~~(4) Optional standby systems.~~
SUBSTANTIATION: The permission for an additional service to supply optional standby systems seems counter to Section 702-2, which per Section 90-3 modifies the general rules of Chapters 1 through 4. The word "intended" in Section 702-2 and in other Code sections conveys a quasi-mandatory intent.
PANEL ACTION: Reject.

PANEL STATEMENT: The panel's action on Proposal 4-46a clarifies their position on the submitter's concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1022)

4- 48 - (230-2(a)(6) (New)): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information.
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Add a new section 230-2(a)(6) as follows:
(6) High-power, network-powered broadband communications systems.
SUBSTANTIATION: This is a companion proposal to the proposal for Article 831, High-Power, Network-Powered Broadband Communications Systems, and is necessary to allow high-power, network-powered broadband communications systems as an additional service.
PANEL ACTION: Reject.
PANEL STATEMENT: The referenced Article 831 has not been accepted by CMP 16. CMP 4 refers this to CMP 16 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2431)

4- 49 - (230-2(b)(2)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Revise text to read as follows:
"A single building or other structure sufficiently large to make two or more services necessary <u>at two locations of the building without being grouped providing the services can be tripped by a remote means outside the building.</u>"
SUBSTANTIATION: In cases of a mall it should be permissible to have two services because of distances but it should not be allowed to have two locations with 6 disconnects each in a locked room several hundred feet apart for the fire department to shut down in emergencies. Many fires start in the equipment rooms to begin with. Many power companies require a disconnecting means on the outside of the building.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation to require the remote tripping as proposed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2489)

4- 50 - (230-2(b)(2)): Reject
SUBMITTER: Lynn Adams, Escambia County, FL
RECOMMENDATION: Revise as follows:
230-2(b)(2) A single building or other structure sufficiently large to make two or more services necessary. <u>Each service shall be limited to the adjacent area of the building.</u>
SUBSTANTIATION: If multiple services are installed, a danger exists when circuit extensions are made into other areas of the building. Section 230-2(e) requires that the areas served be identified. This proposal would prevent the intermingling of circuits in the middle area between the two services.
PANEL ACTION: Reject.
PANEL STATEMENT: There are instances where it is necessary to have circuits supplied from multiple services in the same area of a building such as circuits supplied from an emergency service or different voltage characteristics. Acceptance of this proposal could lead to conflicts with other parts of Section 230-2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2430)

4- 51 - (230-2(c)(1), (2), (3)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: At the end of each requirement add:
"<u>When the services are grouped in one location.</u>"
SUBSTANTIATION: Right now there is a conflict between 230-2(b)(2) and the above section. We just had a mall built and there were two services of 3500 amps a piece, the engineer argued that they could have two services in different locations because of the capacity of the service and did not need special permission to put them in different locations. My feelings are that if this were the case they should at least be in the same location.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no conflict between Section 230-2(b)(2) and 230-2(c).
The submitter has not provided any documentation that the current wording has created problems in the field.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2490)

4- 52 - (230-2(d)): Reject
SUBMITTER: Lynn Adams, Escambia County, FL
RECOMMENDATION: Revise as follows:
(d) Different Characteristics. Additional services shall be permitted for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules. <u>The services shall be in sight from one another.</u>
SUBSTANTIATION: This would add to safety by making all sources of power apparent to any servicing or emergency personnel. Using the defined term "in sight from" allows for separate equipment locations, but ensures they can be opened promptly.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 230-2(e) provides the necessary provisions for safety where multiple services are not wiithin sight from each other. No substantiation has been provided to indicate that the current wording has created problems in the field.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1749)

4- 53 - (230-5 (New)): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Add new text to read as follows:
230-5. Diagrams of Service. If required by the authority having jurisdiction, a diagram showing service details shall be provided prior to the installation of the service. Such a diagram shall show the area in square feet of the building or other structure supplied by each service, the total connected load before applying demand factors, the demand factors used, the computed load after applying demand factors, and the size and type of conductors to be used. The diagram shall be done so the service is in complice with article 220.
SUBSTANTIATION: The current requirement for a diagram of a feeder is in 215-5 and is limited to feeders only (see scope 215-1). This would expand the requirement to include services, when the authority having jurisdiction thought it was necessary. There are a lot of building that do not have a feeder in them (most smaller buildings). The current text will not allow the authority having jurisdiction to require a diagram of the service (load calculation per article 220). It may be appropriate to put this requirement in article 220-5 so it would not be needed in 215-5 and 230-5 please see other proposal on 220-5 and 215-5.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 220 requires load calculations. It is the prerogative of the authority having jurisdiction to require the proposed diagram showing the load calculations. The proposal is unenforceable as changes to building systems invalidate the initial diagram. The submitter is referenced to Article 80-Administration and Enforcement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #431)

4- 54 - (230-6): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for consideration of Proposal 10-3a.
SUBMITTER: Steve Canaday, Dept. of Labor and Industries, WA
RECOMMENDATION: Add text to 230-6 to read as follows:
Where installed in conduit not less than 18 in. in the earth.
SUBSTANTIATION: A conduit buried 18 in. deep in the earth should provide the same protection as a conduit encased in 2 in. of concrete. Also, it is difficult to determine if the conduit is actually encased in 2 in. of concrete all the way.
PANEL ACTION: Accept in Principle.
Modify the proposed text and make it Section 230-6(4) as follows:
"(4) Where installed in conduit and under not less than 450mm (18 in) of earth beneath a building or other structure."
PANEL STATEMENT: The panel's action clarifies that the accepted language is an alternative method of providing protection for service conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4068)

4- 55 - (230-6(3)): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for consideration of Proposal 10-3a.
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.
RECOMMENDATION: Revise as follows:
(3) Conductors and equipment ~~Where~~ installed in a ~~transformer~~ fire resistant vault conforming to the requirements of Article 450, Part C.
SUBSTANTIATION: There is a need to clarify that the intent of a vault is for fire resistance whether a transformer is present or not. A vault meeting the fire resistance requirements of 450 Part C shall be considered outside the building.
PANEL ACTION: Accept in Principle.
Revise the proposed language to read
3) Where installed in any vault that meets the construction requirements of 450 Part C.
PANEL STATEMENT: This action clarifies that any vault constructed in accordance with Part C of Article 450 is considered acceptable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4101)

4- 56 - (230-6(3)): Accept in Principle
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Revise as follows:
(3) Conductors and equipment ~~Where~~ installed in ~~a transformer~~ fire resistant vault conforming to the requirements of Article 450, Part C.
SUBSTANTIATION: There is a need to clarify the intent of a vault is for fire resistance whether a transformer is present or not. A vault meeting the fire resistance requirements of 450 Part C shall be considered outside the building.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-55.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #719)

4- 57 - (230-7): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Other Conductors in Raceway or Cable. ~~Conductors other than service~~ Service conductors shall not be contained ~~installed~~ in ~~the same service~~ a raceway, cable, auxiliary gutter, or cablebus assembly that contains other than service conductors, or service conductors of a different class.
Exceptions No. 1 and 2 No change.
SUBSTANTIATION: Editorial. For consistency other enclosures permitted for service conductors should be included. Code users may install conductors in a raceway but do not install them in a cable. Service cable may be interpreted as covering Type SE but not other cables permitted as service conductors. Literal wording does not prohibit 120/240 volt single phase and 480-volt three-phase sets of service conductors in the same raceway; both sets are service conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is more than editorial in nature. Auxiliary gutters are used to supplement the wiring space of service equipment and the intermixing of conductors is inevitable in that space. The submitter has provided no technical substantiation to apply this requirement to cablebus.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2808)

4- 58 - (230-7 Exception No. 3 (New)): Reject
SUBMITTER: Bud Swathwood, Bud Swathwood Consulting
RECOMMENDATION: Add an Exception No. 3 to read:
Exception No. 3: In auxiliary gutters, when used as supplemental wiring spaces for service equipment and the conditions of Sections 374-1 and 374-2 are met. The service conductors when used in this wiring method shall be identified.
SUBSTANTIATION: There are those who feel that the auxiliary gutters are raceways and therefore cannot contain "other" conductors (with SE conductors). Auxiliary gutters was added to Section 300-3 as a wiring method because the panel (admitted) that auxiliary gutters, by definition, are NOT raceways. Manufacturers have available A.Gs as a supplement to their equipment for added ring space. Wireway manufactures market A.Gs. for additional wiring space. There is, in my opinion, no hazard by using this method of wiring. No more than having SE conductors installed in the "gutter" space in load centers, switchboards, etc. with branch circuits and feeders.
PANEL ACTION: Reject.
PANEL STATEMENT: In accordance with the definition of raceways in Article 100, auxiliary gutters are not raceways and the exception is not necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP413)

4- 58a - (230-8): Accept
SUBMITTER: CMP 4
RECOMMENDATION: In Section 230-8 amend the reference to Section 300-5 by adding (g). The correct reference is 300-5(g).
SUBSTANTIATION: This change is made to comply with the NFPA NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1188)

4- 59 - (230-8): Reject
SUBMITTER: Earl Dean, Town of Manchester, CT
RECOMMENDATION: Deleted text:
230-8. Raceway Seal. Where a service raceway enters a building or structure from an underground distribution system, it shall be sealed. (delete: in accordance with Section 300-5.) Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, shield, or other components.
SUBSTANTIATION: The way it is currently written requires the reader to search out Section 300-5. It is a long section of which only a single sentence applies: "(g) Raceway Seals. Conduits or raceways through which moisture may contact energized live parts shall be sealed or plugged at either or both ends."
If the intent is to require the sealing of all UG service raceways, then it would be easier and plainer to simply state so in Article 230.
If the intent is to require the sealing of only those UG service raceways that may cause a moisture problem, then add the verbiage in Article 230.

As it stands now, I, as a building official, cannot require the sealing of service raceways until there is evidence of a moisture problem; akin to closing the barn door after the cows have run off.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel disagrees that it is necessary to seal all service raceways. The reference to 300-5 provides the necessary guidance where it is required to seal service raceways. See panel action on Proposal 4-58a
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP415)

4- 59a - (230-9): Accept
NOTE: The Technical Correlating Committee understands that the metric values are those accepted in Proposal 4-46.
SUBMITTER: CMP 4
RECOMMENDATION: In Section 230-9 revise as follows:
"230-9. Clearance from Building Openings. Service conductors and final spans shall comply with (A), (B) and (C).
(A) Clearance From Windows. Service conductors installed as open conductors or multiconductor cable without an overall outer jacket shall have a clearance of not less than 3 ft (914 mm) from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.
Exception: Conductors run above the top level of a window shall be permitted to be less than the 3 ft (914 mm) requirement above.
(B) Vertical Clearance. The vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 230-24(b).
(C) Building Openings. Overhead service conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they will obstruct entrance to these building openings."
SUBSTANTIATION: The panel action complies with the NFPA NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2913)

4- 60 - (230-9): Reject
SUBMITTER: Donald A. Ganiere, Ottawa, IL
RECOMMENDATION: Delete text as follows:
Service conductors installed as open conductors or multiconductor cable without an overall outer jacket shall have a clearance of not less than 3 ft (914 mm) from windows ~~that are designed to be opened~~, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations. Vertical clearance of final spans above, or within 3 ft (914 mm) measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with Section 230-24(b).
SUBSTANTIATION: Windows are used for fire department access whether they are designed to open or not. Fire departments need clear access to windows for victim rescue, building ventilation, and application of fire streams. Conductors are permitted to be installed in locations that unduly interfere with fire department operations by the existing code wording. Keeping conductors at least 3 ft away from all windows will increase fire fighter safety and will make the placement of ladders for emergency rescue and fire fighting faster.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms its position that this section does not apply to fixed glass assemblies. There has been no technical substantiation provided to conclusively support that the placement of the final spans within three feet of windows, which are designed not to be opened, is unsafe.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4102)

4- 61 - (230-9): Reject
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Revise as follows:
230-9. Clearance from Building Openings. <u>The service head or similar fitting shall be located such that the</u> ~~S~~service conductors installed as open conductors...
Move this newly worded requirement to Article 230-54(h).
SUBSTANTIATION: The location of the attachment point at the building is a crucial factor in determining whether the service conductors have the required clearance. Emphasis is needed to alert the installer of the service head or similar fixture of the importance of their action in achieving the required clearance.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text adequately covers the submitter's concerns. The panel's primary concern is that this proposal would limit the applicability of this section to service conductors that are not installed by the utility. The current language in Sections 230-9 and 230-54 does provide the appropriate clearance requirements for service conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3927)

4- 62 - (230-10): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Add new text:
230-10 Diagrams of Service Entrance Conductors.
If required by the authority having jurisdiction, a diagram showing feeder details shall be provided prior to the installation of the service entrance conductors. Such a diagram shall show the area in square feet of the building or other structure supplied by each feeder, the total connected load before applying demand factors,the demand factors used, the computed load after applying demand factors, and the size and type of conductors to be used.
SUBSTANTIATION: I'm not certain where within this section such a proposed requirement should be placed but I find it curious that an inspector may request feeder diagrams in Section 215-5, and there is no similar requirement in Article 230 for Service Entrance Conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 220 requires load calculations. It is the prerogative of the authority having jurisdiction to require the proposed diagram showing the load calculations. The proposal is unenforceable as changes to building systems invalidate the initial diagram. The submitter is referenced to Article 80 Administration and Enforcement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP414)

4- 62a - (230-21): Accept
SUBMITTER: CMP 4
RECOMMENDATION: Delete existing Section 230-21, Overhead Supply. Delete the FPN as well.
SUBSTANTIATION: This language is not necessary as it repeats the Article 100 definition of the term "Service Drop".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3148)

4- 63 - (230-21): Reject
SUBMITTER: Michael Krumnauer, Vasso, MI
RECOMMENDATION: After the word conductors in the first sentence, add the words "<u>on the load side of the service point</u>" so the sentence reads as follows:
"Overhead service conductors, on the load side of the service point, to a building or..."
SUBSTANTIATION: This section is confusing as to what conductors are being considered as service drop conductors. The

service drop up to the service point (usually the meter) are the jurisdiction of the utility and the NESC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has deleted this section from Article 230. The term service drop is defined in Article 100. See panel action on Proposal 4-62a. The panel does not concur that the service drop up to the meter is always under the NESC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP417)

4- 63a - (230-22): Accept
SUBMITTER: CMP 4
RECOMMENDATION: Revise Section 230-22 to read. Individual conductors shall be insulated or covered.
Existing exception is to remain.
SUBSTANTIATION: This action clarifies that it is permissible to use covered conductors. The use of covered conductors is appropriate, particularly in installations over 600 volts.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #720)

4- 64 - (230-22): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Insulation ~~or Covering.~~ Individual conductors shall be insulated ~~or covered~~ with an extruded thermoplastic or thermosetting insulating material.
Exception: No change.
SUBSTANTIATION: Article 100 definition of covered conductor indicates the covering is not insulation. This section indicates an insulating material is required for "covered" conductors. The sentence basically states "conductors shall be insulated or covered with insulation" which is inane.
I recollect a commonly used individual covered conductor widely used by utilities for service-drops, commonly called "weatherproof" wire, but seldom if ever used today. Individual "covered" conductors are noticeable by their absence from code tables and do not appear to be a listed type conductor.
(see my proposal for Article 100 Conductor - Covered)
PANEL ACTION: Reject.
PANEL STATEMENT: There are installations, particularly over 600 volts, where the use of covered conductors is appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11COMMENT ON AFFIRMATIVE:
SUMRALL: Not more than 3 months ago, we installed a covered conductor. We used the existing NEC to justify and propose the use of this conductor, and guess what, there was nothing inane about the installation.

(Log #1185)

4- 65 - (230-23(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add new text:
"Where continuous load(s) or motor load(s) is supplied, the minimum conductor ampacity shall be in accordance with the provisions of Section 230-42."
SUBSTANTIATION: The provisions of Section 230-42 should be applicable to service-drop conductors which carry the same load as service-entrance conductors. The reference in Section 230-42 to adjustment factor can be applicable where service-drop conductors consist of multiconductor cable with or without an outer covering and there are more than three current-carrying conductors. (See my proposal for Section 230-42).
PANEL ACTION: Reject.
PANEL STATEMENT: The provisions of Articles 220 and 430 adequately cover the computation of motor loads.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1052)

4- 66 - (230-23(b)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 230 as follows:
230-23(b) - change "No. 8 copper or No. 6 aluminum" to "8 AWG copper or 6 AWG aluminum"
230-23(b), Exception - change "No. 12" to "12 AWG"
230-31(b) - change "No. 8 copper or No. 6 aluminum" to "8 AWG copper or 6 AWG aluminum"
230-31(b), Exception - change "No. 12 copper or No. 10 aluminum" to "12 AWG copper or 10 AWG aluminum"
230-202(a) - change "No. 6" to "6 AWG" and "No. 8" to "8 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2178)

4- 67 - (230-23(c) and FPN (New)): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(c) Grounded Conductors. The grounded conductors shall be not less than the minimum size as required by Section 250-24(b).
FPN: Reasonable efficiency of operation can be provided when voltage drop is taken into consideration in sizing overhead service-drop conductors.
SUBSTANTIATION: This fine print note should be added. A similar fine print note is found in Section 230-31 for underground service-lateral conductors. The fine print note applies equally to overhead service-drop conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed fine print note does not enhance the usability of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3401)

4- 68 - (230-23(d) (New)): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: It is suggested that a new paragraph be added after 230-23(c) or the panel should accept the concept and generate their own words.
230-23(d) Direct Utility Connection, Customer Option. The aerial service conductors can consist of one, two or three insulated phase conductors, and an insulated identified conductor (neutral), and a messenger that also serves as a grounding conductor to be used as an equipment grounding conductor, which originates at the service transformer.
Underground service conductors can consist of one, two or three insulated phase conductors, and an insulated identified conductor (neutral), and a grounding conductor to be used as an equipment grounding conductor, which originates at the service transformer.
SUBSTANTIATION: Please note that this is an option for the informed customer to make, not a requirement. Granted there is no probation against doing this, except the concept is foreign to the authority having jurisdiction and it is very doubtful if the authority having jurisdiction would approve such an installation. Therefore, this allowance must be placed in the NEC to permit protection against stray, uncontrolled primary neutral current flow over metallic piping such as water, gas, etc. and the earth.
There are laws such as Ohm's Law and Kirchoff's Laws. Now there is Zipse's Law - Zipse's Law:
"In order to have and maintain a safe electrical installation:
All continuously, flowing current shall be contained within an insulated conductor or if a bare conductor, the conductor shall be installed on insulators, insulated from earth, except at one place within the system and only one place can the neutral be connected to earth.

A system is defined as the conductors between transformers or after the last transformer."

Approximately 25 years ago, what is now Code Making Panel 19 made mandatory the connection of trailers using 4 or 5 wire systems. The panel recognized the hazards associated with multiple connection of the neutral conductor, identified conductor to earth/ground. Two (2) or three (3) phase conductors, and insulated neutral conductor and a bare ground conductor were required.

One or two Code cycles later another Code Making Panel made mandatory the connection of Marinas using 4 or 5 wire systems thus eliminating the hazardous condition of stray, uncontrolled flow of current over metallic conducting paths and water.

It was not until the 1996 edition of the NEC that Code Making Panel No. 5, saw clear to make ranges and dryers wiring mandatory using 4 or 5 wire systems with an insulated and isolated neutral/identified conductor and a separate equipment ground/earth conductor.

It makes sense then that the high voltage electrical systems under the control of the NEC and Code Marking Panel No. 5 would follow the same logic, that the neutral/identified conductor would be insulated and connected to earth at only one place in order to eliminate hazardous flow of uncontrolled stray current. (Proposals have been submitted to CMP #5). It has been reported that persons in showers and swimming pools and dairy cows have received electric shocks from this stray uncontrolled flow of neutral return current flowing uncontrolled over the earth, metallic piping and other conductive surfaces.

Are the members of the Code Making Panel aware that the primary neutral return current from the primary side of the transformers used for services is directly connected to the secondary side neutral at the utility's transformer?

This allows primary neutral current to flow over the interior metallic water piping, uncontrolled, not within an insulated conductor. Does any member of this panel condone the flow of uncontrolled primary neutral current over interior metallic piping, over the earth flowing uncontrolled, shocking persons in swimming pools, showers, and dairy cows? After the panel members recognize this hazard I am sure they will agree and seek a solution.

If and when the public is informed of the dangers associated with multiple neutral to ground/earth connections that result in hazardous uncontrolled flow of stray current over the earth, interior water and gas piping systems and other conducting paths that result in electric shocks to the inhabitants, law suits will probably follow.

The object of this proposal is to prevent the uncontrolled flow of continuous current over the earth by allowing the service neutral to be insulated and to require a separate ground conductor to originate at the service transformer. This is the same requirement that now exists for marinas and mobile homes, ranges and dryers. Why should the building be exempt?

Yes, today the utilities do not supply an insulated, separate neutral, (yet). Someone has to be first and why not the NFPA's NEC? This is the case of the chicken and the egg, which came first?

The grounding conductor would be connected again to earth at the service entrance and any other places that would be desirable.

The basic substantiation is Ohm's Law and Kirchoff's Laws. Kirchoff states, "The algebraic sum of the currents toward any point in a network is zero." Thus with the identified conductor (neutral) connected to earth at more than one place, at the service to each and every house served from the transformer and at the transformer, uncontrolled current can and will flow over the earth. No matter what the resistance is to the earth and the resistance of the messenger serving also as the neutral and the ground, a proportion of the return current will flow uncontrolled over the earth. (Ohm's Law).

Two technical papers are available on the web. They explain in detail the problem with multiple connection to earth of the neutral conductor. One is subtitled, "The Shocking Showers" and the other is subtitled, "The Shocking Swimming Pool". They can be found at:

www.mikeholt.com/Newsletters/8-16-99.doc and at www.mikeholt.com/Newsletters/8-17-99.doc.

All continuous current flow however, must be contained within insulated conductors. The rejection of this proposal could indicate this panel condones and approves of the uncontrolled flow of current over the earth, which I am sure you do not.

By approving this proposal, you are opening the way to improve the use of electrical energy safely by making the first step to preventing uncontrolled flow of continuous current over the earth.

PANEL ACTION: Reject.

PANEL STATEMENT: The AHJ and the building owner have no control over the grounding of the service drop supplied by the utility or the methods and materials used. Regardless, if the neutral is insulated the effect that the submitter desires is negated by the bonding jumper required at the service equipment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP403)

4- 68a - (230-24): Accept

SUBMITTER: CMP 4

RECOMMENDATION: Delete the first sentence of Section 230-24.

SUBSTANTIATION: This requirement is not enforceable.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP418)

4- 68b - (230-24): Accept

SUBMITTER: CMP 4

RECOMMENDATION: In Section 230-24 number the clearance requirements (1) through (4).

SUBSTANTIATION: The panel action complies with the NFPA NEC Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1161)

4- 69 - (230-24(a) Exception No. 5 (New)): Reject

SUBMITTER: Charles K. Eldridge, Indianapolis, IN

RECOMMENDATION: Add a new Exception No. 5 to read:

230-24. Clearances. The vertical clearances of all service-drop conductors shall be based on conductor temperature of 60°F (15°C), no wind, with final unloaded sag in the wire, conductor, or cable.

Service-drop conductors shall not be readily accessible and shall comply with (a) through (d) for services not over 600 volts, nominal.

(a) Above Roofs. Conductors shall have a vertical clearance of not less than 8 ft (2.44 m) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance of not less than 3 ft (914 mm) in all directions from the edge of the roof.

Exception No. 5: Where the voltage between conductors does not exceed 600, the roof has a slope of 4 in. (102 mm) in 12 in. (305 mm), or greater, and the service drop is Messenger Supported Wiring as defined in Article 321, a reduction in clearance above only the overhanging portion of the roof to not less than 36 in. (915 mm) shall be permitted if (1) not more than 6 ft (1.83 m) of service-drop conductors, 4 ft (1.22 m) horizontally, pass above the roof overhang, and (2) they are terminated at a through-the-roof raceway or approved support.

SUBSTANTIATION: This change would permit the now wide spread practice (the National Electrical Safety Code®, Rule 234C3d(1) Exception No. 1, permits this installation now) of allowing a 480 volt service drop to hit a through the roof raceway with proper clearance. In addition to the general restrictions given in Exception No. 3, I have increased safety by adding the general restrictions in Exception No. 2.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not adequately defined whether the proposed text is applicable to open conductors or cables. Reducing the clearance for this level of voltage is considered to be a reduction in the present level of safety. The panel does not concur that this is permitted by the NESC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #122)

3- 3 - (230-25, 305): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.
NOTE: The following proposal consists of Comment 4-49 on Proposal 4-77 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-77 was:
Add the following new section under Article 230:
230-25. Vegetation. Vegetation such as trees shall not be used for support of overhead service drop conductors.
Exception: For temporary wiring in accordance with Article 305.
SUBMITTER: Melvin K. Sanders, TECo., Inc.
RECOMMENDATION: CMP 3 Task Group accepts the Panel Action to Accept in Part Proposal 4-77 such that the rule will be: "Section 230-25. Vegetation. Vegetation such as trees shall not be used for support of overhead service drop conductors." and to exclude the proposed Exception.
SUBSTANTIATION: It is the position of CMP 03 Task Group Raymond W. Weber, Richard P. Owen and Melvin K. Sanders, Secretary, on ROP 4-77 that it is within the purview of CMP 04 to determine the support requirements for wiring methods in Article 230.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Section 305-4 requires compliance with the provisions of Article 230 for services used for a temporary installation. Panel 4 has jurisdiction over the support requirements for service conductors and should make the determination on whether or not to relax support requirements for a temporary service. CMP 3's position is that vegetation shall not be used as a support means.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1446)

4- 70 - (230-25 and Exception (New)): Accept in Principle in Part
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information.
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Add the following new section:
230-25. Vegetation. Vegetation such as trees shall not be used for support of overhead service drop conductors.
Exception: For temporary wiring in accordance with Article 305.
SUBSTANTIATION: This same requirement has been in the "Code" for feeders (225-26) for some time now. The same requirements should apply to overhead service conductors.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the proposed text and has modified it by changing the title to read:
"Vegetation as Support", deleting the word "drop" and renumbering this to be 230-10. The panel rejects the proposed exception.
PANEL STATEMENT: The panel agrees with the submitter's proposal to prohibit vegetation as a support method and has expanded it to cover all service conductors by placing the requirement in Part A. The panel has not accepted the proposed exception as there is a significant difference between Article 225 and Article 230 relative to overcurrent protection requirements for conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #721)

4- 71 - (230-28): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
Service masts shall be installed in a manner that will permit the minimum clearances specified in Section 230-24 for service-drop conductors.
SUBSTANTIATION: The proposed requirement is inferred where service-drops are covered by the code. Many exempt utility-owned and installed service do not conform to Section 230-24. There is no requirement to provide mast installation which allows conformance with Section 230-24 in such cases. Since the majority of service drops are exempted from Section 230-24 by Section 90-2, the proposal would enhance the likelihood of conformance with Section 230-24.
PANEL ACTION: Reject.
PANEL STATEMENT: In order to meet the clearance requirements of this section, installers must coordinate the installation of the mast with the serving utility. Additional language is not necessary to assure compliance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4067)

4- 72 - (230-28): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./Electric Light & Power Group
RECOMMENDATION: Add a sentence at the end of 230-28:
230-28. Service Masts as Supports. Where a service mast is used for the support of service-drop conductors, it shall be of adequate strength or be supported by braces or guys to withstand safely the strain imposed by the service drop. Where raceway-type service masts are used, all raceway fittings shall be identified for use with service masts. Only power service-drop conductors shall be permitted to be attached to a service mast. Only one service drop shall be attached to a raceway-type service mast.
SUBSTANTIATION: This change ensures that proper loading is applied to raceway-type masts.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation to limit the number of service drops permitted to be attached to a single mast.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1670)

4- 73 - (230-28, Exception): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information.
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Add the following exception at the end of Section 230-28:
Exception: Communications and community antenna television (CATV) service drops shall be permitted to be attached to a service mast that is listed for the purpose of accepting multiple attachments.
SUBSTANTIATION: The present general prohibition regarding the attachment of communications and CATV service drops to the power service mast is excessive. Where the service mast is designed and listed for the attachment of multiple service drops, a single mast for all attachments should be permitted. Listing will ensure that the mast itself, as well as the installation hardware and methods, are adequate to withstand the total combined load. Also, listing will provide a verification method to the authority having jurisdiction. It is unnecessarily costly to the building owner and aesthetically unslightly when two service masts must be provided, one for power and another for communications and CATV services.
This proposal attempts to find a reasonable and safe alternative to the main rule by permitting communications and CATV attachments to power service masts that are listed for such application. Listing will help ensure the safety of attached power and communications conductors on a single mast, as well as address the personnel safety concerns raised by CMP 4 in previous Code cycles. It should be noted that the communications and CATV craft personnel are trained to work in close proximity to power conductors. Section 800-10(a)(4) permits a minimum separation of 12 inches between power-service drops and communications drops at their point of attachment to the building, provided that the nongrounded power conductors are insulated and that a clearance of 40 inches between the two services is maintained at the pole.

Section 820-10(f)(1) permits separations of as little as 4 inches where cables of the two systems are attached to buildings.

This proposal seeks relief from the present prohibition on communications and CATV attachments to a power service mast in a way that is both safe and cost effective.

Note that companion proposals for a new Section 800-10(c) and a revised Section 820-10(c) have been submitted. These companion proposals would permit communications and CATV service drop attachments to a power service mast in accordance with the proposed Section 230-28, Exception.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel does not believe that the listing of the product will adequately address the personnel safety issues that are created by the co-mingling of the different systems on a common mast. Issues such as loading can be addressed by the proposed listing, however personnel safety can not be assured regardless of the listing criteria.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

YOUNG: Personnel safety is important, but the code does not impose any limitations or restrictions on the installation of different systems today. A listed mast could well be safer by identifying where and how the systems are attached.

COMMENT ON AFFIRMATIVE:

HUGHES: I strongly support the panel action to reject this proposal. While the suggested listing requirement might address loading requirements, attachment methods, etc., it would still ignore the safety concerns of many installers and service electricians. Documented proof is available that multiple attachments have caused injury to service electricians. This possibility will not be eliminated with listing. Also contrary to the submitter's belief, not all CATV personnel have adequate training to work around live conductors.

The submitter also raises the question of unnecessary cost to the building owner. While cost should not be a controlling factor but rather safety, the installing electrician would have to bear increased cost as well as any increased liability.

SUMRALL: The continuing battle, of telecommunication companies, to attach another service drop to the electrical mast, is only driven by the profits that will be realized by these entities. As stated in the Panel Statement, listing will do absolutely nothing for the safety concerns that are raised each and every time this proposal or one like it is brought before the CMP, the Technical Correlating Committee, or the NFPA floor. These companies seek only greater profit margins and claim aesthetics as one of the substantiation concerns. During the last cycle, an appeals board met to discuss the merits of a similar proposal and agreed with the CMP, 90-1 is the driving force for the NEC. The NEC should not be concerned with minimal costs, but rather the practical safeguarding of persons and property.

(Log #3152)

4- 74 - (230-30): Reject

SUBMITTER: Andrew J. Mayville, Escanaba, MI

RECOMMENDATION: Add the following new section and renumber the present sections of Part C. Make title of section Underground Supply. Article reads as follows:

Underground service conductors from a building or other structure (such as a pole) on which a meter is installed shall be considered service lateral conductors and installed accordingly.

SUBSTANTIATION: It is common to run conductors underground from a metering point, such as on a farm, underground to out buildings. In this case the underground conductors should be considered to be service lateral conductors just like overhead conductors under similar circumstances are to be considered service drop conductors.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided technical substantiation to treat these conductors as service lateral conductors. The panel intends that the requirements of Part D apply to the conductors on the load side of terminal box, meter or other enclosure.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1184)

4- 75 - (230-31(a)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add text to read:

"The ampacity of service-lateral conductors before the application of any adjustment or correction factors shall not be less than the sum of the noncontinuous load(s), plus 125 percent of the continuous load(s) or the ampacity specified for motor supply conductors in Part B of Article 430 and Part D of Article 440, whichever is greater.

Exception: The correction factors for temperatures below 26°C (78°F) shall be permitted in determining the initial conductor ampacity."

SUBSTANTIATION: Loads as computed in Article 220 do not specify any load increase, per se, for continuous load or motor load. Requirements for those type loads specify an increase in conductor ampacity, which is not the same as load. Those requirements are in Articles 210, 215, 230, and 430 which cover branch circuits, feeders, and service-entrance conductors, and "conductors" (not specific) for motors, which could apply but is easily overlooked as applying to service-laterals. Required ampacity increases should apply to service-laterals as it does to service-entrance conductors in Section 230-42(a)(1)(2).

Application of this section does not correlate with Section 215-2 for continuous load nor Section 430-24, and can lead to disparity of ampacity ratings for conductors supplying the same load.

The proposed exception allows for increased ampacity where underground temperatures are deemed to be less than 26°C.

See my proposals for Sections 210-19(a) and 215-2(a).

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not demonstrated that the existing requirement for sizing service lateral conductors has proven to be inadequate. These conductors generally do not terminate in enclosures that require conductors to be sized at 125 percent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #CP419)

4- 75a - (230-31(c)): Accept

SUBMITTER: CMP 4

RECOMMENDATION: Remove the fine print note from Section 230-31(c).

SUBSTANTIATION: The fine print note does not enhance the usability of this section.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3794)

4- 76 - (230-33 (New)): Accept in Principle

SUBMITTER: John I. Williamson, Minnesota Board of Electricity

RECOMMENDATION: Create a new section in Part C (Underground Service Lateral Conductors) similar to Section 230-46 for Service-Entrance Conductors as follows:

230.33. Spliced Conductors. Service-lateral conductors shall be permitted to be spliced or tapped by clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices of conductors shall be made in accordance with Sections 110.14, 300.5(e), 300.13, and 300.15.

SUBSTANTIATION: There is no prohibition in the code from splicing service-lateral conductors, consequently it is assumed that it is permissible to do so. The usability of the code would be improved if the code included a section that specifically permitted service-lateral conductors to be spliced.

PANEL ACTION: Accept in Principle.

Revise as follows:

"230.33. Spliced Conductors. Service-lateral conductors shall be permitted to be spliced or tapped ~~by clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices of conductors shall be made~~ in accordance with Sections 110.14, 300.5(e), 300.13, and 300.15."

PANEL STATEMENT: The panel's action adequately addresses the submitter's concern. See panel action on Proposal 4-96.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1506)

4- 77 - (230-40): Accept in Principle
SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text as follows:
230-40. Number of Service-Entrance Conductor Sets. Each service drop or lateral shall supply only one set of service-entrance conductors.
Exception No. 1: Buildings with one or more than one occupancy shall be permitted to have one set of service-entrance conductors for each ~~class~~ different characteristic of service run to each occupancy or group of occupancies.
Exception No. 2: Where two to six service disconnecting means in separate enclosures are grouped at one location and supply separate loads from one service drop or lateral, one set of service-entrance conductors shall be permitted to supply each or several such service equipment enclosures.
Exception No. 3: A single-family dwelling unit and a separate structure shall be permitted to have one set of service-entrance conductors run to each from a single service drop or lateral.
Exception No. 4: A two-family dwelling or a multifamily dwelling shall be permitted to have one set of service-entrance conductors installed to supply the circuits covered in Section 210-25.
Exception No. 5: One set of service-entrance conductors connected to the supply side of the normal service disconnecting means shall be permitted to supply each or several systems covered by Section 230-82(4).
SUBSTANTIATION: The present Code language does not specify what "class" means, however, 230-2(d) does specify "different characteristics."
PANEL ACTION: Accept in Principle.
Revise Exception No. 1 to read:
"Exception No. 1: A building with one or more than one occupancy shall be permitted to have one set of service-entrance conductors for each ~~class service of different characteristics, as defined in Section 230-2(d), run to each occupancy or group of occupancies.~~"
PANEL STATEMENT: The change to the proposed language enhances the clarity of the exception. This change also incorporates the language of Proposal 4-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2250)

4- 78 - (230 Part D): Reject
SUBMITTER: Michael G. Zeuger, LDA Co.
RECOMMENDATION: I feel a section should be added to service entrance conductors. All services entrance conductors shall be derated 80 percent with no exceptions.
SUBSTANTIATION: Due to a growing amount of nonlinear loads in commercial and institutional buildings.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no techncial substantiation to apply this requirement to all service entrance conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1042)

4- 79 - (230-40 Exception No. 1): Reject
SUBMITTER: William Barnett, City of Gresham, OR
RECOMMENDATION: Delete Exception No. 1.
SUBSTANTIATION: Exception No. 1 is in direct conflict with Part F of Article 230. While 230-40 specifically addresses service-entrance conductors, Exception No. 1 in fact allows an unlimited number of service disconnects and unfused conductors throughout a building with more than one occupancy. A 40-unit apartment building or a 3-story building with a different retail tenant on each floor is a single occupancy building by Uniform Building Code definition. "Buildings with one or more than one occupancy" is a vague and undefined term that covers all existing and future buildings, with or without area or occupancy separations. Section 230-40 Exception No. 1 is subject to broad interpretation and nullifies Sections 230-2, 230-70(a), 230-71(a), and 230-72(a). The National Electrical Code does not define "occupancy", "mixed-occupancy", or "multi-occupancy". The NEC repeatedly refers to NFPA 101-1997 and this standard uses the UBC definition of "occupancy". Code Making Panel No. 1 has refused to accept the UBC definition of "occupancy". While it is necessary to have alternate methods to achieve compliance with the intent of the codes, Exception No. 1 lessens uniformity, compliance and is potentially hazardous for firefighters and building occupants.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation is incorrect. Section 230-40 Exception 1 does not conflict with Part F. Exception No. 1 permits multiple sets of service entrance conductors to be supplied by a single service and Section 230-71(a) specifically addresses the location of the disconnecting means. The multiple sets of service entrance conductors are required to comply with the requirements of Section 230-70(a) and it is not permitted to run conductors without overcurrent protection through the interior of the building. The use of this exception has practical application for buildings with more than one occupancy and the submitter has not provided documentation to indicate that this language has resulted in decreased safety of the installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1409)

4- 80 - (230-40 Exception No. 1): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise as follows:
Exception No. 1: ~~Buildings~~ A building with one or more than one...
(Remainder Unchanged).
SUBSTANTIATION: Buildings (plural) literally indicates more than one structure. The proposal would include one structure with one or more occupancy, or a separate structure(s) with one or more occupancy which may be on the same property. Proposal is editorial.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4171)

4- 81 - (230-40 Exception No. 1): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
"By special permission, where there is no available space for service equipment accessible to all the occupants, buildings with more than one occupancy shall be permitted to have one set of service entrance conductors for each class of service run to each occupancy or group of occupancies."
SUBSTANTIATION: The continuing rejection of any limits on the existing exception is unbelievable. On the literal text of the present NEC, it is permitted to group six of seven service disconnects for a seven family dwelling at one point. Then, one can run a set of service conductors around the outside of the building to a remote location and spot the seventh disconnect. In fact, the service conductors need not run outside the building; they could be run in a wall as long as there was two inches of concrete encasement.
Section 230-2 does not apply, since there is only one service. Therefore, it is not even necessary to provide a directory at either disconnect location to inform the fire service of the remote, still energized disconnect. If this does not justify an outright prohibition, surely it justifies a requirement for special permission. This rule has been in the Massachusetts Code for over ten years now, and it is working well. In truly extenuating circumstances, special permission is granted, usually upon the condition of reciprocal labeling.

The 1999 change, expanding this allowance to each class of service, makes this proposal even more critical. Under the 1996 NEC a ten-family apartment house might have 60 service disconnects. If there are two classes of service, now there could be 120 disconnects.

Prior panel statements about (effectively) Section 90-4 are, frankly, irresponsible. Good inspectors loathe code rules that effectively force them in to inventing the Code through that process. Only the bad inspectors welcome this chance to show how powerful they are. In all the electrical seminars I have been part of across the nation, I have never found any support for they way this rule can be applied, and with the new change it's worse than ever. The inspector needs a forthright statement that clearly shows that special discretion is expected in these cases.

PANEL ACTION: Reject.

PANEL STATEMENT: The use of this exception has practical application for buildings with more than one occupancy and the submitter has not provided documentation to indicate that this language has resulted in decreased safety of the installation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

SUMRALL: Since the State of Massachusetts elected to utilized 90-4 for the adoption of this exception into their Electrical Code, it would appear not all inspectors need a "forthright statement" to grant special permission for this type of installation. This most learned seminar instructor, I hope, is not rejecting the idea of the Authority Having Jurisdiction does not already have the tools to use discretion in these cases, because they do have that ability. This is the only proposal for this section, so therefore the problem might not be as widespread as the submitter thinks.

(Log #722)

4- 82 - (230-40 Exception No. 5): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Exception No. 5: One set of service-entrance conductors connected to the supply side of the normal service disconnecting means shall be permitted to supply each or several systems covered by Section 230-82 (4) or (5).

SUBSTANTIATION: Editorial. Section 230-82(5) covers systems permitted to be connected to the supply side of the normal service disconnecting means by conductors which may be considered service conductors.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #723)

4- 83 - (230-41, Exception (New)): Accept in Principle in Part

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add a new paragraph (e) to the exception to read as follows:

(e) Bare copper used in an auxiliary gutter or in a cablebus assembly.

SUBSTANTIATION: Editorial. These are permitted wiring methods in Section 230-40, but since they are not considered raceways bare grounded conductors are not permitted, for no other apparent good reason.

PANEL ACTION: Accept in Principle in Part.

Amend the proposed text to read:

"(e) Bare conductors used in an auxiliary gutter".

Do not accept the proposed language to permit bare grounded conductors in cablebus.

PANEL STATEMENT: The panel disagrees that this proposal constitutes an editorial change only. The panel is capable of judging whether a proposed change is editorial. Section 365-3(a) requires that all current carrying conductors in cablebus be insulated. Section 374-7 permits the use of bare conductors in an auxiliary gutter and does not restrict this permission to copper conductors only. Conductors in auxiliary gutters may be wire or busbar.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #17)

4- 84 - (230-42(a)): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 2 and 11 for information.

NOTE: The following proposal consists of Comment 4-64 on Proposal 4-96 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 4-96 was:

Revise as follows:

230-42. Size and Rating.

(a) General. Service-entrance conductors shall be of sufficient size to carry the loads as computed in Article 220.

(1) Ampacity. Ampacity shall be determined from Section 310-15.

Exception: The maximum allowable current of approved busways shall be that value for which the busway has been listed or labeled.

(2) Continuous and Noncontinuous Loads. Where service entrance conductors supply continuous loads or any combination of continuous and noncontinuous loads, the minimum service entrance conductor size, without the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly, including any overcurrent devices, is listed for operation at 100 percent of their rating, neither the ampere rating of the overcurrent device nor the ampacity of the branch circuit conductors shall be less than the sum of the continuous load plus the noncontinuous load.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Accept in principle, revise Panel Action as follows:

(a) General. ~~The ampacity of the service entrance conductors, before the application of any adjustment or correction factors shall not be less than items 1 or 2 below. Loads are to be determined in accordance with Article 220. Ampacity shall be determined from Section 310-15. 1) The sum of the noncontinuous load, if the service entrance conductors terminate in an overcurrent device that is listed for operation at 100 percent of its rating.~~ Service-entrance conductors shall have an ampacity not less than the maximum load to be served. Where service-entrance conductors supply continuous load or any combination of continuous, noncontinuous load, and motor load, the minimum service-entrance conductor size, before the application of any adjustment or correction factors, shall have an allowable ampacity equal to or greater than the noncontinuous load plus 125 percent of the continuous load, plus the ampacity specified in Section 430-24 for motor loads.

Exception No. 1: Where the assembly, including the overcurrent protective device(s) for the service-entrance conductors are listed for 100 percent of their rating, the ampere rating of the overcurrent protective device(s) shall not be less than the sum of the continuous load plus the noncontinuous load, plus the motor load, and the ampacity of the service-entrance conductors shall not be less than the continuous load plus the noncontinuous load, plus the ampacity specified in Section 430-24 for motor loads.

SUBSTANTIATION: Although a fully loaded motor operating for 3 hours or more meets the definition of continuous load, this does not appear to be the intent of the Code. The revision would be more comprehensive for Code users (user friendly) and correlate with a similar requirement of Section 430-24. Although a fully loaded motor operating for 3 hours or more meets the definition of continuous load, this does not appear to be the intent of the Code and is not addressed in this section. The proposed revision would be more comprehensive for Code users and "user friendly". Panel revision item (a)(2) is incorrect as pointed out by Mr. Young and has left out inclusion of "assembly" which is generally necessary for a 100 percent continuous load rating. Busway current rating is covered in Article 364.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirements of Articles 220, 430 and 440 adequately cover the requirements for calculating the loads described in the proposal. Panel 4 does not have jurisdiction over the rules for computing loads. See panel action on Proposal 4-87.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4116)

4- 85 - (230-42(a)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: Revise the first sentence of the section as follows with the deletions and additions as indicated:
"The ~~ampacity of the~~ service-entrance conductors ~~before the application of any adjustment or correction factors~~ shall have an allowable ampacity not ~~be~~ less than as determined in either (1) or (2)."
SUBSTANTIATION: The phrase "before the application of any adjustment or correction factors" is particularly confusing to electricians making conductor ampacity selection when adjustment factors are being used. Some apply the adjustment factors to the allowable ampacity found in the appropriate table and then compare it with 100 percent of both continuous load and noncontinuous load, others compare the adjusted allowable ampacity to the sum of 100 percent of the noncontinuous load and 125 percent of the continuous load. By removing the confusing statement, it makes the section clear that the adjusted allowable ampacity of the conductor is not permitted to be less than the sum of 100 percent of the noncontinuous load plus 125 percent of the continuous load.
PANEL ACTION: Reject.
PANEL STATEMENT: The current language contained in 230-42(a) provides the correct sizing requirements. The ampacity of the conductors is determined by calculating the continuous and noncontinuous loads before the application of any adjustment or correction factors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4118)

4- 86 - (230-42(a)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: In the first line add the word allowable before ampacity. The section will then read "The allowable ampacity of the service-entrance conductors..."
SUBSTANTIATION: The addition of the word allowable should make it clear that the ampacity of the service entrance conductors is the value determined in the appropriate allowable ampacity table with any appropriate adjustment factors applied.
PANEL ACTION: Reject.
PANEL STATEMENT: Addition of this language does not add clarity to this section. In fact it may cause confusion that only the tables of Article 310-15(b) are permitted to be used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1186)

4- 87 - (230-42(a)(1), (2)): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 2 and 11 for information.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
(1) The sum of the noncontinuous load(s), plus 125 percent of the continuous load(s) or the ampacity specified for motor supply conductors in Part B of Article 430 or Part D of Article 440, whichever is greater.
(2) The sum of the noncontinuous load(s) ~~plus~~ and the continuous load(s), plus the ampacity specified for motor supply conductors in Part B of Article 430 and Part D of Article 440, if the service-entrance conductors terminate ~~in an overcurrent device~~ at an assembly with or without an integral overcurrent device(s) where ~~both the overcurrent device and its~~ the assembly ~~are~~ is listed for continuous operation at 100 percent of ~~their~~ its rating.
Exception: Boxes or other enclosures which contain only spliced or tapped conductors in accordance with Section 230-46 shall not be required to be listed for continuous operation.
SUBSTANTIATION: The panel statement for Comment 1-174 in the 1998 ROC indicated motor loads continuing for 3 hours or more are not excluded from the definition of continuous load. This may be literally correct but not in harmony with Article 430 and 440 and common practice which only applies the 25 percent ampacity increase (125 percent factor) to the largest motor (regardless of operating time). If motors operating for 3 hours or more are deemed continuous load, this section (1) requires each motor supply conductor to be computed at 125 percent ampacity. If the motor(s) operate for less than 3 hours no factor is required by this section, which conflicts with Article 430 which requires the general 25 percent ampacity increase regardless of operating time. The 25 percent factor for motor supply conductors as I understand it, is not for a phantom load but provides for temporary motor overload and the general maximum rating for motor overload devices. The proposed revision for (1) would allow the continuous load factor to apply to the motor conductor ampacity factor or vice-versa, whichever is larger.
The proposal for (2) is revised to permit deletion of the 125 percent factor for continuous loads where conductors are terminated at an assembly without integral overcurrent devices, such as a nonfusible switch listed for continuous operation at 100 percent of rating. Present wording disallows a 100 percent ampacity rating of supply side conductors for such a switch or a meter socket. (Literally conductors don't terminate in an overcurrent device.) Again, the required ampacity for motor supply conductors in Article 430 is a given, and should be provided for the largest supplied motor, whether operated for less than 3 hours or more than 3 hours. [See my proposal for Section 215-2(a)].
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements of Articles 220, 430 and 440 adequately cover the requirements for calculating the loads described in the proposal. Panel 4 does not have jurisdiction over the rules for computing loads.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3142)

4- 88 - (230-42(a)(2)): Reject
SUBMITTER: Nathan Kay, Frankenmuth, MI
RECOMMENDATION: Delete the entire Paragraph (2).
SUBSTANTIATION: Conductors are now required to be sized at 125 percent of the continuous load. Why does it matter if the overcurrent device is rated to operate at only 100 percent of the continuous load? In addition, this section deals with wire sizing, not overcurrent device ratings.
PANEL ACTION: Reject.
PANEL STATEMENT: The sizing of the conductors and the limitations on the overcurrent device are indeed interrelated. The existing language is necessary to properly match the conductor size to the service equipment terminations (loads and termination temperature ratings shall be considered).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4117)

4- 89 - (230-42(a)(2)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: Revise paragraph (2) as follows:
"The sum of the noncontinuous load plus the continuous load and not less than the rating of the overcurrent device if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating."
SUBSTANTIATION: The rule for sizing conductors when the overcurrent device is listed for 100 percent operation and one that is not such listed can lead to widely different conductors sized for the same identical load. At least in the case where the overcurrent device is listed for 100 percent operation, the minimum allowable ampacity of the conductor should not be permitted to be less than the rating of the overcurrent device. The following example illustrates the point.
Example: If a set of service entrance conductors supplies a continuous load of 130 amperes and the overcurrent device and enclosure are listed for operation at 100 percent of its rating then the overcurrent device is permitted to be rated at 150 amperes. In this case the conductor is permitted to be sized based upon an allowable ampacity not less than 100 percent of the continuous load. If copper conductors are used with 75°C insulation and terminations, the maximum conductor size required would be AWG #1 which is listed in Table 310-16 as 130 amperes. If the overcurrent

device had not been listed for 100 percent operation, the minimum overcurrent device rating for this load would have been 175 amperes and the minimum conductor size would have been AWG #2/0. This seems to be a wide difference in minimum conductor size for the same identical load simply because one overcurrent device is rated for 100 percent operation and the other is not.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any technical substantiation to justify requiring the conductor to have ampacity not less than the rating of the overcurrent device. This is permitted by Section 230-90(a) Exception No. 2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #724)

4- 90 - (230-42(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
Application of Note 3 to Article 310 Ampacity Tables of 0 to 2000 volts shall be permitted.
SUBSTANTIATION: Editorial. To provide correlation with Note 3 where conductor ampacity and service/feeder ratings may differ. This is done in Section 230-90(a).
PANEL ACTION: Reject.
PANEL STATEMENT: This added reference is not necessary since the general requirements of Section 230-42(a) refer to Section 310-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4172)

4- 91 - (230-42(b)): Accept in Principle in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise by replacing the entire subsection as follows:
(b) Ungrounded Conductors. The ampacity of the ungrounded conductors shall be not less than the load to be carried, determined in accordance with Article 220. In no case shall the ampacity or the conductor sizes be lower than as specified in (1), (2), (3), or (4).
(1) One-Circuit Installation. For installations that supply only limited loads of a single branch circuit, the conductor(s) shall be not smaller than No. 12 copper or No. 10 aluminum or copper-clad aluminum. The service conductors shall not be smaller than the branch-circuit conductors.
(2) Limited-Circuit Installations. For installations consisting of not more than two 2-wire branch circuits, or by special permission for other installations limited by demand or by the source of supply, the conductors shall be not smaller than No. 8 copper or No. 6 aluminum or copper-clad aluminum.
(3) One-Family Dwelling. For a one-family dwelling, the conductors shall have an ampacity of not less than 100 amperes, 3-wire.
(4) All Others. For all other installations, the conductors shall have an ampacity of not less than 60 amperes.
SUBSTANTIATION: This proposal restores the conditions and allowances that were in the 1996 NEC, edited as positive text instead of using exceptions. The 1999 panel action changing this requirement to a cross reference to the disconnecting means thresholds in Section 230-79 introduced major changes without a shred of technical substantiation, and caused major confusion as well. For example, the minimum size on a single circuit was always No. 12. However, Sec. 230-79(a) sets the minimum disconnecting means for such circuits at 15A, which now allows a No. 14 for the first time. Similarly, the two-circuit installation used to be No. 8 minimum; now the rule goes over to the 30A disconnect size, which allows for a No. 10 instead. The former exception allowing a No. 8 for general use on limited demand situations by special permission was deleted outright.
The major area of confusion concerns the present phrase "the minimum rating of the disconnecting means." Suppose you have a calculated load of 237A. You still install 237A minimum conductors, subject to allowances elsewhere in the Code for continuous loads, etc. The fact that the switch might be 400A with 250A fuses, because those are standard sizes, doesn't mean you have to cable to the 400A switch size. Nevertheless, I have found in doing seminars across the country that many people think they do have to cable to the switch size.
This proposal puts everything in the 1996 provisions, except as modified for the 100A house rule, back on the table. CMP 4 should retain this format. If it chooses to remove any element, then it should provide the technical justification for doing so.
PANEL ACTION: Accept in Principle in Part.
The panel has modified Section 230-42(b) to read:
"230-42(b) Specific Installations. In addition to the requirements of 230-42(a), the minimum ampacity for ungrounded conductors for specific installations shall not be less than the rating of the service disconnecting means specified in 230-79(a) through (d)."
The remainder of the proposal is rejected.
PANEL STATEMENT: The panel has modified 230-42(b) to address the submitter's concern over clarity.
The panel reaffirms that the use of conductor ampacities based on 310-15 is not a reduction in the safety of the installation. The overcurrent protection required by Section 230-90 adequately protects the conductor. This action eliminated the confusion between Sections 230-42(b) and 230-79 in the 1996 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2763)

4- 92 - (230-43(15)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add a new sentence to read as follows:
"Where flexible metal conduit is used it shall be installed to comply with Section 350-5(1) when installed in a wet location."
SUBSTANTIATION: The reference to the rule that covers the wiring method should be identified in this section.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 230-43 already requires compliance with the respective wiring method articles in Chapter 3 which includes 350-5(1).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #372)

4- 93 - (230-43(6), (15), (16)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete:
~~(6) Electrical nonmetallic tubing.~~
Add to (15): and limited to a single length.
Add to (16): where limited to a single length not over 6 ft (1.83m) long.
SUBSTANTIATION: Section 331-3(1)(a) indicates ENT is permitted for exposed work in a building where not subject to physical damage. The FPN for this section indicates extreme (not defined) cold may cause susceptibility to damage. Section 331-4(7) indicates ENT is not permitted in exposed wet locations except indoors as specified in Section 331-3(7). This suggests that ENT may not be suitable as a service raceway on the outside of a building in a cold climate.
The substantiation for Proposal 4-99 in the 1986 TCR which reintroduced flexible conduit indicated it was to provide for short lengths necessary to facilitate difficult raceway routing around obstructions and reduce the need for conduit bodies. Present wording does not indicate this purpose and does not limit the number of separate 6 ft or less sections which may be interposed in the service raceway. Such latitude obviates the normal use of nonflexible raceway bends and conduit bodies even where there are no obstructions, which did not seem to be the intent of the proposal.
Present (16) provides no limit on the length of LTFNMC if supported in accordance with Section 351-23(a). If the prime reason for flexible raceway is as stated in the substantiation for Proposal 4-99, it should also apply to LTFNMC.
PANEL ACTION: Reject.

PANEL STATEMENT: Although not appropriate for use in outdoor cold climates, there is no need to completely eliminate the use of ENT installed in accordance with Article 331, as a service wiring method. Additionally there is no technical substantiation to limit items (15) and (16) to a single six foot length.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP420)

4- 93a - (230-44): Accept
NOTE: The Technical Correlating Committee understands that the last paragraph of the present Section 230-43 is deleted. The panel should also consider correcting the last phrase, "in accordance with Article 318", to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 4
RECOMMENDATION: Create new Section 230-44 to read:
"230-44. Cable Trays. Cable tray systems shall be permitted to support cable used for service-entrance conductors in accordance with Article 318."
SUBSTANTIATION: CMP 8 has clarified that cable tray systems are support systems, not wiring methods, therefore it is necessary to separate it from Section 230-43.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #405)

4- 94 - (230-46): Accept in Principle
SUBMITTER: Amos D. Lowrance, Jr., City of Chattanooga, TN
RECOMMENDATION: Revise 230-46 to read as follows:
Spliced Conductors. Service-entrance conductors shall be permitted to be spliced or tapped by crimped, exothermic clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices or conductors shall be made in accordance with Sections 110-14, 300-5(e), 300-13 and 300-15.
SUBSTANTIATION: Presently, the code only permits clamped or bolted connections disregarding the traditional means of exothermic and crimped connections which practice has taught to be a superior method of taping or splicing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-96.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1482)

4- 95 - (230-46): Accept in Principle
SUBMITTER: Larry T. Smith, Nat'l Electrical Seminars
RECOMMENDATION: Revise to read as follows:
Service-entrance conductors shall be permitted to be spliced <u>with irreversible compression connectors or</u> tapped by clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices of conductors shall be made in accordance with Sections 110-14, 300-5(e), 300-13, and 300-15.
SUBSTANTIATION: History ignored will repeat itself, and split-bolt connections have a history of failure.
We need to listen to the people who are actually doing the work. Ask an assembly of one hundred electricians this question: "How many of you have seen a split-bolt splice go bad?" Usually ninety hands will go up. I have asked this question in seminar after seminar and gotten the same result; ninety to ninety-five percent of those in attendance will attest to having had to repair a bad split-bolt splice.
Clamped or bolted connectors, if properly installed, are a good product. It's with the proper installation that we have difficulty. Service conductor splices must have the reliability of irreversible compression connectors.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-96.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:
SUMRALL: The submitter in his substantiation asked an assembly of electricians if they have "seen a split-bolt splice go bad," however he did not address if a follow-up question, such as "How many have been properly trained to install a split bolt splice?" In recent history, I have seen two failures of split bolt connections, The Root Cause Failure Analyses in both cases were the result of untrained or poorly trained personnel doing the installation.

(Log #2814)

4- 96 - (230-46): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 1 and 3 for information.
SUBMITTER: John E. Staires, Tulsa Code Seminars/Rep. Oklahoma Chapter IAEI
RECOMMENDATION: Remove the wording:
"~~splices shall be made in enclosures or, if directly buried, with a listed underground splice kit.~~"
Insert the wording:
"<u>splices shall be made in enclosures or, if directly buried, shall be permitted to be spliced with a listed underground splice kit.</u>"
SUBSTANTIATION: The above referenced sentence contains literal wording which would require directly buried service entrance conductors to be spliced with a listed underground splice kit. The requirement for the splicing of directly buried service entrance conductors are in the next sentence of Section 230-46 by reference to Sections 110-14, 300-5(e), 300-13 and 300-15. As presently written, Section 230-46 would literally preclude the splicing of directly buried conductors in an enclosure such as a junction box.
PANEL ACTION: Accept in Principle.
Modify Section 230-46 to read:
"Service-entrance conductors shall be permitted to be spliced or tapped ~~by clamped or bolted connections. Splices shall be made in enclosures or, if directly buried, with a listed underground splice kit. Splices of conductors shall be made~~ in accordance with Sections 110-14, 300-5(e), 300-13, and 300-15."
PANEL STATEMENT: The panel's action addresses the submitter's concern and adds clarity to this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4012)

4- 97 - (230-50(a)(3)): Accept
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: This proposal is to revise (3) to read as follows:
Section 230-50(a)(3) Schedule 80 rigid nonmetallic conduit.
SUBSTANTIATION: There is always confusion when it comes to the installation of nonmetallic conduit. Most people do not realize that every day, typical, nonmetallic conduit is not approved for areas subject to physical damage. The only way one can know this is to carry the UL white book around. By removing the phrase "suitable for the location" and placing "Schedule 80" before the text "rigid nonmetallic conduit", this code section would effectively eliminate any chance of a misapplication of the product.
This type of specific reference to the use of Schedule 80 is made in Section 300-5(d) and Section 336-6(b). These articles specifically refer to Schedule 80 rigid nonmetallic conduit as an alternate wiring method in areas subject to physical damage. This was also done so as to prevent the misuse of Schedule 40 rigid nonmetallic conduit.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #725)

4- 98 - (230-51): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Mounting Supports. Cables or individual open service-<u>entrance</u>

conductors shall be supported as specified in (a) or (b) ~~or (c).~~

(a) Service Cables. Type SE Service-entrance cables and Type MC and Type MI cables used as service-entrance conductors shall be supported by straps or other approved means within 12 in. (305 mm) of every service head, gooseneck, or connection to a raceway or enclosure and at intervals not exceeding 30 in. (762 mm).

(b) Delete.

~~(c)~~ (b) Individual Open Conductors. Individual open service-entrance conductors shall be installed in accordance with ~~Table 230-51(c)~~ applicable provisions of Article 320. Where exposed to the weather, the conductors shall be mounted on insulators or on insulating supports attached to racks, brackets, or other approved means. Where not exposed to the weather, the conductors shall be supported on glass or porcelain knobs. The minimum separation between conductors and the surface wired over shall not be less than 2 in. (50.8 mm).

Delete Table 230-51(c).

SUBSTANTIATION: Since this section is in Part D Service-Entrance Conductors and not all service cables are service-entrance cable, per Article 338, the proper designation should be applied to the specific conductors used.

Panel 7 in response to Comment 7-48 of the 1998 ROC stated that Section 250-51(a) does not apply to support requirements for Type MI cable. Panel 4 in their response to Proposal 4-94 in the 1995 ROP stated they intended this section to apply to all cables used as service-entrance conductors. With different panel opinions consistent interpretation is difficult, and clarification is warranted. Section 334-10(e) indicates this section applies to Type MC cable.

Other (than Type SE) cables indicated by Section 230-43 as suitable for service-entrance conductors are Type MC and MI. Articles 330 and 334 do not have specific restrictions against contact with buildings. What other cables does the present (b) apply to?

Section 300-2 specifies Chapter 3 wiring methods to be used. Article 320 covers open wiring on insulators, which is permitted by Section 230-43(1); the FPN for Section 320-13 refers to this article. Since Article 320 has more comprehensive requirements, limits installation to industrial and agricultural occupancies, and not over 600 volts, has more detailed and limited support requirements, and general protection requirements, the differences between Article 320 and this section indicates this section covers a wiring method that is difficult to identify. While this method of service-entrance conductor installation may be outmoded and seldom used, the reference to Article 320 would provide clarification.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter is incorrect that service cables means only Type SE cable. Section 230-43 permits other cable types. Section 320-2 refers to and defers to Article 225 and other Code sections. Therefore the requirements of Table 230-51(c) are applicable where open conductors are installed as service conductors.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #517)

4- 99 - (Table 230-51(c)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Change Table 230-51(c) as follows.

(Table shown below.)

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2502)

4- 100 - (230-52): Reject

SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ

RECOMMENDATION: Delete Section 230-52.

SUBSTANTIATION: There is no longer any application for this rule. These provisions applied to services that came into attic-installed meters and cutout boxes with the old style knob and tube wiring system.

PANEL ACTION: Reject.

PANEL STATEMENT: Article 324 covers the requirements for knob and tube wiring. Since it is still in the Code, this section should remain.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #726)

4- 101 - (230-54(g)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(g) Arranged that Water will not Enter Service Raceway or Equipment. Service-drop conductors and service-entrance conductors shall be arranged ~~so that~~ to minimize the likelihood of water ~~will not enter~~ entry into service raceways, service cables, or equipment.

SUBSTANTIATION: Present wording is an absolute type of requirement. Cables permitted by Section 230-43 should be included. It is difficult to prevent water entry into flexible metal conduit and Type MC cable.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing wording of this section adequately covers the submitter's concern and provides appropriate requirements for installation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #727)

4- 102 - (230-56): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Service Conductor with the Higher Voltage to Ground. On a 4-wire delta-connected service where the midpoint of one phase is grounded, the service conductor with the highest voltage to ground shall be distinguished from the other phase conductors by a continuous outer finish that is orange in color along its entire length, ~~durably and permanently marked by an outer finish that is orange in color or by other effective means~~ except that a conductor that is larger than No. 6 shall be permitted to be identified at the time of installation by a durable and permanent distinctive orange marking that shall encircle the conductor insulation. Such identification shall be provided at each termination ~~or~~ and junction point except a conduit body that does not contain splices or unused hubs.

(FPN): Junction point includes auxiliary gutters that supplement wiring spaces at service disconnecting means.

Table 230-51(c). Supports and Clearances for Individual Open Service Conductors

Maximum Volts	Maximum Distance Between Supports		Minimum Clearances			
			Between Conductors		From Surface	
	(m)	(ft)	(mm)	(in.)	(mm)	(in.)
600	2.7	9	150	6	50	2
600	4.5	15	300	12	50	2
300	1.4	4 1/2	75	3	50	2
600*	1.4*	4 1/2*	65*	2 1/2*	25*	1*

~~Note: For SI units: 1 in. = 25.4 mm; 1 ft = 0.3048 m~~

*Where not exposed to weather

SUBSTANTIATION: The proposal word "distinguished" would specifically prevent orange insulation on other phase conductors, which seems to be the intent. Present wording permits No. 6 or smaller conductor identification only at termination and junction points. Insulated grounded and grounding conductors No. 6 and smaller must have continuous color identification.

A basic requirement to provide marking that encircles the insulated (grounded) conductor was established by Proposal 5-20 in the 1998 ROP the substantiation for which is applicable to this section. Section 200-6 does not provided for "other effective means" (whatever that means to different persons). The requirement for this section should be no less specific.

Service conductors run through a conduit body without splices or hubs do not appear to warrant this identification since the need to know the higher voltage at this junction point seems minimal.

The fine print note would clarify that an auxiliary gutter containing service conductors looped between service disconnects is a junction point.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed wording does not provide additional safety. The existing wording provides the necessary requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1502)

4- 103 - (230-56): Reject

SUBMITTER: Larry D. Wendt, State of Idaho/Rep. I.A.E.I.

RECOMMENDATION: Revise text as follows:

230-56. Service Conductor with the Higher Voltage to Ground. On a 4-wire, delta-connected service where the midpoint of one phase winding is grounded, the service conductor having the higher voltage to ground shall be durably and permanently marked by an outer finish that is orange in color or by tagging or other effective means, at each termination or junction point. See Section 110-15.

SUBSTANTIATION: Service conductor with the higher voltage to ground is a requirement that should be in Section 110-15 for requirements for electrical installations where it would apply to all types of installations instead of this location. It would also streamline and simplify the code for easier usage.

Please coordinate with proposals on Sections 110-15, 210-4(d), 215-8, 384-3(e), and 384-3(f).

PANEL ACTION: Reject.

PANEL STATEMENT: There is no information to correlate the proposed wording with the submitter's proposal for new 110-15.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1983)

4- 104 - (230-62(c) (New)): Reject

SUBMITTER: John M. O'Connor, North American Technologies, Inc.

RECOMMENDATION: Add new Section 230-62(c) to read as follows:

(c) Meter Sockets. Meter sockets shall be effectively closed by a closure which is integral to the meter socket enclosure when a meter is not installed in the socket.

SUBSTANTIATION: The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by noncode approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

Note: This is a companion proposal to my proposal on Section 373-4(b).

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's concerns are adequately covered by the requirements of Section 110-27 and 230-62. The panel also disagrees that the meter socket is only listed where the meter is in place. Underwriters Laboratories Standard 414 lists the sockets without the meter installed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2101)

4- 105 - (230-62(c) (New)): Reject

SUBMITTER: John M. O'Connor, North American Technologies, Inc.

RECOMMENDATION: Add new text to read as follows:

(c) Meter Sockets. Meter sockets shall be effectively closed by a closure which is integral to the meter socket enclosure when a meter is not installed in the socket.

SUBSTANTIATION: The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by non-code approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

Note: This is a companion proposal to my proposal on Section 373-4(b).

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's concerns are adequately covered by the requirements of Section 110-27 and 230-62. The panel also disagrees that the meter socket is only listed where the meter is in place. Underwriters Laboratories Standard 414 lists the sockets without the meter installed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1883)

4- 106 - (230-64 (New)): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for comment.

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

RECOMMENDATION: Add a new Section 230-64 to read as follows:

Separation from Gas Meters and Tanks. Electric meters and equipment, in general, are sources of ignition and shall be located three ft from gas meters, five ft from portable LP gas tanks and ten ft from hose-filled LP gas tanks. See Section 501-3 and NFPA 54, 2.7.2(c), sources of ignition, and NFPA 58, 3-2.2.2 Table d.

SUBSTANTIATION: These important separation requirements need to be spelled out in Article 230 because service equipment and meters are most likely to have a location conflict with gas equipment.

PANEL ACTION: Reject.

PANEL STATEMENT: The determination of whether a specific location is hazardous (classified) is outside the scope of CMP 4. This proposal has provided no technical substantiation that there is a safety issue. CMP 4 refers this action to CMP 14 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

BECK: The proponent makes some broad assumptions and draws conclusion the Panel did not agree with. Electric meters and metering equipment are not sources of ignition. It is not correct to arbitrarily consider all electrical equipment, devices, or apparatus to be automatically considered sources of ignition. In addition to the

equipment itself and its operation, the equipment, device or apparatus must be considered within the context of the environment and conditions in which it is installed or placed to be considered as a source of ignition. National Electrical Code (NEC) Section 501-3 provides "guidance" for the determination of when a Class I Division 1 or Division 2 location may exist and provides reference to and applicability of NEC Section 500-7. Applying NEC Section 501-3 may require the installation of explosion proof, purged and pressurized enclosures, which would be an extreme and technically unsubstantiated requirement for residential installations especially those located in outdoor locations. Under NEC Section 500-7(a) you must have a gas or vapor concentration that, under normal operating conditions, can be ignitable. Most outdoor locations even when gas and electric meters are in close proximity or adjacent to one another do not necessarily meet that criteria. For example natural gas has a specific gravity of about 0.65 and an UFL of 14 percent and LFL of 4 percent. The actual determination of Class and Division for any location must be made by a knowledgeable person or representative of the Authority Having Jurisdiction, and no attempt should be made for a blanket application of a particular classification for all locations. The real issue here is application of NEC working space requirements. The NEC, as currently written, provides the reasonable guidance and requirements for use by such knowledgeable persons for classifying locations and provided for the proper working clearances as required by the NEC. The determination for application of the requirements of any other NFPA document may or may not, in fact, be appropriate and should be made by the appropriate knowledgeable person based on the site specific installation situation and conditions.

(Log #2564)

4- 107 - (230-70 and Part F): Accept in Principle in Part
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:

F. Service Equipment — Disconnecting Means.

230-70. General. A means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors. The service overcurrent device and ground fault protection where required shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto.

(a) Location. The service disconnect(s)~~ing means.~~ Overcurrent device, and ground-fault protection where required shall be installed at a readily accessible location either in sight outside of a building or structure, or inside nearest the point of entrance of the service conductors.

(1) Service disconnecting means shall not be installed in bathrooms.

(2) A switch or button located in accordance with (a) used to operate a shunt trip main disconnecting means located elsewhere shall not be permitted as the disconnecting means.

(b) Manually or Power Operable. The service disconnecting means for ungrounded service conductors shall consist of either

(1) a manually operable switch or circuit breaker equipped with a handle or other suitable operating means or

(2) a power-operated switch or circuit breaker provided the switch or circuit breaker can be opened by hand in the event of a power supply failure.

(c) Suitable for Use. Each service disconnecting means shall be suitable for the prevailing conditions. Service equipment installed in hazardous (classified) locations shall comply with the requirements of Articles 500 through 517.

(d) Simultaneous Opening of Poles. Each service disconnect shall simultaneously disconnect all ungrounded service conductors that it controls from the premises wiring system.

(e) Indicating. The service disconnecting means shall plainly indicate whether it is in the open or closed position.

~~(b)~~ (f) Marking. Each service disconnect shall be permanently marked to identify it as a service disconnect.

230-71. Maximum Number of Disconnects.

(a) General. The service disconnecting means for each service permitted by Section 230-2, or for each set of service-entrance conductors permitted by Section 230-40, Exception Nos 1 or 3, shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six disconnects per service grouped in any one location. For the purpose of this section, disconnecting means used solely for power monitoring equipment or the control circuit of the ground-fault protection system, installed as part of the listed equipment, shall not be considered a service disconnecting means.

(b) Single-Pole Units. Two or three single-pole switches or breakers, capable of individual operation, shall be permitted on multiwire circuits, one pole for each ungrounded conductor, as one multipole disconnect, provided they are equipped with handle ties or a master handle to disconnect all conductors of the service with no more than six operations of the hand.

FPN: See Section 384-16(a) for service equipment in panelboards, and see Section 430-95 for service equipment in motor control centers.

230-72. Grouping of Disconnects.

(a) General. The two to six disconnects as permitted in Section 230-71 shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six service disconnecting means permitted in Section 230-71, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.

(b) Additional Service Disconnecting Means. The one or more additional service disconnecting means for fire pumps, for legally required standby, or for optional standby services permitted by Section 230-2 shall be installed sufficiently remote from the one to six service disconnecting means for normal service to minimize the possibility of simultaneous interruption of supply.

(c) Access to Occupants. In a multiple-occupancy building, each occupant shall have access to the occupant's service disconnecting means.

Exception: In a multiple-occupancy building where electric service and electrical maintenance are provided by the building management and where these are under the continuous building management supervision, the service disconnecting means supplying more than one occupancy shall be permitted to be accessible to authorized management personnel only.

~~230-74. Simultaneous Opening of Poles. Each service disconnect shall simultaneously disconnect all ungrounded service conductors that it controls from the premises wiring system.~~

230-75. Disconnection of Grounded Conductor. Where the service disconnecting means does not disconnect the grounded conductor from the premises wiring, other means shall be provided for this purpose in the service equipment. A terminal or bus to which all grounded conductors can be attached by means of pressure connectors shall be permitted for this purpose.

In a multisection switchboard, disconnects for the grounded conductor shall be permitted to be in any section of the switchboard, provided any such switchboard section is marked.

~~230-76. Manually or Power Operable. The service disconnecting means for ungrounded service conductors shall consist of either (1) a manually operable switch or circuit breaker equipped with a handle or other suitable operating means or (2) a power operated switch or circuit breaker provided the switch or circuit breaker can be opened by hand in the event of a power supply failure.~~

~~230-77. Indicating. The service disconnecting means shall plainly indicate whether it is in the open or closed position.~~

230-79. Rating of Service Disconnecting Means. The service disconnecting means shall have a rating not less than the load to be carried, determined in accordance with Article 220. In no case shall the rating be lower than specified in (a), (b), (c), or (d).

(a) One-Circuit Installation. For installations to supply only limited loads of a single branch circuit, the service disconnecting means shall have a rating of not less than 15 amperes.

(b) Two-Circuit Installations. For installations consisting of not more than two 2-wire branch circuits, the service disconnecting means shall have a rating of not less than 30 amperes.

(c) One-Family Dwelling. For a one-family dwelling, the service disconnecting means shall have a rating of not less than 100 amperes, 3-wire.

(d) All Others. For all other installations, the service disconnecting means shall have a rating of not less than 60 amperes.

230-80. Combined Rating of Disconnects. Where the service disconnecting means consists of more than one switch or circuit breaker, as permitted by Section 230-71, the combined ratings of all the switches or circuit breakers used shall not be less than the rating required by Section 230-79.

230-81. Connection to Terminals. The service conductors shall be connected to the service disconnecting means by pressure connectors, clamps, or other approved means. Connections that depend on solder shall not be used.

230-82. Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

1. Cable limiters or other current-limiting devices.
2. Meters nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.

3. Instrument transformers (current and voltage), high impedance shunts, surge-protective devices identified for use on the supply side of the service disconnect, load management devices, and surge arresters.
4. Taps used only to supply load management devices, circuits for stand-by power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors.
5. Solar photovoltaic systems or interconnected electric power production sources (See Articles 690 or 705 as applicable.)
6. Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided.
7. Ground-fault protection systems where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided.

SUBSTANTIATION: Some plans examiners inspectors and engineers are interpreting Section 230-76(2) as permitting a shunt trip button (switch) to be located in accordance with Section 230-70(a). This is permitting a very dangerous situation as it allows service entrance conductors inside the building without overcurrent protection. Recently I was involved with a case which resulted in a laborer being killed in Little Rock, Arkansas. The engineer had specified a shunt-trip switch to be located outside at the point of entrance. The service disconnect was located approximately 170 feet inside the building fed with overhead 3000 amp busduct. The laborer while repairing a sheetrock fireblock drilled into the busduct. His last words were "the electrician said there was nothing hot he could touch". The arcing continued until the substation approximately 1/4 mile away tripped out. The plans examiner and inspector had approved the installation based on Section 230-76(2).

I did a survey at several IAEI section meetings and found other inspectors are interpreting the NEC to permit this method of installation. I feel rearrangement of Article 230 Part F will stop this misinterpretation of Article 230.

PANEL ACTION: Accept in Principle in Part.

The panel accepts in principle the concept of outside disconnecting means being within sight of the building or structure served and the issue of not permitting remote control actuators as the service disconnecting means.

The panel rejects the remainder of the proposal.

PANEL STATEMENT: The panel accepts in principle the concept of outside disconnecting means being within sight of the building or structure served and the issue of not permitting remote control actuators as the service disconnecting means. The panel's action on Proposal 4-107a has addressed these issues.

The panel rejects the remainder of the proposal as there is insufficient substantiation to warrant the proposed changes.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP422)

4- 107a - (230-70(a)): Accept

SUBMITTER: CMP 4

RECOMMENDATION: Revise existing Section 230-70(a) to read:

"230-70. General. Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors.

(A) Location. The service disconnecting means shall be installed in accordance with (1), (2), and (3):

(1) Readily Accessible Location. The service disconnecting means shall be installed at a readily accessible location in accordance with (a) or (b).

(a) Outside. Service disconnecting means installed outside a building or structure shall comply with (1) or (2):

(1) The service disconnecting means shall be permitted on or within sight of the building or structure served.

(2) Where the service disconnecting means is not within sight of the building or structure served, a feeder disconnecting means for the building or structure supplied shall be installed in accordance with Part B of Article 225.

(b) Inside. Where the service disconnecting means is installed inside, it shall be nearest the point of entrance of the service conductors.

(2) Bathrooms. Service disconnecting means shall not be installed in bathrooms.

(3) Remote Control. Where a remote control device(s) is used to actuate the service disconnecting means, the service disconnecting means shall be located in accordance with (1) above."

The current sections (b) and (c) remain.

SUBSTANTIATION: The panel has addressed specific issues that have been raised relative to the location of service and building disconnecting means. Additionally, the panel's action on remote control actuators clarifies that they are not recognized as the required service disconnecting means.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
CARRICK: See my Explanation of Negative Vote on Proposal 4-22a.

(Log #1778)

4- 108 - (230-70(a)): Accept in Principle

SUBMITTER: Terry L. Carlson, Nebraska State Electrical Board

RECOMMENDATION: Revise as follows:

(a) Location. The service disconnecting means shall be located at a readily accessible location either inside or outside of a building or structure nearest the point of entrance of the service conductors. Service disconnecting means shall not be installed in bathrooms.

SUBSTANTIATION: The intent of Section 230-70(a) and Section 225-32 are identical in that both provide the required location of a building or structure disconnecting means. The intent is based on electrical safety, and that safety depends on the ability of the building occupant to have ready access to the building disconnect in the event of an emergency.

However, even though the intent of each Section is the same, safety for the occupant, the language in both conflict with each other. Section 225-32 requires that the disconnect in a second building be located either inside or outside of the building nearest the point of entrance of the service conductors. Therefore, regardless of whether the disconnect is located inside or outside, according to Section 225-32 it still must be located nearest the point of entrance of the service conductors.

But, Section 230-70(a) allows the building disconnect for a single building or structure to be located either inside nearest the point of entrance of the service conductors or outside of, and off of, the building at any location the designer or installer chooses, as long as it is readily accessible. A disconnect located 500 feet from the building in an open field may be considered 'readily accessible' by some designers, however it is not in the best interest of electrical safety or the building occupant. This is not consistent with the safety requirements of Section 225-32.

Whether a disconnecting means is for multiple buildings as covered in Section 225-32 or for a single building fed with a service as covered in 230-70(a), the location requirement for each should be the same. This can be accomplished by this proposal. It will both streamline the NEC for consistent building disconnect requirements and also enhance electrical safety for building occupants.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The submitter's concern relative to the location of the disconnecting means has been clarified by the panel's action on Proposal 4-107a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1925)

4- 109 - (230-70(a)): Accept in Principle

SUBMITTER: W. Creighton Schwan, Hayward, CA

RECOMMENDATION: Revise the first paragraph to read:

Location. The service disconnecting means shall be installed at a readily accessible location either inside or outside of a building or structure nearest the point of entrance of the service conductors.

SUBSTANTIATION: There is no new wording. The words have been rearranged to specify the outside disconnect location. Present wording permits the service disconnect to be at any location, at any distance outside the building. This is too vague for reasonable understanding or enforcement.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The submitter's concern relative to the location of the disconnecting means has been clarified by the panel's action on Proposal 4-107a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2893)

4- 110 - (230-70(a)): Reject
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Revise Section 230-70(a) to read as follows:
(a) Location. The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure, or inside nearest the point of entrance of the service conductors. The service disconnecting means shall be installed adjacent to and accessible from the same working area as the utility meter.
SUBSTANTIATION: This requirement was added at the request of our fire departments, in order to have a disconenct available for emergencies, either on the outside of a building or within a dedicated room with one hour separation, as requried in Proposal #11. At the present time fire departments have to pull the meter under load or wait for the utility to arrive to disconect, if the disconnect is within the area of the fire.
PANEL ACTION: Reject.
PANEL STATEMENT: The location of the service disconnecting means is not relevent to the location of the meter. There are metering arrangements that would make this location impractical.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2894)

4- 111 - (230-70(a)): Reject
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Revise 230-70(a) to read as follows:
(a) Location. The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure, or inside nearest the point of entrance of the service conductors.
All service disconnecting means located inside a building shall be enclosed within a room or space separated from the rest of the building by not less than a one-hour fire resistive occupancy separation.
SUBSTANTIATION: This code proposal was adopted by the Maricopa Association of Governments for the last 3 code cycles. There have been many cases when service entrance sections have been installed within a building. Because of high AIC availability in many cases, faults within this equipment have created costly fires. Faults have been created while servicing or working on SES equipment. These faults have in some cases burned for over 30 minutes until the utility was able to disconnect. We require that a one hour fire separation be installed that separates the service entrance section from any other spaces within a building. This separation enclosure is to be constructed in accordance with the applicable building code in effect within the jurisdiction. This type of installation has limited many fires to small areas in fires documented by the City of Phoenix.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation provided to require a one hour fire-rated room or enclosure in a residential structure.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3240)

4- 112 - (230-70(a)): Reject
SUBMITTER: Edward J. Fox, Jr., Orange County Bldg Div., FL
RECOMMENDATION: 230-70(a): The service disconnecting means for residential services shall be installed on the outside of the building.
SUBSTANTIATION: If the electrical service is on the interior of a building, then firemen and emergency people would not be able to shut power off safely in the case of emergency.
The above article provides a higher degree of safety and flexibility for the consumers.
To safely remove power in case of emergency reason's, such as fire, tree down or storm damage items. This could be accomplishing quickly and easily because a person would not have to go into a building to find the service disconnect switch. This would help save lives and property due to fire when the fireman has to shut power off.
Power could be locked off or disconnected quickly and easily if needed in case of emergency.
It would allow power to be shut off quickly and easily in time of an emergency, such as fire and would allow fireman access to fight fires and thusly save more structures.
In times of emergency, such as during lightning storms, which frequent Florida, fires spring up very easily, less damage will be done to structures if power can be shut off quickly when firemen arrive to fight fires.
PANEL ACTION: Reject.
PANEL STATEMENT: The historical precedence of locating the service disconnecting means inside a building or structure has not resulted in a reduction of safety. There are locations where locating the equipment inside is necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4090)

4- 113 - (230-70(a)): Reject
SUBMITTER: Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL
RECOMMENDATION: Add new text to read as follows:
(a) Location. The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors. If the service disconnecting means is located at a point that is not accessible and available for servicing, and disconnecting in case of emergencies, there shall be a shunt trip switch installed on the exterior of the building or structure. The shunt trip switch, when installed should be between six (6) feet and six feet seven inches (6 ft 7 in.) above finish grade. A sign constructed of a permanent material with no less than 1-1/2 in. high letters designating "Shunt Trip — Main Disconnect" shall be located on the exterior of the building or structure, and approximately one foot (1) above and one foot (1) to one side of the shunt trip mechanism.
SUBSTANTIATION: This new text is needed to provide firefighters with a means to turn off the power to a building or structure much quicker and safer in some cases.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation provided to require a remote actuator for the service disconnecting means.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4173)

4- 114 - (230-70(a)): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc. /Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise the first paragraph as follows:
"The service disconnecting means shall be installed at a readily accessible location either outside and attached to or immediately adjacent to the building or structure served, or inside nearest the point of entrance of the service conductors."
SUBSTANTIATION: A service disconnect in a metering pedestal would not be located at a building or structure, and therefore the multiple buildings or structures provisions in Section 225-8 wouldn't apply. The service disconnect could indeed be remote from the building. The consistent position of CMP 4, however, has always been that the metering pedestal is a structure.
This doesn't agree with the BOCA definition of "structure", which is "a combination of materials assembled at a fixed location to give support or shelter, such as a building, framework, retaining wall, tent, reviewing stand, platform, bin, fences over six feet high, sign, flagpole, recreational tramway, mast for radio antenna, or the like." A metering pedestal supported on a pole would, collectively constitute a structure, true enough. However, a self-contained, single-entity item like a metering pedestal alone, wouldn't be a "combination of materials assembled at a fixed location," and therefore wouldn't qualify, except under the most tortured interpretation of the definition.

PANEL ACTION: Accept in Principle.
The panel accepts in principle the concept of establishing a proximity for the service disconnecting means.
PANEL STATEMENT: Without a defined distance for the term "immediately adjacent" the panel has embraced the concept of "within sight" per the definiton of that term in Article 100. See the panel's action on Proposal 4-107a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1777)

4- 115 - (230-70(d) (New)): Reject
SUBMITTER: Terry L. Carlson, Nebraska State Electrical Board
RECOMMENDATION: New subsection: (d) Mounting Height. Each service disconnecting means shall be installed so the bottom of the enclosure containing the disconnecting means is not less than 610 mm (2 ft) above finished grade or working platform.
Exception: Service disconnecting means located within floor mounted switch gear enclosures.
SUBSTANTIATION: There is currently no reference to the minimum mounting height of normal service disconnecting means other than for mobile home service equipment. Inspectors in the field find service disconnects mounted so low to the floor or finished grade that it is impossible to inspect them or for electricians to service them without getting down on their knees or lower to open the equipment enclosure.
The exception is for large floor mounted switch gear where it is common to locate the main disconnect in the lower part of the enclosure. The need for a minimum height requirement has existed for many years and this proposal will accomplish it.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation to mandate a minimum clearance. Additionally this proposal raises an equipment design consideration that is outside the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3684)

4- 116 - (230-70(d) (New)): Reject
SUBMITTER: Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL
RECOMMENDATION: Add new paragraph (d) to read as follows:
(d) The service disconnecting means for residential services shall be installed on the outside of the building.
SUBSTANTIATION: This new text is needed to provide a quicker and safer means of turning off the power to a residence for firefighters if the need should arise to do so.
PANEL ACTION: Reject.
PANEL STATEMENT: The historical precedence of locating the service disconnecting means inside a building or structure has not resulted in a reduction of safety. There are locations where locating the equipment inside is necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #728)

4- 117 - (230-71(a)): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-118. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) General. The service disconnecting means for each service permitted by Section 230-2, or for each set of service-entrance conductors permitted by Section 230-40, Exception Nos. 1, ~~or~~ 3, 4, or 5 shall consist of not more than six switches or sets of circuit breakers or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, in a group of enclosures, or in or on a switchboard. There shall be no more than six sets of disconnects per service grouped in any one location. For the purpose of this section disconnecting means used solely for power monitoring, or the control circuit of the ground-fault protection system or power-operable service disconnecting means, installed as part of the listed equipment, shall not be considered a service disconnecting means.
SUBSTANTIATION: Editorial. the conductors permitted by Exceptions No. 4 and 5 appear to have been overlooked. These conductors must terminate in service equipment and should be included. Since (b) permits single-pole circuit breakers with a handle tie, each individual breaker may be considered as one of six. The word "sets" would clarify they are considered one unit. The reference to a combination would clarify that all sets do not have to be either switches or circuit breakers.
Disconnects for control circuits of power-operable service disconnecting means are a reasonable inclusion with ground-fault and power monitoring equipment, otherwise they are not exempted from the rule.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4354)

4- 118 - (230-71(a)): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-117. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Brian E. Rock, Hubbell Inc.
RECOMMENDATION: Revise as follows:
230-71. Maximum Number of Disconnects.
(a) General. The service disconnecting means for each service permitted by Section 230-2, or for each set of service-entrance conductors permitted by Section 230-40, Exception Nos. 1 or 3, shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six disconnects per service grouped in any one location. For the purpose of this section, disconnecting means used solely for power monitoring equipment, transient voltage surge suppression, or the control circuit of the ground-fault protection system, installed as part of the listed equipment, shall not be considered a service disconnecting means.
SUBSTANTIATION: Section 230-71(a) mandates that maximum number of disconnects not exceed six for each service; each disconnect, typically a circuit breaker overcurrent device, constitutes 1/6 of the total number of overcurrent devices; 1/6 equals 16.67 percent, more than 10 percent. Section 384-14(a) defines a lighting and appliance branch-circuit panelboard as having more than 10 percent of its overcurrent devices protecting lighting and appliance branch circuits. Section 230-79(d) mandates that a service disconnect not be rated less than 60 amperes. By contrast, Section 384-14(a) defines a lighting and appliance branch circuit as having overcurrent protection limited to 30 amperes maximum.
When a transient voltage surge suppressor is provided at the service entrance, there have been misinterpretations treating the TVSS as a branch circuit carrying a continuous load. Transient voltage surge protection (TVSS) is wired across each of the ungrounded, grounded and grounding conductors, with no outputs for load. In other words, transient voltage surge suppressors provide this protection in parallel, not "downstream" in series, with their single set of connection wire leads.
The TVSS normally sit across the conductors, with no conduction whatsoever. When a transient voltage surge appears, the TVSS clamps and a surge current flows for nanoseconds-to-microseconds duration (billionths of a second to millionths of a second) between the ungrounded, grounded and grounding lines, thereby providing transient voltage surge protection to the entire service. This conducted surge current is of such short duration that the wire lead conductors of the TVSS experience no temperature rise whatsoever, never even remotely approaching the thermal limits associated with the steady-state ampacity rating of that conductor size. As such, TVSSs do not constitute loads and do not require individual overcurrent thermal protection. The TVSSs are protected against excessive surge current and internal failures by internal protection devices as required by UL Standard UL 1449 to which the TVSSs are Listed. Short circuit protection is provided by the main circuit breaker or fuse to the electrical service. The UL Listing Report explicitly states "they are intended to be installed on the load side of the main Overcurrent Protection."
When misclassified as a branch circuit, there have been conflicts regarding the proper ampere rating of overcurrent protection required for the TVSS on its own disconnect. As indicated by the

UL Report, the main overcurrent protections rating, whatever it may be, is adequate and therefore safe. The selection of conductor size for the integral wire leads of the TVSS has absolutely no bearing on the temperature capacity nor any bearing on the ampere rating of the circuit breaker or fuse; conductor size selection relates solely to the transient voltage clamping characteristics and to manufacturing coordination of components internal to the TVSS.

Discrete service equipment panels having only one main disconnecting means would require the TVSS to be tapped off the one set of feeder conductors (load side) in accordance with NEC Section 240-21(b)(1). Servicing a tapped-in TVSS would necessitate disconnecting the electrical service to the entire feeder, resulting in consequential downtime.

Since NEC Section 230-71 allows up to a total of six service disconnects, spare capacity in the same service equipment panelboard for additional disconnects allows one further option; adding a separate main circuit breaker dedicated as a disconnect solely for a TVSS. A dedicated disconnect would allow the TVSS to be served unenergized without disconnecting any of the feeders from the other four main circuit breakers, thereby avoiding any downtime to ongoing operations. However, NEC Section 230-79(d), the service disconnect (main circuit breaker) would have to have a minimum rating of 60 amperes. Until such time that NEC Section 230-71(a), last sentence, is modified to also include transient surge suppression protection, NEC Section 230-79(d)s 60 ampere minimum has been and may continue to be incorrectly misinterpreted to preclude the use of a lower ampere main circuit breaker with a TVSS.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1882)

4- 119 - (230-71(a), FPN (New)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Add a fine print note to 230-71(a) to read as follows:

FPN: See Sections 384-14, 384-15, 384-16 for restrictions on branch circuit breakers.

SUBSTANTIATION: Very few people seem to realize that most 15-30 ampere branch circuits require main protection. This needs a cross reference.
PANEL ACTION: Reject.
PANEL STATEMENT: The addition of the fine print note does not add to the clarity of this section. Users of the Code are required to follow the applicable rules of Article 384.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #435)

4- 120 - (230-71(a), Exception (New)): Accept in Principle
SUBMITTER: Abel S. Lampa, T&M Assoc.
RECOMMENDATION: Add an exception to 230-71(a) to read as follows:

Exception: For the purpose of this section, disconnecting means used solely for the control circuit of ground fault protection system, installed as part of the listed equipment and (transient voltage suppression system equipment) (TVSS) shall not be considered a service disconnecting means.

SUBSTANTIATION: The ability for emergency personnel to disconnect electric loads quickly during an emergency situation appears to be the reason why a limit was placed on the number of disconnects allowed (6). However, a TVSS does not feed a load, it is a sensor. Therefore, the TVSS would not need to be shut down during an emergency.

Based on the above, it is suggested that the section be modified to allow a TVSS connection in addition to six (6) disconnects. This revision will result in significant cost savings to building owners in numerous situations, and should not compromise safety.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-118.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #729)

4- 121 - (230-72(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

(b) ~~Additional Service~~ Disconnecting Means for Additional Services. The one or more additional service ~~disconnecting means~~ disconnects for fire pumps, emergency, legally required standby, ~~or optional standby~~ systems ~~services~~ permitted by the exceptions for Section 230-2 to be served by an additional service(s), shall be installed sufficiently remote from the one to six service disconnects ~~disconnecting means~~ for the normal service to minimize the probability of simultaneous interruption of supply.

SUBSTANTIATION: Emergency systems were mistakenly removed from this section by panel action on Proposal 4-156 in the 1998 ROP apparently due to confusion that this section applies to additional disconnecting means for taps on the supply side of the normal service disconnect. In the heading the word “additional” may be construed as applying to “service” or “service disconnecting means”, which are different and may be confusing. However, the text reference to Section 230-2 clearly indicates service is intended since that section does not relate to taps ahead of the service disconnecting means. Deletion of “emergency” removes the application of the requirement to disconnects for an additional emergency service. The “one or more additional” phrase is superfluous and may add to the confusion, and is covered by Section 230-71. Since disconnecting means is defined as a group of devices and may consist of six devices per group, the word “disconnects” may be more technically correct and clear.

Optional standby systems is deleted since Section 702-2 indicates on-site generated power is to be used.
PANEL ACTION: Reject.
PANEL STATEMENT: The action by CMP 15 in the 1996 NEC to remove taps ahead of the service disconnecting means as a method of providing emergency power is the substantiation offered by the proposer in his Proposal 4-157 in the 1998 ROP, therefore the panel maintains that the inclusion of the term “emergency” is not appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4174)

4- 122 - (230-72(c) Exception No. 2 (New)): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add a second Exception as follows:

Exception No. 2: In a multiple occupancy building where each occupant has grouped, readily accessible means to disconnect all ungrounded conductors within that occupancy with no more than six motions of the hand, the service disconnecting means shall be permitted to be accessible to authorized management personnel only.

SUBSTANTIATION: Relief is needed. Consider an underground service to a package store on the first floor and basement, with an apartment upstairs. Does anyone seriously believe the package store owner is going to allow the apartment tenant access to his basement on a 24-hour basis? The other exception doesn't apply since there is no “continuous building management supervision.” The present requirements are not realistic for many of these small occupancies. The result is anarchy, as jurisdiction by jurisdiction the rule is avoided or unenforced in many different ways. The submitted wording is working well in Massachusetts as a part of its electrical code. Everyone is playing on a level playing field, applying a workable, consistent rule.

The last time the panel rejected this substantiation, it said every occupant had a legitimate need for access for the purposes of continuity and control. They would have that in their own panels under the provision of this proposal, and they would have it far more quickly at hand. This proposal strikes a more realistic balance between the prerogatives of the building ownership and the rights of the various tenancies.
PANEL ACTION: Accept in Principle.
Change the word “motions” to “operations” in the proposed new text.

Add the following to the proposed text:

The rating of the individual branch circuit overcurrent devices shall comply with 230-92.

PANEL STATEMENT: The panel's action harmonizes the proposed language with that of 230-71(b) relative to the use of the word “operation”, and correlates with Section 230-92.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SUMRALL: The submitter continues to submit the same proposal cycle after cycle. In his substantiation he cites a basement of a package store as the reasons building management will not allow access to a tenant of a various class. I am from a location where basements will fill up with water at 5 1/2 ft below the ground level. The alternative is to put the services in a different location, accessible to the various tenants. The State of Massachusetts, by adopting this exception, embraced 90-4, the very same section, the submitter says in Proposal 4-81 is "irresponsible."

Perception, without the facts, is truth. Fact, during the past two cycles this submitter is the only person that feels the playing field needs to be leveled. Fact, during the past two cycles this Panel has rejected the very same proposal it now accepts. Fact, this submitter called the result of this CMP's work an "anarchy."

Truth, there is nothing wrong with the present wording of this section. If this were not so, this Panel would have had more proposals to change the present code. Truth, the only playing field that is not level is that in Massachusetts, compared to the rest of the world. If this were not so, this Panel would have had more proposals to see the wording changed. Fact, the work of this CMP is indeed a privilege to work on, and with colleagues of all disciplines, to learn and share experiences, and to make a better Code. But in so doing, we at times must endure the repeated assault of certain individuals that have other alternatives to making a better code.

(Log #CP423)

4- 122a - (230-75): Accept

NOTE: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 4
RECOMMENDATION: Remove the existing second paragraph of Section 230-75.
SUBSTANTIATION: The issue addressed in the second paragraph is a product standard issue and does not need to be restated in the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
YOUNG: This paragraph is deleted with the substantiation that this is covered in product standards and does not need to be in the code. This is incorrect. This paragraph was added in the 1990 NEC and one of the problems being addressed was the interpretation of "service equipment" meaning the switchoard section containing the service disconnect. The product standard allowed the disconnect for the grounded conductor to be in other sections prior to that code change, but these interpretations would not allow it to be in other sections because of the wording in the first paragraph. This problem would be reintroduced if this paragraph is deleted.

The other problem is that if the second paragraph is deleted there would no longer be a requirement for marking the switchoard section where the disconnect is located and this could be removed from the product standards.

The intent of the code-making panel is that the grounded conductor disconnect can be located in any section of a multisection switchboard, and that this section should be identified by marking. Deleting this paragraph confuses the intent of the code-making panel and will result in reintroducing the problems that existed prior to the 1990 NEC.

(Log #730)

4- 123 - (230-75): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise last paragraph to read as follows:

In a multisection switchboard or motor control center, disconnects for the grounded conductor shall be permitted in any section of the switchboard or motor control center provided any such ~~switchboard~~ section other than the service disconnecting means enclosure is marked to indicate the location of the disconnect.

SUBSTANTIATION: Motor control centers may contain service equipment, and since they are covered in Article 430 may not be equated with switchboards even if similarly constructed. Purpose of the marking should be indicated, and such marking does not seem necessary where the grounded conductor disconnect is in the service disconnecting means section.
PANEL ACTION: Reject.
PANEL STATEMENT: The second paragraph of Section 230-75 has been removed. See panel action and comment on Proposal 4-122a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #731)

4- 124 - (230-79(b), (c), (d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

(b) ~~Two Circuit Installation~~ Specified Circuits. ~~For installations consisting of not more than two 2-wire branch circuits the~~ The service disconnecting means shall have a rating of not less than 30-amperes to supply; (1) two or more 2-wire circuits supplied by a 2-wire service; (2) more than two 2-wire circuits supplied by a 3-wire service; (3) two or more 3-wire circuits supplied by a 3-wire service or; (4) two or more 4-wire circuits supplied by a three-phase 4-wire service.

(c) ~~One Family~~ Dwelling Units. For a one family dwelling, the service disconnecting means shall have a rating of not less than 100-amperes 3-wire single phase or 60-amperes 4-wire three phase. For an individual dwelling unit of a two-family or multifamily dwelling the service disconnecting means shall have a rating of not less than 60-amperes 3-wire single-phase or 30 (40) amperes 4-wire three phase (Figure 40 is alternate)

~~(d) All Others. For all other installations the service disconnecting means shall have a rating of not less than 60 amperes.~~

SUBSTANTIATION: The proposal for (b) tracks Section 215-2 for feeders and is more specific and comprehensive than present wording. Present wording requires a minimum 30-ampere disconnecting means for a 3-wire service supplying two 2-wire branch circuits, but if a single 3-wire circuit is supplied per (a) the disconnecting means could be rated 15-amperes. A disconnecting means for a 3-wire service which supplies two 15-ampere 3-wire circuits, for example, is not covered and falls under the requirement of (d) which requires a minimum 60-ampere rating, likewise for a 4-wire three phase disconnecting means supplying two 15-ampere 4-wire circuits.

Present wording of (c) suggests a 4-wire three phase service is not permitted. A 60-ampere 208y/120-volt 4-wire service can supply 21600 volt-amperes compared to 20800 volt-amperes of a 208y/120 volt 3-wire single-phase service. Though (d) may be construed to permit a 60-ampere disconnecting means where a 100-ampere 3-wire rating per (c) is not provided, the text is not clear. The proposal for two-family and multifamily dwellings is similar in vein; present (d) requires a minimum 60-ampere rating which can supply 12480 volt-amperes at 208y/120-volt 3-wire single-phase, compared to a 30-ampere rating at 208y/120-volt three phase which can supply 10800 volt-amperes or at 480 volts three phase, 14400 volt-amperes.

The present 60-ampere minimum seems arbitrary and doesn't appear to take into account voltage and number of phases whereby the volt-ampere capacity can greatly vary.

Under the present wording of this section where a minimum 60-ampere disconnecting means is required, it can result in service-entrance conductors larger than necessary for the load. For example, a 60-ampere disconnect which supplies two branch circuits for 7-1/2 HP 460 volt three phase motors. No. 10 copper service-entrance conductors have ampacity suitable for the load. If nontime-delay fuses are used for OC devices the service OC device could be rated 40-amperes. This fuse rating requires a 60-ampere switch, which also satisfies (d). However, Section 230-42(b) requires the service-entrance conductor ampacity to be at least 60-amperes. For other installations requiring a 60-ampere rating per (d) but where a lower rated OC device is sufficient for the load, the same condition can exist. For circuit breakers used as the service disconnect it is difficult to provide the required 60-ampere rating with lower overcurrent trip rating, which may be suitable for the load. The requirement of (d) in effect, also mandates a service-entrance ampacity and OC device rating of 60-amperes.
PANEL ACTION: Reject.

PANEL STATEMENT: The current requirements of the Code provide the minimum specifications for safe service installations. The current Code does not prohibit a 3-phase, 4-wire service to a dwelling provided it has the same capacity as the 100 ampere, 3-wire rated disconnect.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4440)

4- 125 - (230-79(c)): Reject
SUBMITTER: George T. Anderson, Antioch, CA
RECOMMENDATION: Revise as follows:
(c) One-Family Dwelling. For a one-family dwelling, the service disconnecting means shall have a rating of not less than 200 amperes, 3-wire.
SUBSTANTIATION: Todays technology and optional appliances have increased our needs for extra circuits:
1. Electronic equipment performs "cleaner" on its own circuit.
2. Audio equipment as above.
3. Spas at 2 pole 40 to 60 amperes.
4. Landscape and "garden" lighting.
5. Future automotive recharging.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation to increase the minimum rating of the disconnecting means.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
SUMRALL: During the last cycle a subcommittee convened to submit the changes the 1999 code now has as the rule. The mentioning of electronic equipment was noted and discussed. However, the technical substantiation was not available and therefore the current installation practices were utilized. Articles 210, 220 and 680 all refer to Chapter 2 for calculating loads. The submitter might be better equipped to submit technical data for their consideration, than to this CMP.

(Log #3263)

4- 126 - (230-82): Accept
NOTE: The Technical Correlating Committee directs the Panel to reword "in accordance with Article 250" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise NEC 230-82 with the deletion (strike-through) as shown. The entire text of 230-82 is shown for clarity, but only those changes shown as strike-through are part of this proposal.
230-82. Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:
1. Cable limiters or other current-limiting devices
2. Meters nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250
3. Instrument transformers (current and voltage), high-impedance shunts, ~~surge-protective devices identified for use on the supply side of the service disconnect,~~ load management devices, and surge arresters.
SUBSTANTIATION: The NEC only addresses the installation of surge arresters presently. I am not aware of any surge protection device that is "identified for use on the supply side of the service disconnect" that is not presently covered as a Surge Arrester in Article 280. The problem with the present language is that it is leading intallers to assume that devices other than surge arresters (i.e. TVSS devices) are OK on the line side of the service disconnect. Since there are no devices other than surge arresters that can be installed in this manner, the confusing wording should be removed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4065)

4- 127 - (230-82): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for information.
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./Electric Light & Power Group
RECOMMENDATION: Revise as follows:
230-82. Equipment Connected to the Supply Side of Service Disconnect. Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:
1. Cable limiters or other current-limiting devices.
2. Meters nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.
3. Instrument transformers (current and voltage), high-impedance shunts, surge-protective devices identified for use on the supply side of the service disconnect, load management devices, and surge arresters.
4. Taps used only to supply load management devices, circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for service-entrance conductors.
5. Solar photovoltaic systems or interconnected electric power production sources. (See Articles 690 or 705 as applicable.)
6. Control circuits for power-operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided.
7. Ground-fault protection systems where installed as part of listed equipment, if suitable overcurrent protection and disconnecting means are provided.
8. Standby power system transfer equipment that is listed and labeled as service disconnect and grouped with the service overcurrent device. (See Articles 100, 250, and 700 through 702 as applicable)
SUBSTANTIATION: This change is necessary to clarify the intent for the main service equipment function when transfer equipment is installed on the supply side for standby power. For example, some transfer switches are manufactured, listed and labeled "suitable for use as service equipment" and contain only a disconnecting device along with necessary grounding provisions for service equipment. Although, the listing agency qualifies the equipment in this manner, they do indicate the installation shall meet national and local requirements. The practice typically recognized as the local requirement is that service equipment needs to be comprised of a switch and fuse or circuit breaker to meet the necessary disconnecting and protective function at the load end of service conductors. The service equipment could contain these devices in one enclosure or within adjacent enclosures. In outdoor high voltage stations, the devices are grouped within the same switchyard.
This change will mitigate installation arrangements in conflict with the requirements of authorities having jurisdiction of the electric supply and National Electrical Code.
PANEL ACTION: Accept in Principle.
Revise the text of item 8 to read:
"8. Transfer equipment installed in accordance with Sections 700-6, 701-7 and 702-6."
PANEL STATEMENT: The proposed language has been added to permit transfer switches to be connected ahead of the service disconnecting means. The panel does not intend that transfer switches become the service disconnecting means unless identified and installed for that purpose. This change correlates with the changes made by CMP 15 to Sections 700-6, 701-7 and 702-6. It is recommended to the Technical Correlating Committee that this action be referred to CMP 15 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3757)

4- 128 - (230-82(2)): Accept
NOTE: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee directs the Panel to reword "in accordance with Article 250" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Timothy M. Croushore, Allegheny Power Service Corp./Rep. Edison Electric Inst./Electric Light and Power Group
RECOMMENDATION: Revise the current (2) to read as follows:
Meters, meter sockets, or meter disconnect switches, normally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.

SUBSTANTIATION: This change will add meter sockets and meter disconnect switches to the list of equipment permitted ahead of the service disconnecting means. Meter sockets are commonly placed ahead of the service disconnecting means in almost every location to facilitate the installation of electric metering. Meter disconnects are commonly used ahead of meter sockets on 480Y/277 volt services with self-contained metering. Self-contained metering does not have external potential or current transformers. These meter disconnects are required by the serving electric utility to de-energize the meter socket during meter installation or replacement. Electric utilities will often refer to this type of metering as "cold sequence."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
ZINNANTE: I believe that Proposals 4-128 and 4-129 were supposed to be submitted identically. Proposal 4-128 had one word misspelled ("normally" instead of "nominally"). Therefore, the Panel accepted in principle 4-128 and accepted 4-129, not as both accepted as shown on the ballot. If the error was by staff, then there are no objections to accepting both. If the spelling error is by the submitter, then 4-128 should be "accepted in principle".
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(Log #4070)

4- 129 - (230-82(2)): Accept
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./Electric Light & Power Group
RECOMMENDATION: Revise the current (2) to read as follows:
Meters, meter sockets, or meter disconnect switches, nominally rated not in excess of 600 volts, provided all metal housings and service enclosures are grounded in accordance with Article 250.
SUBSTANTIATION: This change will add meter sockets and meter disconnect switches to the list of equipment permitted ahead of the service disconnecting means. Meter sockets are commonly placed ahead of the service disconnecting means in almost every location to facilitate the installation of electric metering. Meter disconnects are commonly used ahead of meter sockets on 480Y/277 volt services with self-contained metering. Self-contained metering does not have external potential or current transformers. These meter disconnects are required by the serving electric utility to de-energize the meter socket during meter installation or replacement. Electric utilities will often refer to this type of metering as "cold sequence."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
ZINNANTE: See my Comment on Affirmative on Proposal 4-128.

(Log #732)

4- 130 - (230-82(4)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(4) Taps used only to supply load management devices, circuits for standby power systems, fire pump equipment, and fire and sprinkler alarms, if provided with service equipment and installed in accordance with requirements for services. ~~service-entrance conductors.~~
SUBSTANTIATION: Editorial. If service equipment for such taps is grouped with "normal" service disconnects (max. of 6 total) grounding/bonding per service requirements will likely be done; if the service equipment for such taps is remote from the "normal" service disconnects, service type grounding/bonding may not occur. Since "services" covers all aspects including service-entrance conductors it may be more appropriate.
PANEL ACTION: Reject.
PANEL STATEMENT: The current wording adequately covers the requirements for the tap conductors. The reference to providing service equipment for the tap conductors in the requirement addresses the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3909)

4- 131 - (230-82(4)(a) (New)): Accept in Principle
SUBMITTER: Ronald E. Gnotke, Rep. Minnesota Board of Electricity
RECOMMENDATION: Add new Section 230-82(4)(a) to read as follows:
(a) A transfer switch or disconnecting means, listed as suitable for use as service equipment, with or without overcurrent protection, shall be permitted at the distribution point or service point supplying one or more buildings or structures under single management or ownership. Transfer switches without overcurrent protection, shall not be installed in or on buildings or structures, but are permitted to be installed adjacent to these structures providing the working space between the transfer switch and the building or structure complies with the minimum requirements of Section 110-34.
Where a parallel path is not created with the grounded conductor, the bonding requirements of 250-28 shall apply to both the transfer switch and the service disconnecting means in the building. Agricultural buildings and structures shall comply with the requirements of Section 547-8.
SUBSTANTIATION: When 1996 NEC Section 230-83 was deleted in the 1999 NEC, some authorities having jurisdiction would only allow unfused transfer switches to be installed on agricultural building sites as indicated in Section 547-8(a). There are many other residential sites with small acreages and commercial installations that would be better served by allowing or clarifying this code change. Where the transfer switch without overcurrent protection ahead of or an integral part of the switch, is away from the building or structure, it would appear that there is not greater safety hazard present with this switch than there is with a CT enclosure, connection cabinet, meter socket or other unprotected piece of equipment. If interrupting ratings or available fault current is an issue, consider limiting the size of the transfer switch without overcurrent protection to 800 or 1000 amps maximum.
By locating these switches according to Table 110-34(a), distances from the building would not be left to field interpretation.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-127.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3293a)

4- 132 - (230-82(5)): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information. The Technical Correlating Committee directs the Panel to reword "(See Articles 690, 691, or 705 as applicable.)" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Kenneth Krastins, Plug Power, Inc.
RECOMMENDATION: Revise Section 230-82(5) to read as follows:
"Solar photovoltaic systems, fuel cell systems, or interconnected electric power production sources (See Articles 690, 691, or 705 as applicable.)
SUBSTANTIATION: This proposal is submitted to provide correlation for a new Article 691.
An important goal of building codes is to permit to the fullest extent possible, the use of modern methods, devices and technological improvements while protecting the health, safety, and welfare of the end user and general public. While new technology may offer many worthwhile benefits, appropriate regulations are needed to allow safe adoption of the technology and prevent misapplication. The fuel cell represents just such an emerging technology. Fuel cells provide a means, via an electrochemical process, of converting a fuel gas (such as natural gas, propane, etc.) into electrical energy that may then be used to power a building or residential dwelling. Fuel cells are virtually pollution free, very quiet when compared to other means of electric power generation, and can operate at high efficiency levels using very abundant and cheap fuels such as natural gas and LP gas.
There is growing interest in small, clean and quiet independent power generating units. The installation of fuel cell electrical generating systems used at residential and light commercial establishments is imminent. Recent advances in fuel cell technologies and more economical means of production will foster widespread acceptance of small distributed electrical generating units (under 50 kW) for single family home use and medium size units (51 kW to 250 kW) for multifamily units and small commercial buildings.

The interest in other clean forms of distributed generation is demonstrated by the adoption of the NEC Article 690, Solar Photovoltaic Systems. The direct interpretation of this article and its application deals specifically with solar photovoltaic electrical generating systems. It has been suggested that this article can also adequately cover other forms of distributed generation including fuel cell systems. However, since much of the language in Article 690 is specific to photovoltaic systems and rather complex to accommodate the interconnection requirements of the many sub-systems in photovoltaic systems, application of this article to fuel cells will be cumbersome.

Much of the information in Article 690 could apply to small and medium size electrical generating systems in general. Likewise, Article 705, Interconnected Electrical Power Production Sources, and Article 490, Equipment Over 600 Volts, Nominal, apply mainly to the large utility grid parallel independent electrical generating units. For example, Article 705-12, (b), (1) stipulates, "The aggregate of non-utility sources of electricity has a capacity in excess of 100k W, or the service is above 1000 volts." Leaving the interpretation of Article 690 and other articles up to the local inspector to determine the requirements for fuel cell systems will be problematic and could hinder the use of this beneficial technology. While the combination of these existing articles and others may adequately address fuel cells, it is clearly advantageous to users of the National Electrical Code, to have an article which specifically articulates the electrical installation requirements of fuel cell systems.

This being stated, Article 690, Solar Photovoltaic Systems, does offer a good basis for the creation of a Fuel Cell Systems article. A description of and substantiation for the individual topics to be covered in the proposed article follows. Where appropriate, comparisons are made within the following detailed substantiation between this proposed fuel cell article and the extant Photovoltaic Article 690. Sections of the Photovoltaic article that do not appear at all in the proposed article are also discussed and distinguished in bold, italicized text.

Additional Changes – Revised wording is recommended for section 230-82 (5), the exception to section 705-3, and section 705-30 to include language to cover fuel cell systems, similar to what is currently included for solar photovoltaic systems.

Members of Plug Power, Inc. and DTE Energy Technologies drafted the original version of the proposed fuel cell article. The proposed article began to be referred to as 691 because of its similarity and relationship to Article 690. It is recognized that the number ultimately assigned to the article may be different from 691.

The article was then circulated, reviewed, and revised internally at Plug Power. Subsequently, an e-mail notification was forwarded on September 13, 1999 to the members of three different groups advising them of the existence of the proposed article and inviting them to request a copy for review and comment. The three different groups notified were

- The members of the IEEE Standards Coordinating Committee (SCC) 21 currently involved in the development of a national standard (P1547) to cover interconnection of distributed resources with electrical power systems
- The members of the technical working group involved in the development of Standard Interconnection Requirements (SIR) for New York State which have since been submitted to the NYS Public Service Commission
- The Codes & Standards Working Group of the US Fuel Cell Council

All totaled, these groups include over 200 individuals. Presentations concerning the proposed article were given by Plug Power at both the September 27, 1999 meeting of the IEEE-SCC21 committee in Arlington, Virginia and the October 8, 1999 Power Quality Workshop (Interconnect-3) sponsored by the US Fuel Cell Council in Phoenix, Arizona. Those individuals who requested a copy of the draft article as a result of the e-mail notification or the presentations were sent one for review. After comments were received, they were negotiated and incorporated in the proposed article currently being submitted. Substantial changes have been made to the proposed article since its original inception, but the input generously provided by the individuals of the groups listed above has served to help develop a much better article as a result.

PANEL ACTION: Accept.
PANEL STATEMENT: This action is based on acceptance of the proposed Article 691.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1982)

4- 133 - (230-83 (New)): Reject
SUBMITTER: John M. O'Connor, North American Technologies, Inc.
RECOMMENDATION: Add new Section 230-83 to read as follows:
230-83. Meter Socket Bypass/Jumper Means. Meter sockets shall be bypassed or jumpered only by a full rated listed bypass or jumper. The bypass/jumper shall be enclosed by a listed method which prevents access to live parts.
SUBSTANTIATION: The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by noncode approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

Note: This is a companion proposal to my proposal on Section 373-4(b).
PANEL ACTION: Reject.
PANEL STATEMENT: The use of bypass mechanisms is not an installation issue. This is a maintenance and service issue and the proposed language is unenforceable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2100)

4- 134 - (230-83 (New)): Reject
SUBMITTER: John M. O'Connor, North American Technologies, Inc.
RECOMMENDATION: Add a new section to read as follows:
"Meter sockets shall be bypassed or jumpered only by a full rated Listed bypass or jumper. The bypass/jumper shall be enclosed by a Listed method which prevents access to live parts."
SUBSTANTIATION: In many instances meters are bypassed, often by non-code approved means, in order to provide temporary power on construction jobsites and power to homes and businesses until a meter is installed. If a bypass switch is used this can be done safely. However, most times it is jumpered in an unsafe manner which can be dangerous to the individual doing the work and is a shock hazard to others if not properly protected. Removal of nonListed jumpers can also be hazardous to the meter installer when it is time for the meter to be installed. With the advent of utility deregulation, there will be increased occurrences of jumepring and hazardous situations. By requiring Listed bypass/jumpers and integral covers, the industry will be safer for workers and users.

Listed metering assemblies with safe bypass means and integral covers are already commercially available.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of bypass mechanisms is not an installation issue. This is a maintenance and service issue and the proposed language is unenforceable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4175)

4- 135 - (230-83): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Restore 1996 NEC Section 230-83 to the 2002 NEC, in the following edited form:
230-83. Transfer Equipment.
Transfer equipment, including transfer switches and all permanent wiring arrangements that contemplate a transfer of power between on-site sources and service conductors, shall operate such that all ungrounded conductors of one source of supply are disconnected before any ungrounded conductors of the second source ~~are~~ can be connected.

Exception No. 1: Where manual equipment identified for the purpose or suitable automatic equipment is utilized, two or more sources shall be permitted to be connected in parallel through transfer equipment.

Exception No. 2: ~~Where~~ Parallel operation ~~is~~ shall be permitted ~~used and~~ where suitable automatic or manual control equipment is provided .

SUBSTANTIATION: This section was removed by a panel proposal with essentially no substantiation. It took up about one inch of space in the ROP and most of use read over it, which is probably why there weren't any comments. I tried to convince some CMP 4 members to push for a panel comment to restore it during the ROC meetings, but no deal. Contrary to the panel statement, there are larger issues here than the product standard issue about contact overlap. It needs to be restored because until and unless the scope of Article 702 changes, this material is all that stands as enforceable language between a homeowner's power inlet for his cord-connected generator and a utility line crew repairing an outage.

I had used the phrase "including transfer equipment" as a key point in arguing that the scope of this section extended beyond just transfer equipment. Then I insisted the owner show how one system had to be off if the other were on. The final result, invariably, was an agreement to go get a manual transfer switch. Time after time this was in the context of the owner showing me how he was willing to turn everything off except this circuit and that circuit. "The main breaker; you mean I have to turn that off too?" went the response, "OK, I'll be sure and remember to do that." Sure.

This proposal updates the main rule to clearly address these arrangements. It also makes an editorial change in the last exception to make it more positive and use a complete sentence format.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The submitter's concerns have been addressed by the panel's action on Proposal 4-127.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #CP424)

4- 135a - (230-90): Accept

NOTE: The Technical Correlating Committee directs the Panel to reword Exception No. 3 "in accordance with Article 220" to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 4

RECOMMENDATION: Revise 230-90 as follows:

"230-90. Where Required. Each ungrounded service conductor shall have overload protection.

(a) Ungrounded Conductor. Such protection shall be provided by an overcurrent device in series with each ungrounded service conductor that has a rating or setting not higher than the allowable ampacity of the conductor. A set of fuses shall be considered all the fuses required to protect all the ungrounded conductors of a circuit. Single-pole circuit breakers, grouped in accordance with Section 230-71(b), shall be considered as one protective device.

Exception No. 1: For motor-starting currents, ratings that conform with Sections 430-52, 430-62, and 430-63 shall be permitted.

Exception No. 2: Fuses and circuit breakers with a rating or setting that conform with Section 240-3(b) or (c) and Section 240-6 shall be permitted.

Exception No. 3: Two to six circuit breakers or sets of fuses shall be permitted as the overcurrent device to provide the overload protection. The sum of the ratings of the circuit breakers or fuses shall be permitted to exceed the ampacity of the service conductors, provided the calculated load in accordance with Article 220 does not exceed the ampacity of the service conductors.

Exception No. 4: Overload protection for fire pump supply conductors shall conform with Section 695-4(b)(1).

Exception No. 5: Overload protection for 120/240-volt, 3-wire, single-phase dwelling services shall be permitted in accordance with the requirements of Section 310-15(b)(6).

~~FPN: See Standard for the Installation of Centrifugal Fire Pumps, NFPA 20-1996.~~

(b) Not in Grounded Conductor. No overcurrent device shall be inserted in a grounded service conductor except a circuit breaker that simultaneously opens all conductors of the circuit."

SUBSTANTIATION: The changes that have been made are editorial and to comply with the NFPA NEC Style Manual. The fine print note is deleted as NFPA 20 is referenced in Article 695, therefore it is not necessary to repeat it in Article 230.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2920)

4- 136 - (230-90): Reject

SUBMITTER: Joseph A. Tedesco, Boston, MA

RECOMMENDATION: Change the word "overload" to "overcurrent" so that it reads "230-90 Where Required. Each ungrounded service conductor shall have overcurrent protection".

SUBSTANTIATION: The current requirement is often met by limiting the load at the service equipment. No short-circuit protection is provided for the service entrance conductors. This proposed wording would require short-circuit protection where the service entrance conductors receive their source of supply, but would still allow overload protection at the service entrance equipment by limiting the load. Limiters, as allowed by 230-82(1), are available to provide this short-circuit protection.

PANEL ACTION: Reject.

PANEL STATEMENT: The intent of this section is to reasonably and practically address the safety issues of conductors connected and energized by utility provided conductors. Adding cable limiters is not technically justified in all instances. There is no technical justification to require the installation of load limiters by changing "overload" to "overcurrent'.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2477)

4- 137 - (230-90(a) Exception No. 3): Reject

SUBMITTER: William Eder, Chicago Switchboard Co.

RECOMMENDATION: Revise as follows:

... The sum of the ratings of the circuit breakers or fuses shall not be permitted to exceed 125 percent of the ampacity of the service conductors when these overcurrent devices are rated at 80 percent and not exceed 100 percent of service conductors when rated at 100 percent.

SUBSTANTIATION: Loading in buildings is constantly growing and what may work now for overcurrent protection will not in the future - this is safety insured and not overload service conductors after future growth.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided technical substantiation to justify the proposed change. Providing extra capacity is a design consideration.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #733)

4- 138 - (230-90(a) Exception No. 6 (New)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add an exception to read as follows:

Exception No. 6: Ratings for welders in conformance with Article 630 shall be permitted.

SUBSTANTIATION: Although Chapter 6 may modify this section, Exception No. 4 is provided, and the proposed exception would also be useful to code users.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 90-3 states that the requirements of Chapter 6 articles modify the requirements of Chapters 1-4.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2921)

4- 139 - (230-91(a) (New)): Reject
SUBMITTER: Joseph A. Tedesco, Boston, MA
RECOMMENDATION: Add a new paragraph as follows:
(a) Residential Occupancies. Service entrance conductors for residential occupancies shall be protected against overcurrents before the conductors enter the structure.
SUBSTANTIATION: Fires cause by unprotected service entrance cables continue to take lives and cause property damage. Several utilities already require this proposed protection. Outdoor, weatherproof fused disconnects or circuit breakers could be locked as long as the branch circuit devices, per Section 230-92, were accessible and of a smaller size than the outdoor main. Therefore, this proposal should not cause any problems, and will definitely save lives and property.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate technical substantiation to require overcurrent protection, other than overload protection, for residential service conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #406)

4- 140 - (230-92): Reject
SUBMITTER: Amos D. Lowrance, Jr., City of Chattanooga, TN
RECOMMENDATION: Revise 230-92 to read as follows:
Locked Service Overcurrent Devices. In a multiple-occupancy building, where the device overcurrent devices are locked or sealed, or not readily accessible to the occupant, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location and shall be of lower ampere rating than the service overcurrent device.
SUBSTANTIATION: The code as currently written requires a reduction in size of the overcurrent service any time the service disconnection means is locked, even on a single-family dwelling. This would require that any tab be removed that would permit locking the outside disconnect or that the inside overcurrent devices be smaller than the main.
PANEL ACTION: Reject.
PANEL STATEMENT: This requirement is only applicable where the overcurrent device(s) is actually locked or sealed, not where the potential of locking exists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #734)

4- 141 - (230-92): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Locked Service Overcurrent Device. Where the service overcurrent device(s) is locked or sealed, or otherwise not ~~readily~~ accessible to ~~the~~ an occupant for whom access is not requisite, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location and shall be of a lower ampere rating than the service overcurrent device(s) from which they are supplied.
FPN: See Section 240-24(b).
SUBSTANTIATION: "Locked or sealed" appears to be equated with "not readily accessible". This section uses not readily accessible (location) instead of accessible which relates to locks or other effective means. Overcurrent devices which are not readily accessible conflicts with Section 230-70(a) where the disconnecting means is a fused switch or circuit breaker. Section 240-24(a) generally does not permit not readily accessible overcurrent devices. Section 380-8(a) generally does not permit (fused) switches and circuit breakers to be not readily accessible.
This section does not correlate with other sections where fused switches and circuit breakers are permitted or required to be locked, but are considered readily accessible. For example Sections 110-26, 110-31, 110-34(c), 240-24(b).
Branch-circuit overcurrent devices which are also locked can be readily accessible but would not be accessible to those without a key.
Since service overcurrent devices may consist of six sets with different ampere ratings, the proposal would clarify the rating relationship.
The FPN would be helpful to Code users as Section 240-24(b) relates to this section and also covers feeder overcurrent devices.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's proposal does not accurately reflect the current wording of this requirement. The panel is unclear of the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3378)

4- 142 - (230-92): Reject
SUBMITTER: Dale P. Missey, Mesa, AZ
RECOMMENDATION: Revise 230-92 to read:
230-92. Locked Service Overcurrent Devices. Where the service overcurrent devices are locked or sealed, or not readily accessible to the occupant, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location, and shall be selectively coordinated with the service overcurrent device.
SUBSTANTIATION: The intent of the existing phrase "of lower ampere rating than" is to assure that an overcurrent on a branch circuit will open only the branch circuit overcurrent device and not the service overcurrent device, so that the occupant can reenergize the circuit after finding and fixing the problem. This is especially important for occupants that utilize in-home life support systems. Unfortunately, just because the service overcurrent device is larger than the branch device, it doesn't mean that the two will selectively coordinate. This proposal clarifies the intent by requiring that the two devices are selectively coordinated. Both fuses and circuit breakers are available to meet this proposed requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: Selective coordination is a design consideration.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1507)

4- 143 - (230-95): Reject
SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text as follows:
230-95. Ground-Fault Protection of Equipment. Ground-fault protection of equipment shall be provided for solidly grounded wye electrical services of more than 150 volts to ground, but not exceeding 600 volts phase-to-phase for ~~each~~ service ~~disconnect~~ equipment rated 1000 amperes or more.
~~The rating of the service disconnect shall be considered to be the rating of the largest fuse that can be installed or the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted.~~
Definition. Solidly grounded means that the grounded conductor is grounded without inserting any resistor or impedance device.
Exception No. 1: The ground-fault protection provisions of this section shall not apply to a service disconnect for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.
Exception No. 2: The ground-fault protection provisions of this section shall not apply to fire pumps.
(a) Setting. The ground-fault protection system shall operate to cause the service disconnect to open all ungrounded conductors of the faulted circuit. The maximum setting of the ground-fault protection shall be 1200 amperes, and the maximum time delay shall be one second for ground-fault currents equal to or greater than 3000 amperes.
(b) Fuses. If a switch and fuse combination is used, the fuses employed shall be capable of interrupting any current higher than the interrupting capacity of the switch during a time when the ground-fault protective system will not cause the switch to open.
(c) Performance Testing. The ground-fault protection system shall be performance tested when first installed on site. The test shall be conducted in accordance with instructions that shall be provided with the equipment. A written record of this test shall be made and shall be available to the authority having jurisdiction.
FPN No. 1: Ground-fault protection that functions to open the service disconnect will afford no protection from faults on the line

side of the protective element. It serves only to limit damage to conductors and equipment on the load side in the event of an arcing ground fault on the load side of the protective element.

FPN No. 2: This added protective equipment at the service equipment may make it necessary to review the overall wiring system for proper selective overcurrent protection coordination. Additional installations of ground-fault protective equipment may be needed on feeders and branch circuits where maximum continuity of electrical service is necessary.

FPN No. 3: Where ground-fault protection is provided for the service disconnect and interconnection is made with another supply system by a transfer device, means or devices may be needed to ensure proper ground-fault sensing by the ground-fault protection equipment.

SUBSTANTIATION: The hazards of equipment damage from ground faults are based on total system capacity, not disconnect ratings, therefore the protection for the hazard should be based on system capacity, which is related to equipment rating. The number of service disconnecting means as allowed by 230-71, does not reduce the potential hazard. The section as written works fine for when there is a single main disconnect which is related to the overall equipment rating. The problem arises when multiple disconnects (up to six) are installed each with ratings below 1000 amps. A 4000 amp switchboard with six 800 amp main service disconnects has the same potential to burn down from an arcing ground fault as the same 4000 amp switchboard with a single 4000 amp main disconnect.

In addition, since the ground fault protection would now be based on the rating of the service equipment, defining the disconnect rating is no longer necessary. This also removes the potential conflict and confusion that has come from application of Section 240-6(c).

PANEL ACTION: Reject.

PANEL STATEMENT: The original study for including this requirement in the Code was based on the rating of the overcurrent device installed in the disconnecting means and not the total rating of the service. The statement in the submitter's substantiation relative to the similar effects of multiple disconnecting means is not accurate, was not supported by the original study, and in fact the subdivision of the disconnecting means is desirable to minimize the impact of ground faults.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2559)

4- 144 - (230-95, FPN No. 3): Reject

SUBMITTER: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services

RECOMMENDATION: Revise as follows:

FPN No. 3: Where ground-fault protection is provided for the service disconnect and interconnection is made with another supply system by a transfer device, a 4-pole transfer switch should be used on this 3-phase 4-wire system to isolate the neutral completely from the generator windings under normal power conditions to stop false tripping of ground-fault protection, and having current flowing back on neutral taking a path through ground-fault sensor and not sensed as fault current.

SUBSTANTIATION: In my experience in the installation of 480/277 volt 3-phase systems where a 3-pole transfer switch is used, if a phase leg develops a ground fault, this current travels back on the neutral and takes a path through the ground-fault sensor and is not sensed as fault current. In addition to this problem, under normal conditions when no ground-fault exists, neutral current due to normal load unbalance on phase legs divides at common neutral connection in automatic transfer switch with some current flowing toward the generator and returning to service main on a metal conduit indicating falsely that a ground-fault exists and takes out ground-fault protection. A four pole transfer switch always eliminates this condition and gives a definitive method of installation.

PANEL ACTION: Reject.

PANEL STATEMENT: The present wording of the fine print note adequately covers the topic of interconnected system concerns. The proposed text could be construed as a mandatory requirement in an advisory statement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1159)

4- 145 - (230-95 Exception No. 3 (New)): Reject

SUBMITTER: James A. Erickson, Boltswitch, Inc.

RECOMMENDATION: Add a new Exception No. 3 to read:

Exception No. 3: The ground-fault protection provisions shall not be required on the service disconnect if all sub-main devices are contained within the same switchboard and all are equipped with ground-fault protection. This allowance shall not be intended to require ground-fault protection on loads identified in Exceptions No. 1 and No. 2.

SUBSTANTIATION: Service disconnect devices that are designed to interrupt ground fault circuits can and do usually require maintenance after the device trips under fault conditions. This is understood and allowed by design standards. When a service disconnect requires maintenance, a utility shutdown is generally required. Consequently, when a service disconnect interrupts under ground fault conditions, the building management is faced with the choice of either lengthy delays (and costs) for a utility shutdown to perform maintenance or re-energize the system without proper maintenance. Unfortunately, the second option is usually selected.

The addition of Exception No. 3 would allow for a service disconnect to be placed directly ahead of any device equipped with ground fault protection. This would allow for proper maintenance without the delays and costs of a utility shutdown.

Also, Exception No. 3 would allow for ground fault protection to be installed solely on sub-main switches, which would provide an additional benefit of isolating a ground fault induced outage to only a portion of the facility. The unexpected outage would be less catastrophic, and the fault would be easier to locate.

Also, Exception No. 3 would allow for ground fault protection to be installed on sub-main switches without relying on coordinated trip settings or the cost and complexity of zone interlocking.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed exception reduces the level of protection for the main bus of the service equipment. The submitter has not provided technical substantiation to justify using downstream GFP protection as a substitute for protection for the entire bus.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2455)

4- 146 - (230-96 (New)): Reject

NOTE: The Technical Correlating Committee notes that Code-Making Panel 2 rejected Proposal 2-119 that relates to this proposal. It is also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 2 for information.

SUBMITTER: William H. King, Jr., U.S. Consumer Product Safety Comm.

RECOMMENDATION: Add new Section 230-96 as follows:

230-96. Replacement of Service Equipment in Dwelling Units. When service equipment in dwelling units is replaced, each existing 125-volt, single-phase, 15- and 20-ampere lighting and appliance branch circuit shall be individually protected by an arc-fault circuit interrupter.

FPN: See Section 210-12(c). (Editorial note: Section 210-12(c) is a proposed new paragraph, submitted separately to the CMP for Article 210, to complement this proposed new Section 230-XX. For information purposes, proposed new Section 210-12(c) reads as follows: Lighting and Appliance Branch Circuits. Each existing 125-volt, single-phase, 15- and 20-ampere lighting and appliance branch circuit shall be individually protected by an arc-fault circuit-interrupter when the service equipment is replaced.)

SUBSTANTIATION: According to a study conducted by the U.S. Consumer Product Safety Commission (CPSC), "Residential Electrical Distribution System Fires", Smith & McCoskrie, 1987, fires originating in branch circuit wiring predominately occurred in dwellings over 20 years old, with the highest rates of fires occurring in dwellings over 40 years old. Older dwellings are frequently upgraded with replacement service equipment to accommodate an increase in the service rating to supply additional appliance and equipment loads. However, often times, the existing lighting and appliance branch circuits in dwelling units are not replaced when the service is upgraded, due to the increased cost, and/or the inability to evaluate the remaining life expectancy of the branch circuit conductors. The branch circuit conductors are frequently located in concealed spaces surrounded with thermal insulation, and may be in a deteriorated condition at the time the service is

upgraded. This proposal is intended to remedy this situation with the addition of arc-fault circuit interruption (AFCI) protection against fire hazard conditions for the existing branch circuit conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is outside the scope of CMP 4. CMP 4 directs the Technical Correlating Committee to refer this to CMP 2 and CMP 10 for review.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2922)

4- 147 - (230-96 (New)): Reject
SUBMITTER: Joseph A. Tedesco, Boston, MA
RECOMMENDATION: Add a new Section 230-96 in the 2002 NEC as shown below:
230-96. Large Services. Where the size of the service is large enough so that three or more cables per phase are utilized, and are connected together at both the point where they receive their supply and at the service entrance equipment, current-limiting cable limiters shall be installed on both ends of each cable to provide both short-circuit protection and isolation of a faulted cable.
SUBSTANTIATION: This proposal provides for service entrance conductor protection for those large services that require three or more cables per phase. Because of their large size, these services can produce tremendous amounts of available short-circuit current. Without this requirement, there is only minimal protection provided on the line side of the transformer. Many utilities already have similar requirements for these limiters on large services. Because of the very high available short-circuit currents, the available arc flash energy is also extremely high. Because of their current-limiting properties, current-limiting cable limiters can limit this arc flash energy. Workers will still need to wear appropriate PPE, but the hazard level will be greatly reduced.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation to require this type of protection. In a three conductor per phase installation, where cable limiters have been installed, the isolation of one cable would cause the remaining two cables in that phase to continue operation with inadequate overload protection. This method of installation is permitted by Article 240 and is a design consideration.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP421)

4- 147a - (230-203): Accept
SUBMITTER: CMP 4
RECOMMENDATION: Delete Section 230-203.
SUBSTANTIATION: These requirements are adequately expressed in Section 110-34(c).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3262)

4- 148 - (230-203): Reject
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise the 230-203 with the additions (underlined) as shown. The entire text is shown for clarity, but only those changes shown underlined are part of this proposal.
230-203. Warning Signs. Signs with the <u>following</u> words <u>or equivalent</u>, "DANGER - HIGH VOLTAGE - KEEP OUT" shall be posted in plain view where unauthorized persons might come in contact with energized parts.
SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.
The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns have been addressed by the panel's action on Proposal 4-147a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #735)

4- 149 - (230-208(b)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Enclosed Overcurrent Devices. The restriction to 80 percent of the rating for an enclosed overcurrent device <u>for</u> continuous loads shall not apply to overcurrent devices installed in ~~services~~ <u>systems</u> operating at over 600 volts.
SUBSTANTIATION: Editorial. This section appears almost unnecessary in view of ratings permitted in the first paragraph. Moreover, the specific 80 percent wording appears only in Section 384-16(d) for lighting and appliance panelboards. It is my understanding there are no panelboards listed for over 600 volts. Since this section specifies only services, is it intended that Section 210-20(a) apply to branch circuits served by a service or separately derived system?
Article 490 does not indicate such requirement.
PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1473)

4- 150 - (230-212): Accept in Principle
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Change Section 230-212 to read:
230-212 ~~Services~~ Over 15,000 Volts. Where the voltage exceeds 15,000 volts, between conductors ~~they shall enter either~~ <u>which enter a building, they shall terminate in a</u> metal-enclosed switchgear <u>compartment</u> or a transformer vault conforming to the requirements of Sections 450-41 through 450-48.
SUBSTANTIATION: Many services over 15000 volts do not enter a building but terminate in an outdoor substation. The proposed wording remedies this oversight.
This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.
The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.
Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)
PANEL ACTION: Accept in Principle.
Amend the proposed language to read:
"230-212 ~~Services~~ Over 15,000 Volts. Where the voltage exceeds 15,000 volts, between conductors ~~they shall enter either~~ <u>which enter a building, they shall terminate in a</u> metal-enclosed switchgear <u>compartment</u> or a transformer vault conforming to the requirements of Sections 450-41 through 450-48."
PANEL STATEMENT: The modification to the proposed text clarifies that the conductors are permitted to terminate in any vault that meets the requirements of Article 450, Part C.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
LEWIS: The Panel Action is appropriate and clarifies the intent of Section 230-212. I notice, however, that there is an inconsistency with 230-212, and 450-21, and 450-24, and 450-25. 450-21(b) requires only that specific transformers be installed in a fire resistant room. The term "Fire Resistant" for this section is defined as construction having a minimum fire rating of one hour. 450-21(c), 450-24, and 450-25 then specify that the three hour fire rated room (part C) will be required only if the voltage rating is greater than 35,000 Volts.

By requiring that services over 15,000 Volts which enter a building and terminate in other than metal enclosed switchgear, be in a three hour vault; the panel is requiring more restrictive rules on services, than on feeders between 15,000 Volts and 35,000 Volts. Since there is no difference in protection methods for feeders and services at this voltage level, I question the justification for the difference.

This comment is offered to highlight the inconsistency and to give the public an opportunity to suggest corrective measures if it has created a problem; or to provide justification for the difference.

(Log #4069)

4- 151 - (230-212): Accept in Principle
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.
RECOMMENDATION: Revise as follows:
230-212. Services Over 15,000 Volts ~~Within Buildings.~~
SUBSTANTIATION: Applied literally, this rule excludes the use of outdoor substations as allowed by Section 110-31(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-150.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4103)

4- 152 - (230-212): Accept in Principle
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Revise as follows:
230-212. Services Over 15,000 Volts Within Buildings.
SUBSTANTIATION: Applied literally, this rule excludes the use of outdoor substations as allowed by Article 110-31(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 4-150.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 240 — OVERCURRENT PROTECTION

(Log #1274)

10- 3 - (240): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 240-4(b)(2) replace text with strikeout with underlined text "20-ampere circuits — No. 18, up to ~~50 ft (15.2 m)~~ 15m (50 ft) of run length"
2. In Section 240-4(b)(2) replace text with strikeout with underlined text "20-ampere circuits — No. 16, up to ~~100 ft (30.5 m)~~ 30m (100 ft) of run length"
3. In Section 240-21(b)(1) replace in subdivision title and text "10 ft (3.05 m)" with "3.0 m (10 ft)"
4. In Section 240-21(b)(2) replace in subdivision title and text "25 ft (7.62 m)" with "7.5 m (25 ft)"
5. In Section 240-21(b)(3) replace in subdivision title and text "25 ft (7.62 m)" with "7.5 m (25 ft)"
6. In Section 240-21(b)(4) replace in subdivision title and text "25 ft (7.62 m)" with "7.5 m (25 ft)"
7. In Section 240-21(b)(4) replace "35 ft (10.67 m)" with "11 m (35 ft)"
8. In Section 240-21(b)(4) replace "100 ft (30.5 m)" with "30 m (100 ft)"
9. In Section 240-21(b)(4) replace "30 ft (9.14 m)" with "9.0 m (30 ft)"
10. In Section 240-21(c)(2) replace in subdivision title and text "10 ft (3.05 m)" with "3.0 m (10 ft)"
11. In Section 240-21(c)(3) replace in subdivision title and text "25 ft (7.62 m)" with "7.5 m (25 ft)"
12. In Section 240-92(b)(1)(a) replace "50 ft (15.24 m)" with "15 m (50 ft)"
13. In Section 240-92(b)(1)(b) replace "75 ft (22.86 m)" with "23 m (75 ft)"
14. In Section 240-92(b)(1)(c) replace "75 ft (22.86 m)" with "23 m (75 ft)"
SUBSTANTIATION: The proposed revisions are intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units.
PANEL ACTION: Accept in Principle.
In Item 1, change "No. 18" to "18 AWG".
In Item 2, change "No. 16" to "16 AWG.
In Item 3., change "3.0 m" to "3 m".
In Item 9., change "9.0 m" to "9 m".
In Item 10., change "3.0 m" to "3 m".
PANEL STATEMENT: The change from "No." to "AWG" is to provide consistency with the action taken on proposal 10-2. The deletion of the extra precision in the conversion shown in Items 3, 9, and 10 is made to avoid implying undue precision in the conversion to a smaller length in metric units.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP1004)

10- 3b - (240-2, Other Article Referenced): Accept
SUBMITTER: CMP 10
RECOMMENDATION: Move existing 240-2 to 240-3, delete existing title and add new title "Other Articles."
Delete second paragraph of section 240-3(e) and relocate to section 240-2 as a definition titled "Tap conductor".
Delete section 240-11 and relocate to section 240-2 as definition titled "Current limiting overcurrent protective device".
Delete section 240-91 and relocate to section 240-2 as definition titled "Supervised Industrial Installations".
Delete last paragraph of section 240-12 and relocate to section 240-2 as definition titled "Coordination".
Move existing 240-3 to 240-4.
Move existing 240-4 to 240-5.
Revise as follows:
240-1 No change
"240-2 Definitions
Coordination. The proper localization of a fault condition to restrict outages to the equipment affected, accomplished by the choice of selective fault-protective devices.
Current-Limiting Overcurrent Protective Device. A current-limiting overcurrent protective device is a device that, when interrupting currents in its current-limiting range, will reduce the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance.
Supervised Industrial Installation. For the purposes of Part H, supervised industrial installation is defined as the industrial portions of a facility where all of the following conditions are met:
1. Conditions of maintenance and engineering supervision ensure that only qualified persons will monitor and service the system.
2. The premises wiring system has 2500 kVA or greater of load used in industrial process(es), manufacturing activities, or both, as calculated in accordance with Article 220.
3. The premises has at least one service that is more than 150 volts to ground and more than 300 volts phase-to-phase.
This definition shall not apply to those installations in buildings used by the industrial facility for offices, warehouses, garages, machine shops, and recreational facilities that are not an integral part of the industrial plant, substation, or control center.
Tap Conductors. As used in this article, a tap conductor is defined as a conductor, other than a service conductor that has overcurrent protection ahead of its point of supply, that exceeds the value permitted for similar conductors that are protected as described elsewhere in this section."
240-3 Other Articles (Add existing text of section 240-2).
240-4 (relocate existing section 240-3).
240-5 (relocate existing section 240-4).

SUBSTANTIATION: The proposed changes are in conformance with the NEC style manual. This change provides for a more user friendly format of Article 240.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1053)

10- 2 - (240-2): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 240 as follows:
240-3(d) - change:
"No. 14" to "14 AWG"
"No. 12" to "12 AWG" in two places
"No. 10" to "10 AWG" in two places
240-4(b)(1) - change:
"No. 18" to "18 AWG"
"No. 16" to "16 AWG"
240-4(b)(2) - change:
"No. 18" to "18 AWG"
"No. 16" to "16 AWG"
"No. 14" to "14 AWG" in two places
"No. 12" to "12 AWG" in two places
240-4(b)(3) - change "No. 16" to "16 AWG"
240-21(b)(4)(g) - change "No. 6 copper or No. 4 aluminum" to "6 AWG copper or 4 AWG aluminum".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: No clarity is added for U.S. and some other locations, where the meaning of "No. 14" and "14 AWG" are universally known and interchangeable; further, the Code is generally consistent in listing "xx AWG" in the tables and "No. xx" in the text. However, this proposal adds considerable clarity for international locations that might accept the NEC, where common U.S. trade sizes are less well known.
The panel suggests that the Technical Correlating Committee ensures that all final actions on similar proposals are consistent throughout the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP1005)

10- 3a - (240-2 (New)): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 4-54 and 4-55. The Technical Correlating Committee directs the panel to clarify the location of the new definition. This action will be considered by the Panel as a Public Comment.
The Technical Correlating Committee directs that this proposal be forwarded to Code-Making Panel 4 for information.
SUBMITTER: CMP 10
RECOMMENDATION: Add the following definition to 240-2:
"Conductors Considered Outside the Building. In addition to outdoor conductors," (Add existing text from Section 230-6 of the existing code).
SUBSTANTIATION: This definition clarifies the panel's intent in recognizing a long-standing practice.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BORTHICK: I am opposed to the panel action.
Existing 240-21(b)(5) permits feeder conductors to be tapped without restriction to the length of the tap conductors and without restriction to the minimum tap conductor size. These two parameters can have significant effect on circuit impedance. Without careful consideration of these factors a short-circuit near the extreme end of the tap might reduce the fault-current in the circuit to a level that the feeder overcurrent protective device might not operate quickly enough to prevent damage to the tap conductor or at the very least its insulation. Another possible scenario is that the tap conductor could melt in two before the overcurrent protective device could open thus "clearing the fault" and the overcurrent protective device would not open at all leaving the severed tap conductors energized.
A generic example to illustrate this might be a 200 amp 480 volt three-phase feeder run to a junction box where numerous taps are made. The available fault-current at the junction or "tap" box is 24000 amps. A three-phase tap is made here, using #12 AWG copper. The tap conductors immediately exit the building and are run on the building surface for 160 feet and terminate at a 20 amp overcurrent protective device that protects the tap conductors against overload. If a short-circuit occurs at 150 feet from the tap box the available fault current is roughly 1100 amps. How long will the feeder overcurrent protective device take to open at only 550 percent of its rating? At least a few seconds longer than it would take for the #12 copper to melt. Also, if the tap conductors are attached to a combustible surface the heat generated at the fault might also be of sufficient duration and intensity to ignite these combustibles.
The existing 240-21(b)(5) is sufficiently unrestrictive to cause concern for its general application.
The panel's acceptance of the proposal further broadens the permitted installations. It is conceivable that many traditional branch circuits that have been safely protected against overcurrent by installation of overcurrent protective devices at their supply, will now become taps protected from overload by virtue of being installed per the criteria of 230-6.
COMMENT ON AFFIRMATIVE:
DOLLARD: I am voting affirmative to the panel action to accept proposal 10-3a. My comments are as follows:
"The panel statement explains that defining "Conductors Considered Outside the Building" in Article 240 is necessary to recognize a long-standing practice. I agree with the Panel's intent to allow some flexibility to outside tap conductors at the point they enter a building or structure. However, applying this definition globally throughout Article 240, may result in confusion, installations and interpretations that are not the intent of the Panel on this proposal. The words "outside", "outdoors" and "outdoor" occur in Sections 240-21(b), 240-21(c) and 240-92(c). The need for this definition arises from the use of these words in the associated tap rules. With the acceptance of this new definition to Article 240 the words "outside", "outdoor" and "outdoors" as used in existing text will be interpreted in a very different manner. Acceptance of this proposal will permit "Service Equivalent Taps" as described in proposal 10-68 in the ROP for the 1999 code cycle. The Panel rejected this proposal and noted in the panel statement the confusion that could occur in the application and enforcement of such a change.
I believe that the Panel's intention can be met with the following changes:
240-21(b)(5) Outside Taps of Unlimited Length. Where the conductors are located outdoors <u>or enter a building or structure from the outdoors in accordance with Condition No. 1 or Condition No. 2 of Section 230-6,</u> except at the point of <u>load</u> termination, and comply with all of the following conditions.
240-21(c)(4) Outside Secondary Conductors. Where the conductors are located outdoors <u>or enter a building or structure from the outdoors in accordance with Condition No. 1 or Condition No. 2 of Section 230-6,</u> except at the point of <u>load</u> termination, and comply with all of the following conditions.
240-92(c)(3) The tap conductors are installed outdoors <u>or enter a building or structure form the outdoors in accordance with Condition No. 1 or Condition No. 2 of Section 230-6,</u> except at the point of <u>load</u> termination."

(Log #737)

10- 4 - (240-3): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Protection of Conductors. ~~Conductors~~ Circuit conductors, other than flexible cords and cables, and fixture wires shall be protected against overcurrent in accordance with their ampacities as specified in Section 310-15 unless otherwise permitted or required in (a) through (g) below:
Exception: Grounded conductors shall not be required to have overcurrent protection.
(a) No change.
(b) Devices Rated 800 Amperes or Less. ~~The next~~ A higher ~~standard~~ overcurrent device rating or setting (above the ampacity of the conductor being protected) shall be permitted to be used provided all the following conditions are met:
(1) No change.
(2) No change.
(3) The ~~next~~ higher ~~standard~~ rating or setting selected does not exceed the next higher standard rating and 800 amperes.
(c) Devices Rated Over 800 Amperes. Where the overcurrent device ~~is rated~~ rating or setting is over 800 amperes, the ampacity of the conductors shall be ~~equal to or greater~~ not less than the rating or setting of the overcurrent device. ~~as defined in Section 240-6.~~
(d) Small Conductors. Unless specifically permitted otherwise in (e) through (g) blow, the overcurrent protection shall not exceed 15 amperes for No. 14, 20 amperes for No. 12, and 30 amperes for No. 10, copper, or 15 amperes for No. 12 and 25 amperes for No. 10 aluminum or copper-clad aluminum, except where ambient temperatures of 21-25°C permit an increase in ampacity the provisions of Section 240-3(b) shall apply.
(e) Tap Conductors. Tap conductors shall be considered ~~permitted~~ to be protected against overcurrent in accordance with Sections 210-19 (c) and (d), 240-21; 364-11; and 430-53(d).
(remainder unchanged)
(f) Transformer Secondary Conductors. Conductors connected to a transformer secondary in accordance with Section 240-21(c) shall be ~~permitted~~ considered to ~~have~~ be protected against overcurrent. ~~protection located as specified in Section 240-21(c).~~
(g) Overcurrent Protection for Specific Conductors. Application. ~~Overcurrent protection for the specific conductors~~ Conductors shall be ~~permitted~~ considered to be protected against overcurrent where installed in conformance with requirements for specific applications as referenced in the list below:
(Existing list unchanged)
Add to list:

Battery Circuit Conductors	Article 480 Section 480-3
Electrolytic Cell Conductors	Article 668 Section 668-30(d)

SUBSTANTIATION: The first paragraph should include flexible cables since their ampacities are covered in Article 400, not Section 310-15. Flexible cords and fixture wires are indicated, even though indirectly excluded by the FPN for Section 310-1. The limiting word "circuit" and the proposed exception would exclude grounding and bonding conductors, and grounded conductors which are literally included in the rule. The exception would correlate with Sections 230-90(b) and 240-22, and where an overcurrent device such as a multiple circuit breaker does supply a grounded conductor as permitted, the overcurrent element for the grounded conductor, whether or not a reduced-in-size neutral, would not have to comply with this section. The exception reflects present accepted practice.
The present wording of (b) implies that only the next higher standard rating shall be permitted and that seems to be the impression of some code users. If the allowable ampacity of a conductor is determined to be 180 amperes why should a rating of 190 amperes not be permitted? The revised wording would correlate with the FPN for Section 240-6(b), is reasonable and practical. Since a setting may be different from rating, per the exception for Section 240-6(b) it should be included.
Proposal for (c) is editorial.
The present (d) limits overcurrent protection to 15, 20, 25 or 30 amperes even after the correction factor for ambient temperature of 21-25°C permits an ampacity that is higher, and effectively negates the provisions of Section 240-3(b). The small ampacity increase permitted for lower ambient temperatures that may prevail, such as underground, in northern climes, or in controlled temperature environments may not be of great consequence but could matter in border line installations.
In (e), (f), and (g) I believe "considered to be" is more technically accurate based on the premise that overcurrent (overload, short-circuit, ground-fault) protection is literally only provided where the overcurrent device is located at the point of supply and rated in accordance with the conductor ampacity. Many sections where these conditions are not met refer to "overcurrent device" or "overload protection" to indicate overcurrent protection is not literally provided. Section 210-19(c) should logically be included.
The present (f) only relates to location of overcurrent protection (devices) but does not affect the basic ampacity requirements of the first paragraph of this section.
The list in (f) should include Section 668-30(d) which is applicable, and Section 480-3 if my proposal for that section is accepted.
PANEL ACTION: Accept in Part.
The panel accepts the insertion of "(c) and" in Item (e) of the proposal.
The panel rejects the remainder of the proposal.
PANEL STATEMENT: The panel does not consider that the qualifier "circuit" on conductors is necessary.
The addition of "and cables" would modify protection requirements of type AC, MI, MC, etc. cables.
The exception is a duplication of the material in 240-22, and is in conflict with section 430-36.
No technical substantiation was provided for the proposed changes to (b) and (c). The present text is easy to read and enforceable without change.
In proposed (d), adding "otherwise" does nothing except add another word. The added sentence is too permissive in a bracketed area, and would allow larger than a 15, 20, 25, or 30 ampere overcurrent device to be used. The present text is practical, enforceable, and easy to read.
In proposed (e), the panel does not agree that "considered" is more technically correct, and the word is not permitted by the NEC Style Manual.
The panel approves the addition of "(c) and" to proposed (e).
The proposed change to (f) does not improve clarity. The panel does not agree that "considered" is more technically correct, and the word is not permitted by the NEC Style Manual.
The proposed change to (g) does not improve clarity. The panel does not agree that "considered" is more technically correct, and the word is not permitted by the NEC Style Manual.
The additions to the list have no specific provisions for overcurrent protection in the referenced sections.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2247)

10- 5 - (240-3(b)): Reject
SUBMITTER: Steven R. Musial, II, Pittsburgh, PA
RECOMMENDATION: Revise text as follows:
240-3(b) "The next higher standard overcurrent device rating (at or above the ampacity of the conductors being protected) shall be...".
SUBSTANTIATION: Several conductor sizes listed in Table 310-16 have rated ampacities that match the standard size fuses and circuit breakers that are commonly manufactured per Article 240-6 (e.g., No. 3 AWG Cu, THW rated at 100 amperes).
PANEL ACTION: Reject.
PANEL STATEMENT: Protection of the conductors at the ampacity of the conductors is in conformance with 240-3. Section 240-3(b) addresses overcurrent protection at a value above the conductor ampacity.
The present text of this section meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #309)

10- 6 - (240-3(c)): Reject
SUBMITTER: Sonny D. Nordhoff, Noblesville, IN
RECOMMENDATION: Revise 240-3(c) to read as follows:
Where the overcurrent device is rated over 800 amps, the ampacity of the conductors it protects shall be equal to, or greater than the rating of the overcurrent device as defined in Section 240-6.
Exception No. 1: Where the ampacity of the conductors is no more than 60 amps or less, than the rating of the O.C.P., it shall be permitted to increase to that higher O.C.P.
SUBSTANTIATION: When installing a 1200 amp service, three 500 kcmil conductors come up short by only 60 amps short of the rating of 1200 amps. It is my understanding that section 240-3(c) is in place because of the large jumps between standard size fuses over 800 amps. The 60 amp increase is not too much in my eyes but I am just an electrician, not an authority having jurisdiction.

PANEL ACTION: Reject.
PANEL STATEMENT: There is a lack of technical substantiation for making this a general rule. No technical information has been provided to show whether the conductors could be damaged due to the increase of resistive heat.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
ELDRIDGE: This proposal should have been Accept in Principle. Chance as follows to allow for all ranges of ampacities. "Where the overcurrent device is rated over 800 amperes, the ampacity of the conductors it protects shall be equal to or greater than not less than 95% of the rating of the overcurrent device as defined in Section 240-6" This satisfies the submitter's concerns.
By making this change, a 1600-ampere service could be wired with four sets of 500 kcmil, Cu., 75 degrees C wire. This was done for years without any problems and no problems have been encountered for the existing 800 amperes or less, as permitted now in Section 240-3(b). Of course, all the other code provisions would have to be followed.
FREDERICKS: I'm voting against the panel action. I agree the original proposal was flawed because it is too specific, but it raises a good concept that should have been accepted in principle. The panel should have voted to accept in principle per the motion made in the panel meeting.
The motion would have allowed, for devices above 800 amperes, the next higher available size of overcurrent device to be used, where the next higher size was no more than 5 percent above the allowable conductor ampacity.
Below 800 amperes, the NEC already allows conductors to be protected at the next standard device rating, effectively allowing these conductors to be protected and up to 18 percent above their allowable ampacity. This practice has proven successful in many thousands of NEC installations and in years of practice. This successful practice is with conductors that are smaller and heat more quickly than those above 800 amperes. Also, the overcurrent protective device is smaller and more sensitive to the wire size below 800 amperes.
It would seem that, if anything, there would be more technical merit in restricting the smaller devices and conductor, but again long successful practice and experience supports the exiting latitude given in 240-3.
There is no technical reason to disallow the modest 5 percent allowance for conductors above 800 amperes, as proposed in the motion.

(Log #1772)

10- 7 - (240-3(e)): Reject
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise to read as follows:
(e) Tap Conductors. Tap conductors shall be permitted to be protected against overcurrent in accordance with Sections 210-19(d), 240-21, 364-11, 364-12, and 430-53(d).
As used in this article, a tap conductor is defined as a conductor, ~~other than a service conductor~~ that has overcurrent protection ahead of its point of supply, that exceeds the value permitted for similar conductors that are protected as described elsewhere in this section.
SUBSTANTIATION: This paragraph as written in the 1999 NEC was being misinterpreted and the proposed phrase to be deleted neither added to the definition or clarified its intent. Service conductors are protected against overload and not overcurrent.
PANEL ACTION: Reject.
PANEL STATEMENT: The phrase "other than a service conductor" is needed in the definition to avoid confusion and misapplication. Some service conductors are protected against overcurrent when, for example, cable limiters are used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2055)

10- 8 - (240-3(e)): Accept
Note: The Technical Correlating Committee understands that this revision occurs in the relocated definition in Proposal 10-3b.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Revise section 240-3(e) by adding a comma after the words service conductors as shown below:
(e) Tap Conductors. Tap conductors shall be permitted to be protected against overcurrent in accordance with Sections 210-19(d), 240-21, 364-11, 364-12, and 430-53(d).
As used in this article, a tap conductor is defined as a conductor, other than a service conductor, (add a comma here) that has overcurrent protection ahead of its point of supply, that exceeds the value permitted for similar conductors that are protected as described elsewhere in this section.
SUBSTANTIATION: A comma is required to clarify what a tap really is .
As stated the tap must be OTHER than service conductors.
As now written no tap occurs if the service conductors have overcurrent in the conductors at its point of supply.
This change will clarify the proper intent.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2457)

10- 9 - (240-3(e)): Accept
Note: The Technical Correlating Committee understands that this revision occurs in the relocated definition in Proposal 10-3b.
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Insert a comma as shown:
"... defined as a conductor, other than a service conductor, that has...".
SUBSTANTIATION: English was not my best subject but I think this is proper.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3353)

10- 10 - (240-3(e)): Accept
Note: The Technical Correlating Committee understands that this revision occurs in the relocated definition in Proposal 10-3b.
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Insert a comma after the words "service conductor" in the second sentence as follows:
As used in this article, a tap conductor is defined as a conductor, other than a service conductor, that has overcurrent protection ahead of its point of supply, that exceeds the value permitted for similar conductors that are protected as described elsewhere in this section.
SUBSTANTIATION: A service conductor does not have overcurrent protection ahead of its point of supply and should be "separated" from the rest of the sentence. This will clarify that it is the tap conductor that has overcurrent protection ahead of its point of supply, and not the service conductor.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4176)

10- 11 - (240-3(e)): Accept
Note: The Technical Correlating Committee understands that this revision occurs in the relocated definition in Proposal 10-3b.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise by adding a comma after "service conductor" and deleting the comma after "point of supply" as follows:
As used in this article, a tap conductor is defined as a conductor, other than a service conductor, that has overcurrent protection ahead of its point of supply, that exceeds the value permitted for similar conductors that are protected as described elsewhere in this section.
SUBSTANTIATION: Service conductors don't customarily have overcurrent protection ahead of their point of supply. The misplaced comma effectively groups the concept of "overcurrent protection ahead of its point of supply" with service conductors, which is wrong, and not with values permitted for similar conductors, as intended.
PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1162)

10- 12 - (240-3(f)): Reject
SUBMITTER: Charles K. Eldridge, Indianapolis, IN
RECOMMENDATION: Revise text to read:

(f) Transformer Secondary Conductors. Single-phase (other than 2-wire) and multiphase (other than delta-delta, 3-wire; ungrounded 3-wire wye; or high resistance grounded wye) transformer secondary conductors shall not be considered to be protected by the primary overcurrent protective device. Conductors supplied by (1) the secondary side of a single-phase transformer having a 2-wire (single-voltage) secondary, (2) ~~or~~ a three-phase, delta-delta connected transformer having a 3-wire (single-voltage) secondary, or (3) a 3-phase, 3-wire ungrounded wye transformer, or (4) a 3-phase high resistance grounded wye transformer shall be permitted to be protected by overcurrent protection provided on the primary (supply) side of the transformer, provided this protection is in accordance with Section 450-3 and does not exceed the value determined by multiplying the secondary conductor ampacity by the secondary to primary transformer voltage ratio.

SUBSTANTIATION: This was a good and technically correct proposal when submitted for the 1999 Code cycle. Mr. Krupesh-Kumar K. Parikh, General Electric Company, has considered the technical problems concerning the issues surrounding this proposal and is correct in his conclusions.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: This proposal is technically sound but proper application may require engineering supervision. For example, the secondary conductors may have to be sized at 125-150 percent or more of the transformer secondary full-load current rating in order to be protected against overload by the primary overcurrent protective device.

Proper application is best restricted to Part H, Supervised Industrial Installations. See panel action and statement on proposal 10-71.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #414)

10- 13 - (240-3(h) (New)): Reject
SUBMITTER: Robert Reed, Wood County Building Dept., OH
RECOMMENDATION: Add new text to read as follows:

Conductors that are derated for number of current carrying conductors in raceway, or oversized for voltage drop, shall be marked for maximum size of overcurrent protection at the point of overcurrent protection.

SUBSTANTIATION: To keep from oversizing protection when the derating is not apparent in nature.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel considers this to be an application/design issue, not a code issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #736)

10- 14 - (240-4): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Protection of Flexible Cords, Flexible Cables, and Fixture Wires. Flexible cords and cables, including tinsel cord and extension cords, and fixture wires shall be protected ~~against overcurrent~~ by overcurrent devices in accordance with either (a) or (b).

(a) Flexible cord and cable shall be protected by an overcurrent device in accordance with its ampacity as specified in Tables 400-5(A) and (B). (remainder of (a) unchanged)

(b) Branch Circuit Overcurrent Device. Flexible cord and fixture wire shall be considered to be protected against overcurrent where supplied by a branch circuit in accordance with ~~one of the methods described below~~ (1), (2), or (3).

(1) Supply Cord of Listed Appliances or Portable Lamps. Where flexible cord or tinsel cord is approved for and used with a specific appliance or portable lamp ~~it shall be permitted to be~~ and supplied by a branch circuit of Article 210 in accordance with the following: (remainder unchanged)

(2) Fixture Wire. Fixture wire ~~shall be permitted to be tapped~~ where used as tap conductors for connecting a lighting fixture(s) to the branch circuit conductors of a branch circuit of Article 210 in accordance with the following: (remainder unchanged)

(3) Extension Cord Sets. Flexible cord used in listed extension cord sets, or in extension cords made with separately listed and installed components ~~shall be permitted to be~~ where supplied by a branch circuit of Article 210 in accordance with the following:

20-ampere circuits- No. 16 and larger.

(c) Permanently Connected. Where permitted elsewhere in this code to be permanently connected as feeder or branch-circuit conductors, flexible cords and cables shall be permitted to be protected in accordance with applicable provisions of Section 240-3.

SUBSTANTIATION: Flexible cords should be noted because of the reference to Table 400-5(B) which covers such conductors. The fixture wire of (b)(2) should be limited to use as fixture tap conductors otherwise Sections 725-23 Exception and 760-23 Exception permits application to No. 18 and 16 fixture wires used for Class 1 and NPLFA circuits. The option of using (b) does not provide true "overcurrent" protection, as defined in Article 100, and may or may not even provide short-circuit or ground-fault protection. The proposed overcurrent "device" does not infer overcurrent protection is necessarily provided.

Fixture wire should be noted in the first paragraph of (a) as it is covered in (b).

Section 240-3 does not apply to flexible cords, and where they are permitted to be permanently connected as branch circuit or feeder conductors for temporary wiring, motors, cranes and hoists, elevators, floating buildings, etc., they must be protected in accordance with (a) of this section since they are not covered by (b). Where such cords have adequate ampacity, none of the subsections of Section 240-3 relating to overcurrent protection apply. If a flexible cord for a material handling magnet is permanently connected to a branch circuit with short-circuit protection only, per Section 240-3(a), it is likely the cord conductors would have to be "oversize" to comply with (a) of this section. A cord supplying a wet pit submersible motor rated 12 amperes could have an ampacity of 15, but if the circuit overcurrent device exceeds 15 amperes (e.g. 30 amperes) the cord would have to be increased in size to comply with (a) of this section. Is anyone requiring this?

Section 610-12(b) may be considered as modifying (a) of this section by virtue of Section 90-3 since it is not in permissive form, but Articles 364, 422, 430, 553, 610, 620 do not appear to have any modifications of this section.

PANEL ACTION: Reject.
PANEL STATEMENT: No justification was provided for adding flexible cables.

The proposed changes to (a) and (b) do not improve clarity.

The proposed item (c) is redundant with section 240-4(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3442)

10- 15 - (240-4(b)): Reject
SUBMITTER: Randall Kirkman, Energy, IL
RECOMMENDATION: Delete (1) and (3). Renumber existing (2) as new (1).

SUBSTANTIATION: The new requirement for AFCI protection for bedroom circuits is a step in the right direction in the pursuit of reducing electrically caused fires in residences. Fires caused by shorts in small cords and by overloaded cords will be greatly reduced in years to come as more and more new homes are built. Unfortunately, there are literally millions of existing homes that will not have the extra protection offered by AFCIs.

What are we as an industry going to do to protect the public that lives in existing homes? There is one major step that we can take. That needed step is to require protection of small cords at their ampacity. This can be accomplished economically by the manufacturer of the small appliance or the manufacturer of the extension cord. Agreed, this will not cover the hundreds of millions of appliances and extension cords that are currently in use, but, with limited life, these appliances and extension cords will be replaced

much sooner than the existing homes will be replaced. This gives us the means to reduce fires for the millions of existing homes.

How do we know that protecting small cords at their ampacity will reduce the amount of electrical fires? UL did a study for the U.S. Consumer Product Safety Commission (CPSC-C-94-1112). Following are quotes from that study.

Page (ix) "The technologies, as exemplified by the devices analyzed, demonstrated a capability of detecting and/or responding to certain types of abnormal conditions involving over temperature and/or overcurrent and showing that supplementary protection technology can contribute to a reduction in the likelihood of an electrically caused fire."

Page 18 "Supplementary protective devices are intended to be installed between the receptacle and the plug of an appliance. These devices provide fused-down customized overcurrent protection for certain loads and/or provide sensitivity to high temperatures that might develop at a plug or receptacle."

Page 136 "Abnormal conditions that involve normal load current levels but that do not involve arcing or current to ground (e.g., high resistance series faults, usage of undersized conductors, etc.) will not be detected by arc-fault detectors, fault interrupters, or overcurrent protection until and unless such conditions lead to overcurrent, ground faults and/or arcing faults. Supplementary protection devices can potentially address such conditions."

What about AFCIs. Won't they protect the small cords? As explained above, AFCIs won't generally be used in the millions of existing homes and therefore offer no protection for those homes. In addition, the same UL study as mentioned above makes the following statements with regard to the various protection techniques, including AFCIs.

Page x "It was determined that no single product or technology in the examined state of development would provide protection against all electrical ignition scenarios likely to be encountered in residential wiring systems."

Page 136 "From the previous discussion, it is evident that no single product or technology in the examined state of development was found to provide protection against all electrical overheating mechanisms, as shown in Figure 4, that might directly or indirectly lead to ignition."

In addition, UL 1669, the Standard for Safety for Arc-Fault Circuit Interrupters, makes it clear that AFCIs are not intended to open for all potential ignition-causing conditions. For example, the minimum current at which an AFCI is tested to open under the "point contact" test is 75 amperes (56.5.3). The value is set so high because the AFCI cannot trip out during the "Unwanted" Tripping Test. This proposal, if accepted, would therefore add a degree of safety above and beyond that provided by AFCIs for those current levels below which the AFCI is not required to open. It is a great combination to reduce electrically caused fires in new homes.

What kind of history do supplementary devices have as far as protection is concerned? Have they ever been required? Supplementary devices have never been required to protect small conductors in the United States. However, they have been required for many years in England, where they have an exemplary record.

Don't the branch circuit overcurrent devices in the panel provide protection? No, a 20 ampere fuse or circuit breaker is simply not designed to protect a number 18 copper conductor. Both devices can do an excellent job protecting a number 12 copper conductor, but neither can react to conductor overloads, which are less than the rating of the fuse or circuit breaker. Again, refer to the UL study for the CPSC.

Page 129 "Since present branch-circuit devices are only intended to protect properly sized wire against damage from overcurrent, they may not protect undersized conductors or high resistance series faults under overcurrent conditions."

In summary, this proposal will take advantage of a technology identified in the UL study that, if combined with AFCIs, will dramatically reduce the number of electrically caused fires in new homes. And because AFCIs won't find their way into most existing homes, this proposal will become the primary means to reduce the number of electrically caused fires in those homes.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 240-4(b)(1) deals with the supply cords of listed appliances or portable lamps. These are the cords to dedicated loads of known ampacity. The proposal does not substantiate a problem with these cords. With respect to extension cord sets, section 240-4(b)(3), there have been major changes in the labeling and construction of these cords. Thus, 16 AWG and larger wire may be protected on 20-ampere circuits. Again, the proposal does not substantiate a problem with these cords.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2

EXPLANATION OF NEGATIVE:

DOLLARD: I am voting Negative to the panel action to reject proposal 10-15. My reasons are as follows:

I believe the submitter did substantiate that a problem exists in both appliance cords and extension cords. This substantiation is similar to the ones given in proposals 2-128 and 2-129 of the ROP stage in the 1999 code cycle, which resulted in a requirement for AFCI protection.

In the substantiations for proposals 2-128 and 2-129 in the 1999 code cycle numbers of fires are attributed to appliances, appliance cords, and extenstion cords. These staggering statistics demand that steps be taken to attempt to eliminate these potential fire hazards.

The steps that need to be taken are not within the scope of the NEC.

It is the appliance manufacturers and listing agencies that should evaluate appliance cords and extension cords. Appliance cords and extension cords should be tested and sized to allow the branch circuit overcurrent protective device to operate in the event of an overcurrent.

These two subdivisions should be deleted. These requirements belong in product standards not the NEC.

It is the job of the authority having jurisdiction to inspect the installation of conductors and equipment on an electrical installation. When was the last time a job was failed by an authority having jurisdiction because an appliance cord or extension cord set was undersized?

Appliance and extension cord manufacturers are sizing conductors according to the minimum requirements of the NEC as listed in 240-4. These conductors cause staggering numbers of fires. The scope of the NEC is the practical safeguarding of persons and property from hazards arising from the use of electricity. The scope of the NEC demands that this issue be addressed.

OCKULY: I vote negative on the panel action. The proposer did, in fact, supply compelling substantiation that problems exist with the use of supply cords and extension cord sets applied using Exceptions No. 1 and No. 3 in Section 240-4(b). The two exceptions are realistically outside the scope of the NEC and unenforceable! These cord sets are installed after the wiring installation has been "final inspected" by the Authority Having Jurisdiction.

Documentation has been supplied by the manufacturers of AFCI devices that fully two-thirds of dwelling fires occur in "zones" two and three. These zones, Zone 2 the cord set, and Zone 3 the utilization equipment, are beyond the premises hard wired system. Removal of Exceptions No. 1 and No. 3 from Section 240-4(b) would require the product standards to deal with the proper overcurrent protection of supply cords and extension cords. Further, addressing the flexible cord overcurrent protection issues in the product standards provides increased safety for existing dwellings when new cord sets and equipment are installed in older homes. It is difficult to understand why some provisions such as AFCIs are accepted in some articles of the NEC and the code chooses to ignore the similar fire and safety issues allowed by Exceptions No. 1 and No. 3 in this section.

(Log #3843)

10- 16 - (240-6 and 430-152): Reject

SUBMITTER: Brian Rahl, Riviera Electric

RECOMMENDATION: Relocation of text.

When looking for fuse and circuit breaker sizes for motor calculations which are in Section 240-6, should be listed for ease and convenience in two separate locations as sub-notes, 430-52 Rating or Setting for Individual Motor Circuits, and 430-152 Maximum Rating or Setting of Motor Branch-Circuit Short-Circuit and Ground-Fault Protective Devices.

SUBSTANTIATION: In Section 430-152, Maximum Rating or Setting of Motor Branch-Circuit Short-Circuit and Ground-Fault Protective Devices, Section 430-52, Rating or Setting for Individual Motor Circuits, and Section 240-6, Standard Ampere Rating Fuses and Fixed Trip Circuit Breakers.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided substantiation or a signature for this proposal. This proposal does not meet the requirements 4-3.3 of the Regulations Governing Committee Projects concerning content of proposals.

The submitter's intent is to relocate the standard sizes of overcurrent devices to Section 430-52 and Table 430-152. This section belongs in Article 240. Adding text to Article 430 is not

within the Scope of Panel 10. Section 90-1(c) states that the NEC is not intended as a design specification nor an instruction manual for untrained persons, users of Article 430 must also be aware of all other requirements of this code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2876)

10- 17 - (240-6(a)): Reject
SUBMITTER: Michael W. Gordon, Comelco Electric, Inc.
RECOMMENDATION: Revise text to read as follows:
The standard ampere ratings for fuses and inverse time circuit breakers shall be considered 1, 3, 6, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 601, 700, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000, 5000, 6000 amperes.
SUBSTANTIATION: Since there is no qualification or restriction placed on the use of the ratings listed in the exception to 240-6(a), the ratings should be included in the normal text of the code and the exception should be eliminated.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wording does not clarify the issue. Furthermore, the submitter's change would result in deletion of an important sentence dealing with nonstandard ampere ratings.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3867)

10- 18 - (240-6(a)): Accept
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Make the following revision to this section:
Additional ~~The~~ standard ampere ratings for fuses shall be ~~considered~~ 1, 3, 6, 10, and 601.
SUBSTANTIATION: Editorial correction.
PANEL ACTION: Accept.
The panel requests that the proposed revised sentence be placed as the second sentence of the existing code paragraph.
By doing this, the last sentence of this paragraph in the existing code will be deleted.
PANEL STATEMENT: The revised placement of sentences in the paragraph provides greater clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #407)

10- 19 - (240-6(b)): Reject
SUBMITTER: Amos D. Lowrance, Jr., City of Chattanooga, TN
RECOMMENDATION: Revise 240-6(b) to read as follows:
Adjustable-Trip Circuit Breakers. The rating of adjustable-trip circuit breakers having external means for adjusting the current setting (log-time pickup setting), not meeting the requirements of (c), shall be the maximum setting possible. A permanent label shall be placed on or adjacent to the breaker indicating the wire type and size feeding the overcurrent device.
SUBSTANTIATION: The idea behind this is to show at the area of adjustment the size of wire feeding the overcurrent device. This will help prevent the oversizing of the overcurrent device by the electrician.
PANEL ACTION: Reject.
PANEL STATEMENT: An adjustable trip circuit breaker, not meeting the requirements of (c), must be wired for the maximum circuit breaker setting. Since it is being wired as a conventional fixed-circuit-breaker, no additional marking is needed.
The substantiation is somewhat confusing since the application of 240-6(b) is with the protection of wire on the load side of the overcurrent device.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4339)

10- 20 - (240-9): Accept
SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services
RECOMMENDATION: In the second line after short circuits add or ground faults...
In the fourth line after the word ground add faults...
SUBSTANTIATION: To correlate with Code terms. See definition of overcurrent and overload, Article 100.
PANEL ACTION: Accept.
In line 4 of the existing code, change "grounds" to "ground".
PANEL STATEMENT: This is a grammatical correction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2177)

10- 21 - (240-11): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
A current-limiting overcurrent protective device is a device that, when interrupting currents in its current-limiting range, will reduce the current ~~flowing~~ in the faulted circuit...
SUBSTANTIATION: The use of "flowing" is redundant and not needed. Current is defined as the flow of electrons; therefore, it is more proper simply to say "current." The word current is used over 350 times in the code without the use of the words flow or flowing.
PANEL ACTION: Reject.
PANEL STATEMENT: Removal of the word "flowing" may cause confusion. Current-limiting devices, when operating within their current-limiting range, reduce current flowing, not the prospective short-circuit current available at the location of the fault.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3439)

10- 22 - (240-12): Reject
SUBMITTER: Diane L. Ricotta, Ft. Worth, TX
RECOMMENDATION: Revise this section to read:
240-12. Electrical System Coordination. Where an orderly shutdown is required to minimize the hazard(s) to personnel and equipment, the overcurrent protective devices shall be selectively coordinated for all values of overload and available short-circuit current. Under overload conditions, monitoring systems are permitted to cause the condition to go to alarm, allowing corrective action or an orderly shutdown, thereby minimizing personnel hazard and equipment damage.
For the purposes of this section, selective coordination is defined as the proper localization of a fault condition to restrict outages to the equipment affected, accomplished by the choice of selective fault-protective devices.
Remove the existing FPN as it is incorporated into the first paragraph.
SUBSTANTIATION: Current wording permits selective coordination for short circuit conditions and monitoring systems for overload conditions. It does not require selective coordination even though a blackout could result in hazards to both people and equipment. Proposed wording mandates selective coordination where required to minimize hazards to personnel and equipment and allows monitoring systems for overload conditions. Minor changes were made to the definition to clean up the grammar.
PANEL ACTION: Reject.
PANEL STATEMENT: There is confusion between the requirements of the first sentence and the second sentence. Furthermore, the present code language contains the phrase "shall be permitted" and it is considered that this phrase is required. The present FPN does provide explanatory material and it should not be moved into the main text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2EXPLANATION OF NEGATIVE:
DOLLARD: I am voting Negative to the panel action to reject proposal 10-22. My reasons are as follows:

"The present text of Section 240-12 permits coordination, "Where an orderly shutdown is required to minimize the hazard(s) to personnel and equipment."

If an orderly shutdown is required to minimize the hazard(s) to personnel and equipment, then there should be a minimum requirement to provide for an orderly shutdown."

OCKULY: I vote negative on the panel action. I disagree with the panel statement that there is confusion between the requirements of the first sentence and the second sentence of the proposal. The second sentence of the proposal does not modify or conflict with the first sentence. It simply states that system coordination is sometimes achieved under overload conditions by means of monitoring systems. It does not provide an exception to the need for system coordination under overload conditions. The proposal is correct and covers a missing part of supplying a fully coordinated system. As presently written, Section 240-12 does not include requirements for coordination over the full range of an overcurrent protective device's time verus current characteristics including overload, short-circuit, or ground fault. The section only addresses short-circuit.

The potential dangers inherent in a noncoordinated system are every bit as serious if the system overcurrent protective devices cascade out due to overload or ground fault as well as short-circuit.

The international wiring code, specifically IEC 60364, is in the process of considering the need and requirement for coordination in Clause 539.1, discrimination (coordination) between overcurrent protective devices. The NEC should lead in this field. As such, the proposal should be accepted.

(Log #3856)

10- 23 - (240-13): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.

SUBMITTER: J. Philip Simmons, Olympia, WA

RECOMMENDATION: Delete this section and add these requirements to become a new Section 225-41. A companion proposal has been submitted for Section 225-41.

SUBSTANTIATION: Part B of Article 225 deals with disconnecting means for buildings and structures on the premises that are supplied from a service in another building or structure. Section 240-13, which covers equipment ground fault protection requirements for building disconnecting means should be located where the other requirements for building or structure disconnecting means are located.

This should improve the structure of the Code and made the Code more "user friendly."

PANEL ACTION: Reject.

PANEL STATEMENT: The general requirements for ground fault protection of equipment belong in Article 240 dealing with overcurrent protection.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

MUNSON: I agree with the submitter, moving this section to Article 225 will make the code more user friendly. As the code moves into the international arena, it must be easily understood. Associating similar requirements just makes good sense and helps with understanding.

OCKULY: I vote negative on the panel action. I agree with the submitter's proposal. Section 240-13 is redundant and should be removed from the NEC. Ground fault protection of equipment is already covered in numerous sections, including 215-10, 230-95, 426-28, 427-22, 517-17, 690-5 and 700-26.

(Log #4417)

10- 24 - (240-13): Reject

SUBMITTER: Charles Meeker, Electro-Test, Inc.

RECOMMENDATION: Revise text as follows:

240-13. Ground-Fault Protection of Equipment. Ground-fault protection of equipment shall be provided in accordance with the provisions of Section 230-95 for solidly grounded wye electrical systems ~~of more than 150 volts to ground, but not exceeding 600 volts phase-to-phase~~ for each individual device used as a building or structure main disconnecting means. ~~rated 1000 amperes or more.~~

SUBSTANTIATION: There are two reasons for proposing these changes.

1. The deleted words are redundant and unnecessary.
2. To eliminate conflict between proposed changes to 230-95.

The intent of the change is based on the hazards of arcing ground-faults which are determined by total system capacity, and not the size of an individual disconnect rating. Therefore, it is the equipment rating of 1000 amperes or greater that should be used to determine the need for ground-fault protection. For example, the number of individual disconnecting means, as allowed by 230-71, does not reduce the potential hazard to person or equipment of arcing ground-faults, if the rating of the equipment is still 1000 amperes or greater.

PANEL ACTION: Reject.

PANEL STATEMENT: Ground-fault protection of equipment on solidly grounded wye electrical systems rated 1000 amperes or more operating at 480Y/277 volts and 600Y/346 volts was first required in the 1971 Code because of the unusually high number of burndowns reported on these types of systems.

Historically, systems lower than 150 volts to ground do not present the same problems. Also, disconnecting means rated less than 1000 amperes and associated overcurrent devices provide an alternate form of protection.

Ground-fault protection of services will not protect the conductors on the supply side of the service disconnecting means, but is designed to provide protection from line-to-ground faults that occur on the load side of the ground-fault protective device.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #2329)

10- 25 - (240-13(4) (New)): Reject

SUBMITTER: Mark Ptashkin, City of Phoenix, AZ

RECOMMENDATION: Add the following to this section.

(4) Data processing facilities that fall under the scope of Article 645.

SUBSTANTIATION: It has been argued that the loss of power presents the same financial risks to these facilities as it does to industrial facilities. A building owner may wish to preserve the data or the continued operation of the equipment at all costs to the equipment. In other words they would be willing to sacrifice elements of the system to assure its operation, but in so doing, may endanger the well being of occupants in the facility.

Several sections of the code do not require GFP, these include emergency systems, legally required systems, fire pumps, and many areas of hospitals. All of these share a common thread, the activation of the GFP may introduce additional hazards to the welfare of people should they operate. The NEC does not wish to jeopardize the safety of individuals for the continuity of operation of a system that does not provide support for the safety of individuals, or that if it were provided, would endanger individuals through its operation.

The reason for this proposal is to clarify that GFP should be provided in all cases, except where the installation of such equipment would impose an additional hazard to the safety of individuals.

PANEL ACTION: Reject.

PANEL STATEMENT: Loss of power is a financial risk that can be abated by the use of UPS systems and standby generators. The proposal equates financial risk that may be associated with the loss of data with risks associated with loss of power in industrial processes which may include personnel hazards.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #3091)

10- 26 - (240-20(b)): Accept

SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)

RECOMMENDATION: Revise the text in item (b) as follows:

(b) Circuit Breaker as Overcurrent Device. Circuit breakers shall open all ungrounded conductors of the circuit both manually and automatically ~~unless otherwise permitted in (1), (2), or (3)~~.

Exception: Individual single-pole circuit breakers, with or without approved handle ties, shall be permitted as the protection for each ungrounded conductor of multiwire branch circuits that serve only single-phase, line-to-neutral loads except where limited by Section 210-4(b).

~~(1) Except where limited by Section 210-4(b), individual single-pole circuit breakers, with or without approved handle ties, shall be permitted as the protection for each ungrounded conductor of multiwire branch circuits that serve only single-phase, line-to-neutral loads.~~

~~(2) In grounded systems, individual single-pole circuit breakers with approved handle ties shall be permitted as the protection for each ungrounded conductor of line-to-line connected loads for single phase circuits for 3-wire, direct current circuits.~~

~~(3) For line-to-line loads in 4-wire, 3-phase systems or 5-wire, 2-phase systems having a grounded neutral and no conductor operating at a voltage greater than permitted in Section 210-6, individual single-pole circuit breakers with approved handle ties shall be permitted as the protection for each ungrounded conductor.~~

SUBSTANTIATION: The main clause of 240-20(b) in the present Code states that circuit breakers shall open all ungrounded conductors of the circuit unless otherwise permitted in (1), (2), or (3). The implication of the main clause is that circuit breakers are common trip. This is certainly the interpretation of the NFPA National Electrical Code Handbook which states "Section-20(b) requires that if a circuit breaker is used, it must open all ungrounded conductors of the circuit when it trips or is manually operated." The proposed language "Circuit breakers shall open all ungrounded conductors of the circuit both manually and automatically" clarifies this situation.

Many users of circuit breakers are unaware that handle ties do not cause the circuit breaker to serve as a common trip mechanism, but rather that they allow for common switching only. This is clarified in the Handbook that states, "handle tie mechanism circuit breakers are permitted as a substitute for internal common trip mechanism circuit breakers only for limited applications." These limited applications are Exceptions (1), (2), and (3) in the present Code.

This proposal includes removing the permitted areas (2) and (3). These permitted areas deal with the protection of line to line loads, in grounded systems, by individual single-pole circuit breakers with approved handle-ties. With these circuit breakers, and for this type of load, an overcurrent could be removed by the tripping of one of the individual circuit breakers. Under these circumstances, voltage would still be present on the deenergized load. Removal of these two permitted areas would cause circuit breaker users to use common trip circuit breakers for line to line loads in grounded systems. These circuit breakers are commonly available with the same physical size as handle-tied individual single-pole circuit breakers. In fact, the common-trip-breakers are frequently difficult to distinguish from the non-common-trip breakers because both types can be equipped with handle-ties. In both cases the ties are associated with the manual switching operation of all poles. The advantage of the common trip circuit breaker would be the removal of both current and voltage at the load.

The proposal maintains permitted area (1), which has been rewritten as an exception to the main clause 240-20(b). This exception deals with the protection of line to neutral loads. In this case, an overcurrent in one of the load circuits could be removed by the tripping of one individual single-pole circuit breaker. The significant point is that voltage would also be removed from that particular deenergized load.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

ELDRIDGE: This proposal should have been: Accept in Part, in Principle. Add the words as follows:

"Circuit breakers shall simultaneously open all ungrounded conductors of the circuit by means of a common trip mechanism unless otherwise permitted in (1), (2), or (3)."

Common trip is used in the UL product standard and is recognized in the industry. The remaining portion shall remain unchanged, as the substantiation has presented no documented problems with handle ties. This is the same as trying to require common trip fuses.

This proposal has been presented with no substantiation other than to delete the two subsections to "provide better protection and to follow the National Fire Protection Association handbook." If protection was the problem, why allow fuses to be used since they cannot be common trip. Circuit breakers with approved handle ties must be used on a grounded system. Is this any different than the way fuses are used with the same system? The ONLY reason for the handle ties is to provide for common switching, the same as in the realm of safe fusing practices.

The question of safety was raised in the panel discussions. The failure of a load to continue to operate is not sufficient to determine that a circuit is dead and is a violation of all safety rules that I know of with or without common-trip breakers or fuses. It is not reasonable to assume a circuit is dead without testing for the presence of voltage.

I understand the cost of common trip circuit breakers is not much more than single pole breakers, cost is not the problem; however, I have found that the cost of common trip circuit breakers is 15 percent to 30 percent over single pole circuit breakers without handle ties. It appears that this may be an attempt by the circuit breaker manufacturers to sell a more expensive product. Deleting (2) and (3) will require all line-to-line loads to have the more expensive "common trip" circuit breakers. In dwelling units this will include all 240-volt circuits.

MUNSON: The purpose of the handle tie is to achieve full manual disconnection of a load during servicing or shut down. If normal, safe operation of an appliance or piece of utilization equipment requires protection with a circuit breaker that automatically interrupts all ungrounded lines by means of internal common trip construction, then such requirement should be a required marking on the appliance or part of the manufacturer's installation literature.

OCKULY: I vote negative on the panel action. Single-pole circuit breakers with approved tie handles have been used safely for decades. The submitter has provided no evidence or substantiation of a problem. This proposal would remove from the code a long-standing safe installation method of using single-pole circuit breakers with or without approved tie handles on single-phase line-to-line circuits.

Acceptance of this proposal also would create significant problems where a single-pole CB with an approved tie handle must be replaced. The proposal would require replacing not only the defective CB but, also the perfectly good companion CB connected by the tie handle. For some installations, it would be difficult and sometimes impossible to find a replacement two-pole common trip CB to replace the defective single-pole unit.

The NEC permitted two single-pole circuit breakers without tie handles from the 1960's through the 1993 NEC. The 1996 NEC introduced "approved tie handles" to address the issue of common disconnecting of the circuit.

The long, safe history of applying single-pole circuit breakers (even without handle ties) speaks for itself. There is no justification to require common trip CBs on single-phase line-to-line circuits.

COMMENT ON AFFIRMATIVE:

KIMBLIN: The expectation, for multipole circuit breakers, is that the poles not only switch together under manual operation, but that the poles open together due to the presence of overcurrents in any individual pole. Handle-ties indeed ensure the simultaneous switching of all poles, but do not ensure the opening of all poles in the presence of overloads and short circuits. The present proposal permits the continued use of handle-tied circuit breakers on line to neutral loads. Here, operation of a single pole interrupts the load current and also removes voltage from that load. However, the proposal does not permit the continued use of handle-tied circuit breakers on line to line connected loads. Here, operation of a single pole interrupts the load current but does not necessarily remove voltage from the load. It is noted that the titles, identified in Panel Proposal 10-26a, will not be needed if Proposal 10-26 is accepted.

(Log #CP1002)

10- 26a - (240-20(b)(1), (2), (3)): Accept

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 10-26. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 10

RECOMMENDATION: Revise 240-20 to read as follows:

"240-20. Ungrounded Conductors

(b) Circuit Breaker as Overcurrent Device. Circuit breakers shall open all ungrounded conductors of the circuit unless otherwise permitted in (1), (2), or (3).

(1) Line-to-Neutral Single Phase Loads. Except where limited by Section 210-4(b), individucal single-pole circuit breakers, with or without approved handle ties, shall be permitted as the protection for each ungrounded conductor of multiwire branch circuits that serve only single-phase, line-to-neutral loads.

(2) Line-to-Line Loads. In grounded systems, individual single-pole circuit breakers with approved handle ties shall be permitted as the protection for each ungrounded conductor for line-to-line connected loads for single-phase circuits or 3-wire, direct-current circuits.

(3) Line-to-line Loads in Polyphase Systems. For line-to-line loads in 4-wire, 3-phase systems or 5-wire, 2-phase systems having a grounded neutral and no conductor operating at a voltage greater than permitted in Section 210-6, individual single-pole circuit

breakers with approed handle ties shall be permitted as the protection for each ungrounded conductor."
SUBSTANTIATION: The proposed change is to provide titles to these second level subdivisions as required by 2.1.5.2 of the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1781)

10- 27 - (240-21(b)(1)(d), FPN): Accept
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Revise FPN to read as follows:
"For overcurrent protection requirements for lighting and appliance branch-circuit panelboards and certain power panelboards, see Sections 384-16(a), (b), and (e)."
SUBSTANTIATION: Section 384-16 was revised in the 1999 NEC to require overcurrent protection of some power panelboards, so the advice of this FPN should include such information. Otherwise, the FPN in incomplete and inaccurate.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #628)

10- 28 - (240-21(b)(3)b): Reject
SUBMITTER: Vohn N. Peeler, Faith, NC
RECOMMENDATION: Delete existing Section 240-21(b)(3)b and replace with new wording as listed below:
The ampacity of the conductors supplied by the transformer secondary shall not be less than the following: Divide the rating of the overcurrent device protecting the feeder by 3. Multiply this number by the ratio of primary to secondary voltage to find the required ampacity.
SUBSTANTIATION: While I believe the current wording is correct, I also believe that it is difficult to interpret and easy to misapply. I have been teaching the NEC and other electrical courses for many years. I am currently using a textbook written by a well-known code expert. I am convinced that the code expert has misapplied this section. Here is the basic example:
The feeder OCPD is rated 600 amps.
The transformer is 480V primary and 240V secondary.
The tap conductor to the primary side of the transformer is found this way: 1/3(600A) = 200A
The secondary tap conductor is found this way: (1/3)(600A)(.5)= 100A.
I believe it is intended that the ampacity of the secondary tap conductor should be 400A.
If code experts have trouble interpreting this section, then rewording is needed to give the rest a chance.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter acknowledges that the present wording is correct. It is unnecessary to add specific instructions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2330)

10- 29 - (240-21(b)(5)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Change this section as follows, add underlined text and delete strike through text.
"Where the conductors are ~~located outdoors,~~ routed outside a building, except at the ~~point~~ points of termination, and comply with all of the following conditions."
SUBSTANTIATION: This editorial change would permit the feeders to be located under a building as is permitted by 230-6 for service conductors. It seems that the articles intent was to permit any length of unprotected conductor provided it was routed outside of the building.
The change from point to points would allow both ends of a tap to be in the same building provided that they immediately exit and then terminate nearest the point of entry. This change should not have a negative impact on safety, in fact it should in most cases have a shorter length of unprotected conductor in the building than the 10 or 25 ft tap rules.
PANEL ACTION: Reject.
PANEL STATEMENT: Changing the word "point" to "points" implies multiple points of termination and could allow overcurrent protection in excess of the original tap conductor rating, thereby, creating a safety concern.
Section 240-21(b)(5) deals with outside taps. In order to avoid tapping a tap, the proposal would require protection of the incoming tap at its ampacity per 240-21(b)(5)(b). However, the second point of entry would require exactly the same protection. This means that the first incoming outside tap could be overloaded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BORTHICK: I agree with the panel action to reject this proposal.
Allowing tap conductors of unlimited length without size restriction removes any maximum limit on circuit (feeder) impedance. With no tap limitations a short-circuit or ground-fault in the tap conductors might not deliver sufficient current to operate the feeder overcurrent protective device quickly enough to prevent damage to the tap conductors or combustibles surrounding them. To permit multiple entry and exit points of these tap conductors allows even more length of these "unprotected conductors" inside a building where persons are in closer proximity.

(Log #4062)

10- 30 - (240-21(b)(5)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.
RECOMMENDATION: Revise text as follows:
(5) Outside Taps of Unlimited Length. Where the conductors are located outdoors, except at the point of termination, and comply with all of the following conditions.
a. The conductors are suitably protected from physical damage.
b. ~~The conductors terminate at a single circuit breaker or a single set of fuses that will limit the load to the ampacity of the conductors. This single overcurrent device shall be permitted to supply any number of additional overcurrent devices on its load side.~~ The conductors supply a building or other structure in conformance with the requirements of Article 225.
c. The overcurrent device for the conductors is either an integral part of ~~b~~ the disconnecting means specified in Part B of Article 225 or ~~shall be~~ located immediately adjacent thereto.
d. ~~The disconnecting means for the conductors are installed at a readily accessible location either outside of a building or structure, or inside nearest the point of entrance of the conductors.~~ The overcurrent protection complies with Section 230-90.
SUBSTANTIATION: Article 225 recognizes buildings served by a feeder. Part B of Article 225 specifies the required disconnecting means for the building or structure. Whether a building is supplied by a service per Article 230 or a feeder per Article 225, the conductors are protected from overload if such protection complies with 230-90. There is no technical justification to treat the building feeder conductor overcurrent protection differently than that required for service conductors in 230-90. Both must be sized to carry the computed load. This is particularly true recognizing that the feeder conductors have short circuit protection on their supply side. For example, when the ownership of the feeder supply conductors change due to a relocation of the service point as frequently occurs, present 240-21(b)(5) in many instances would require the unnecessary installation of a single main overcurrent device to protect the same tap conductors that are adequately protected by conformance with the requirements of 230-90. Section 225-33 permits the supply feeder to terminate in up to six disconnect switches. This proposal resolves the apparent conflict between the requirements of 225-33 and 240-21(b)(5).
PANEL ACTION: Reject.
PANEL STATEMENT: Addressing first of all Article 225, here the feeder conductors are protected, at their ampacity, at their source. If the feeder conductors were taps, then they would have to be installed in accordance with 240-21(b). In particular, they would need to terminate in a single overcurrent device as per 240-21(b)(5)(b). With respect to 230-90, the service conductors (the conductors from the service point to the service disconnecting means) are indeed protected, at their ampacity, by up to six overcurrent devices. However, these six overcurrent devices are not necessarily sized to protect the utility conductors, of unlimited length, which lead to the service point. Outside feeder tap

conductors fall under the jurisdiction of the Code, and it is necessary to protect these conductors at their ampacity, even though the overcurrent protective device is at the load end of the conductors. A single overload protective device is necessary to ensure overload protection of this tap. With respect to the equipment, changes associated with a change of ownership, this change is also associated with a change of safety-responsibility. A single overcurrent device is mandated unless the plant falls under Part H of Article 240, Supervised Industrial Installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: Proposal 10-30 should have been accepted. Addressing the panel statement, the tap feeder conductors are sized to carry the load and protected at their load end, the same as all taps. Short circuit and ground fault protection is provided at the source of the feeder. The tap conductors would be protected better if the overcurrent protection were in multiple overcurrent devices instead of a single overcurrent device because of the diversity. Overload, short circuit or a ground fault on the load side of the smaller overcurrent device would have lesser effect on the tap conductors than if it were on the load side of a single, larger overcurrent device. The panel statement does not respond to these facts in its assertion that a single overcurrent device is necessary.
A change in ownership associated with the sale of a utility installation to a customer would not change the safety of the former service conductors, now classified as tap conductors.
The following information was sent to Stanley D. Kahn, who was chairman of CMP 10 at the time, on February 23, 1996. It was the outcome of a CMP 4 Task Group established at the direction of the Correlating Committee as the result of action on the part of Panel 10, which was considered outside its scope.
The following was CMP 4's unanimous Task Group Response to CMP 10:
"1. Substantiation referencing utility practices has no bearing on dictating changes to the requirements of the number of disconnects allowed for a feeder.
2. The number of disconnects referenced in Proposal 10-60 (this was Proposal 10-60 for the 1996 cycle) would be compatible with the requirements for a feeder found in Article 225. Six Disconnects installed at a location, in a single enclosure or in separate enclosures grouped together, would constitute a safe installation."
Copies of this was sent to Harold Ware, Don Strassburg (Task Group Chair), Mark Earley, and John Troglia.
Service conductors are permitted to be protected by up to six disconnecting means and there is no justification why feeders, which supply a building or other structure, should not be allowed the same measure of protection.
This has presented a problem of lack of coordination between Article 225 and 240 that will continue if not addressed this code cycle. Since there is a conflict between these two articles, the TCC should help resolve this issue.
FREDERICKS: I'm voting against the panel action on this proposal, which should have been accepted.
The panel should consider that installations with from two to six grouped disconnects are presently allowed for feeders in Article 225, and for transformer secondary protection in Article 450. The panel statement gave no justification for its claim that a single overcurrent device is required to limit the load at the end of the tap conductors and that this same effect could not be accomplished with up to six grouped overcurrent devices. Indeed, Articles 225 and 450 recognize this method of protection, so this panel action results in a lack of correlation with these articles.
MUNSON: The proposal should be Accepted in Principle. The panel statement correctly identifies the problem. In Article 230, the six handles are permitted to allow for an orderly shutdown in the case of emergency. The six sets of overcurrent devices do not protect the utility. In Article 240, we are dealing with two issues, the orderly shutdown in the case of an emergency and secondly, ensuring that the tap does not become overloaded by future additions that increase the number of "handles" past six or that increase the total load above the ampacity of the tap. The panel should Accept this proposal in Principle, and require identification of the uniqueness of the construction; only six "handles" permitted and the maximum total load for the tap.
COMMENT ON AFFIRMATIVE:
BORTHICK: I agree with the panel action to reject this proposal: 240-21(b) general statement allows conductors to be tapped to a feeder. Each of the proposed changes is to allow up to five additional taps to be tapped to the tap. The second sentence of 240-21 specifically prohibits this.

(Log #2111)

10- 31 - (240-21(b)(5)b): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise the text in 240-21(b)(5)b as follows:
b. The conductors, if smaller than 250 kcmil, terminate at a single circuit breaker or a single set of fuses that will limit the load to the ampacity of the conductors. This single overcurrent device shall be permitted to supply any number of additional overcurrent devices on its load side. For conductors larger than 250 kcmil, the overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses grouped in one location.
SUBSTANTIATION: The overcurrent device referenced here is providing overload, not short circuit protection. There is no valid overcurrent-protection reason to limit the number of devices used to provide this protection, at least for larger circuits. The time-honored NEC limit of six devices, based on disconnection reasons, is proposed here. One comment made against similar proposals for the 1999 NEC was that there was no limit on the size of the conductors allowed to be terminated with six disconnects; this proposal addresses that comment.
PANEL ACTION: Reject.
PANEL STATEMENT: No justification has been presented for dealing in a different manner with feeder tap conductors smaller than 250 kcmil and feeder tap conductors larger than 250 kcmil. A single overcurrent device should be used in both cases. Also, see panel action and statement on proposal 10-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: This proposal should have been Accept in Principle, see my comments on Proposal 10-30.
FREDERICKS: This proposal should have been accepted in principle, see my Explanation of Negative Vote on Proposal 10-30.
MUNSON: See my Explanation of Negative on Proposal 10-30.

(Log #2289)

10- 32 - (240-21(b)(5)(b)): Reject
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Delete existing text and insert new text to read:
"The conductors terminate in an overcurrent device that will limit the load to the ampacity of the conductors. The overcurrent device shall be permitted to consist of not more than six circuit breakers or sets of fuses grouped in one location."
SUBSTANTIATION: Other sections allowing six disconnects:
225-33 More than one building or structure
230-71 Services
240-92(b)(2) from your own panel guys!
240-92(c) from your own panel guys!
450-3(a) and (b) Transformers.
The general membership voted for six at the 1998 meeting. The NEC should be responsive to the needs of the industry and this section is not.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 10-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: This proposal should have been accept in principle, see my comments on Proposal 10-30.
FREDERICKS: This proposal should have been accepted in principle, see my Explanation of Negative Vote on Proposal 10-30.
MUNSON: See my Explanation of Negative on Proposal 10-30.

(Log #2916)

10- 33 - (240-21(c)): Reject
SUBMITTER: Arthur J. Carlson, City of Pocatello, ID
RECOMMENDATION: Revise text to read:
(c) Transformer Secondary Conductors. Conductors shall be permitted to be connected to a transformer secondary, ~~without overcurrent protection at the secondary,~~ as permitted in (1) through (4).
SUBSTANTIATION: 240-21(c) is about transformer secondary wiring with and without over current protection.
PANEL ACTION: Reject.
PANEL STATEMENT: Conductors attached to a transformer secondary are not required to have an overcurrent device(s) at that location where the provisions in (1) through (4) are followed. Therefore, the present wording is appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3286)

10- 34 - (240-21(c)): Accept
SUBMITTER: James T. Pauley, Square D Co.
RECOMMENDATION: In 240-21(c), main paragraph revise "(4)" to be "(6)".
In 240-21(c)(3), revise the title as follows: (3) Industrial Installation Secondary Conductors Not Over 25 ft Long.
Add a new (6) to 240-21(c) to read as follows:
(6) Secondary Conductors Not Over 25 ft Long. Where the length of secondary conductor does not exceed 25 ft and complies with all of the following.
(a) The secondary conductors shall have an ampacity that, when multiplied by the ratio of the secondary-to-primary voltage, is at least one-third of the rating of the overcurrent device protecting the primary of the transformer.
(b) The secondary conductors terminate in a single circuit breaker or set of fuses that will limit the load current to not more than the conductor ampacity that is permitted by Section 310-15.
(c) The secondary conductors are suitably protected from physical damage.
SUBSTANTIATION: The objective of this proposal is to solve a long-time problem of "How do I get a 25' secondary on a transformer?" The Code has allowed a 25' secondary by applying the rules in 240-21(b)(3) and making the primary conductors "fully protected" to allow the full 25' on the secondary. The problem with using this rule is two fold. First, the rule is actually for a transformer circuit that is "tapped" to a feeder. In many cases, the circuit is not tapped to a feeder, but it is a direct connection to the feeder overcurrent device. Secondly, getting the user of the NEC to sort through the rule to get to a simple 25' tap is a complex task. The AHJ must "liberally" interpret the "tap" concept to allow it to be applied to a transformer primary directly connected to a feeder OCP.
The new (6) is based on three key rules from 240-21(c)(3)...items b, d and e. The 25' secondary would have to terminate in a single OCP to limit the load and would also have to comply with the 1/3 rule when multiplied by the secondary-to-primary voltage ratio.
The revisions proposed for 240-21(c) and 240-21(c)(3) are really editorial changes to correlate with the new item (6). The recommended title change in (c)(3) would allow the user to easily distinguish the more liberal "industrial installation" rule from the general proposed 25' tap rule.
This proposal will simplify something that is permitted today, but takes considerable explaining to get there.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3936)

10- 35 - (240-21(c)): Reject
SUBMITTER: William F. Laidler, Town of Hanover, MA
RECOMMENDATION: Delete the existing 240-21(c)(2) Transformer Secondary Conductors Not Over 10 ft Long.
Renumber existing 240-21(c)(3) as (2) and strike the restrictive wording "For industrial installations only" to read as follows:
(2) Secondary Conductors Not Over 25 ft (7.62 m) Long. ~~For industrial installations only,~~ where the length of the secondary conductors do not exceed 25 ft (7.62 m) and complies with all of the following:
Add the FPN from the deleted 240-21(c)(2) where it's still relevant to this section.
FPN: For overcurrent protection requirements for lighting and appliance branch-circuit panelboards, see Sections 384-16(a) and (e).
Renumber the remaining sections of 240-21(c) accordingly.
SUBSTANTIATION: As the current Code reads, the maximum length of transformer secondary conductors for other than industrial installations is limited to ten feet (total conductor length). There are many installations in non industrial locations where these conductors are installed without overcurrent protection at their point of supply and exceed the restrictive limitation of 10 feet. In short, the 25 foot rule has been used extensively without a rash of failures.
With the requirement of most equipment in least amount of space it is becoming quite common to install elevated transformers if the secondary conductor installations conform with the requirements of (c)(3) 25 foot rule so to say than whether industrial or commercial the minimum safety requirements are met.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree with the need for deleting the restriction "for industrial installations only." For general use as a 25 foot tap rule, more restrictions must be imposed, such as a requirement for the conductors to be enclosed in a raceway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1171)

10- 36 - (240-21(c)(1)): Accept in Principle
SUBMITTER: John Calice, Peter Basso Assoc., Inc.
RECOMMENDATION: Revise text to read:
(c) Transformer Secondary Conductors. Conductors shall be permitted to be connected to a transformer secondary, without overcurrent protection at the secondary, as specified in (1) through (4).
FPN: For overcurrent protection requirements for transformers, see Section 450-3.
(1) Protection by Primary Overcurrent Device. ~~Single-phase (other than 2-wire) and multiphase (other than delta-delta, 3-wire) transformer secondary conductors are not considered to be protected by the primary overcurrent protective device.~~ Conductors supplied by the secondary side of a single-phase transformer having a 2-wire (single-voltage) secondary, or a three-phase, delta-delta connected transformer having a 3-wire (single-voltage) secondary, shall be permitted to be protected by overcurrent protection provided on the primary (supply) side of the transformer, provided this protection is in accordance with Section 450-3 and does not exceed the value determined by multiplying the secondary conductor ampacity by the secondary to primary transformer voltage ratio.
(a) Single-phase (other than 2-wire) and multiphase (other than delta-delta, 3-wire) transformer secondary conductors shall have primary and secondary overcurrent protection.
SUBSTANTIATION: This proposal addresses the ambiguous wording regarding transformer primary protection only, and primary and secondary protection requirements for transformer secondary conductor overcurrent protection.
PANEL ACTION: Accept in Principle.
Remove the existing first sentence of code section 240-21(c)(1) and reinsert it as a second paragraph of existing 240-21(c)(1).
PANEL STATEMENT: This change clarifies the intent of 240-21(c)(1). The proposed change of wording is not accepted since it changes the intent of this section. No substantiation was provided for the additional changes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP1001)

10- 36a - (240-21(c)(2) FPN): Accept
SUBMITTER: CMP 10
RECOMMENDATION: Revise FPN following 240-21(c)(2) to include new subsection added to 384-16 in the 1999 Cycle as follows:
"FPN: For overcurrent protection requirements for lighting and appliance branch-circuit panelboards and certain power panelboards, see 384-16(a), (b), and (e)."
SUBSTANTIATION: The proposed wording revises this informational Fine Print Note to include new requirements added to 384-16 in the 1999 cycle.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2331)

10- 37 - (240-21(c)(4)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Revise the current paragraph as follows, add underlined text and delete strike through text.
"Where the conductors are ~~located outdoors,~~ routed outside a building, except at the ~~point~~ points of termination, and comply with all of the following conditions."
Add the following part (e):
(e) The secondary conductors immediately exit the building.
SUBSTANTIATION: This editorial change would permit the feeders to be located under a building as is permitted by 230-6 for service conductors. It seems that the articles intent was to permit any length of unprotected conductor provided it was routed outside of the building. Currently the article suggests that conductors are to be outdoors, underground conductors would not be permitted.
The change from point to points would allow both ends of the secondary conductor to be in the same building provided that they immediately exit and then terminate nearest the point of entry. As presently worded the transformer must be located outside the building. Placing the transformer inside a building should have little if any additional hazard to the structure and in fact may improve service continuity. This change should not have a negative impact on safety, in fact it should in most cases have a shorter length of unprotected conductor in the building than the 10 or 25 ft tap rules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 10-29. In addition, the proposal, as written, could allow multiple-tapping of the original tap conductors, subjecting them to overload.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3265)

10- 38 - (240-21(c)(4)): Accept
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise NEC 240-21(c)(4) with the addition (underlined) as shown. The entire text of 240-21(c)(4) is shown for clarity, but only the change shown underlined is part of this proposal.
(4) Outside Secondary Conductors of Unlimited Length. Where the conductors are located outdoors, except at the point of termination, and comply with all of the following conditions.
SUBSTANTIATION: The proposal is a simple revision to make the heading more consistent with the actual rule and to also be consistent with feeder tap heading found in 240-21(b)(5) Outside Taps of Unlimited Length.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4063)

10- 39 - (240-21(c)(4)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.
RECOMMENDATION: Revise text as follows:
(4) Outside Secondary Conductors. Where the conductors are located outdoors, except at the point of termination, and comply with all of the following conditions:
a. The conductors are suitably protected from physical damage.
b. ~~The conductors terminate at a single circuit breaker or a single set of fuses that will limit the load to the ampacity of the conductors. This single overcurrent device shall be permitted to supply any number of additional overcurrent devices on its load side.~~ The conductors supply a building or other structure in conformance with the requirements of Article 225.
c. The overcurrent device for the conductors is either an integral part of ~~b~~ the disconnecting means specified in Part B of Article 225 or ~~shall be~~ located immediately adjacent thereto.
d. ~~The disconnecting means for the conductors are installed at a readily accessible location either outside of a building or structure, or inside nearest the point of entrance of the conductors.~~ The overcurrent protection complies with Section 230-90.
SUBSTANTIATION: Article 225 recognizes buildings served by a feeder. Part B of Article 225 specifies the required disconnecting means for the building or structure. Whether a building is supplied by a service per Article 230 or a feeder per Article 225, the conductors are protected from overload if such protection complies with 230-90. There is no technical justification to treat the building feeder conductor overcurrent protection differently than that required for service conductors in 230-90. Both must be sized to carry the computed load. This is particularly true recognizing that the feeder conductors have short circuit protection on their supply side. For example, when the ownership of the secondary conductors change due to a relocation of the service point to the primary side of the transformer, as frequently occurs, present 240-21(c)(4) in many instances would require the unnecessary installation of a single main overcurrent device to protect the same conductors that are adequately protected by conformance with the requirements of 230-90. Section 225-33 permits the supply feeder to terminate in up to six disconnect switches. This proposal resolves the apparent conflict between the requirements of 225-33 and 240-21(c)(4).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 10-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: Proposal 10-39 should have been accepted. Addressing the panel statement, the tap feeder conductors are sized to carry the load and protected at their load end, the same as all taps. Short circuit and ground fault protection is provided at the source of the feeder. The tap conductors would be protected better if the overcurrent protection were in multiple overcurrent devices instead of a single overcurrent device because of the diversity. Overload, short circuit or a ground fault on the load side of the smaller overcurrent device would have lesser effect on the tap conductors than if it were on the load side of a single, larger overcurrent device. The panel statement does not respond to these facts in its assertion that a single overcurrent device is necessary.
A change in ownership associated with the sale of a utility installation to a customer would not change the safety of the former service conductors, now classified as tap conductors.
The following information was sent to Stanley D. Kahn, who was chairman of CMP 10 at the time, on February 23, 1996. It was the outcome of a CMP 4 Task Group established at the direction of the Correlating Committee as the result of action on the part of Panel 10, which was considered outside its scope.
The following was CMP 4's unanimous Task Group Response to CMP 10:
"1. Substantiation referencing utility practices has no bearing on dictating changes to the requirements of the number of disconnects allowed for a feeder.
2. The number of disconnects referenced in Proposal 10-60 (this was Proposal 10-60 for the 1996 cycle) would be compatible with the requirements for a feeder found in Article 225. Six Disconnects installed at a location, in a single enclosure or in separate enclosures grouped together, would constitute a safe installation."
Copies of this were sent to Harold Ware, Don Strassburg (Task Group Chair), Mark Earley, and John Troglia.
Service conductors are permitted to be protected by up to six disconnecting means and there is no justification why feeders, which supply a building or other structure, should not be allowed the same measure of protection.
This has presented a problem of lack of coordination between Article 225 and 240 that will continue if not addressed this code cycle. Since there is a conflict between these two articles, the TCC should help resolve this issue.

FREDERICKS: This proposal should have been accepted in principle, see my Explanation of Negative Vote on Proposal 10-30.
MUNSON: See my Explanation of Negative on Proposal 10-30.

(Log #2294)

10- 40 - (240-21(c)(4)(b)): Reject
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Delete existing text and insert new text to read:
"The conductors terminate in an overcurrent device that will limit the load to the ampacity of the conductors. The overcurrent device shall be permitted to consist of not more than six circuit breakers or sets of fuses grouped in one location."
SUBSTANTIATION: Other sections allowing six disconnects:
225-33 More than one building or structure
230-71 Services
240-92(b)(2) from your own panel guys!
240-92(c) from your own panel guys!
450-3(a) and (b) Transformers.
The general membership voted for six at the 1998 meeting. The NEC should be responsive to the needs of the industry and this section is not.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 10-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
ELDRIDGE: This proposal should have been Accept in Principle. See my Explanation of Negative Vote on Proposal 10-39.
FREDERICKS: This proposal should have been accepted in principle, see my Explanation of Negative Vote on Proposal 10-30.
MUNSON: See my Explanation of Negative Vote on Proposal 10-30.

(Log #738)

10- 41 - (240-24(a)(3), (b)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a)(3) For overcurrent devices, as described in Section 225-40~~. and 230-92.~~
(b) Occupancy. Each occupant shall have ready access to all overcurrent devices protecting the conductors supplying that occupancy. Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the service, overcurrent devices, feeder and branch circuit overcurrent devices supplying more than one occupancy shall be permitted to be accessible to only authorized management personnel in the following:
(1) In multiple occupancy buildings.
(2) For guest rooms of hotels and motels that are intended for transient occupancy.
SUBSTANTIATION: Although Section 230-92 refers to readily accessible the substance appears related to accessible. (See my proposal for that section).
It seems reasonable to include branch circuit overcurrent devices. Branch circuit panelboards serving more than one occupancy are commonly installed in hallways of hotels and motels and locked (not accessible) This section does not permit such locking.
PANEL ACTION: Accept in Principle in Part.
1. The panel accepts the principle of allowing restricted access to the overcurrent devices supplying the guest rooms of hotels and motels.
2. The remainder of the proposal is rejected.
PANEL STATEMENT: 1. See panel action and statement on Proposal 10-41a.
2. The reference to Section 230-92 is necessary to allow tenants accessiblity to their branch circuits. Adding "and branch circuit" would be in conflict with Section 230-92.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP1006)

10- 41a - (240-24(b)): Accept
SUBMITTER: CMP 10
RECOMMENDATION: Revise as follows:
(b) Occupancy. Each occupant shall have ready access to all overcurrent devices protecting the conductors supplying that occupancy.
Exception No. 1: Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the service overcurrent devices and feeder overcurrent devices supplying more than one occupancy shall be permitted to be accessible to only authorized management personnel in the following:
1. In multiple occupancy buildings.
2. For guest rooms of hotels and motel that are intended for transient occupancy.
Exception No. 2: Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the branch circuit overcurrent devices supplying any guest rooms shall be permitted to be accessible to only authorized management personnel for guest rooms of hotels and motels that are intended for transient occupancy.
SUBSTANTIATION: It is important to permit restricted access to the branch circuit overcurrent protective devices in hotels and motels from tampering by unauthorized personnel.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4177)

10- 42 - (240-24(b), Exception): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 4-122. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add an exception at the end of the subsection after all listed items, as follows:
Exception to all of Section 240-24(b): In a multiple occupancy building where each occupant has grouped, readily accessible means to disconnect all ungrounded conductors within that occupancy with no more than six motions of the hand, the overcurrent devices protecting the source of supply to that occupancy shall be permitted to be accessible to authorized management personnel only.
SUBSTANTIATION: There is no existing permission to shelter these feeder overcurrent protective devices from access by the occupancy they protect. Unless favorable action is taken here, the permission to allow this very practical, workable installation will remain absent. There will not be confusion because this wording exactly correlates with wording sent to CMP 4 under a companion proposal on the same topic.
Relief is needed. Consider an underground service to a package store on the first floor and basement, with an apartment upstairs. Does anyone seriously believe the package store owner is going to allow the apartment tenant access to his basement on a 24-hour basis? The other exception doesn't apply since there is no "continuous building management supervision." The present requirements are not realistic for many of these small occupancies. The result is anarchy, as jurisdiction by jurisdiction the rule is avoided or unen-forced in many different ways. The submitted wording is working well in Massachusetts as a part of its electrical code. Everyone is playing on a level playing field, applying a workable, consistent rule.
In the last cycle, the Panel rejected this on the basis that it would deprive the occupant of access to the overcurrent device protecting the premises. The same is true of service devices, and yet we allow them to be inaccessible if downstream devices are accessible. This concept has been extended on the load side of the service into separate buildings (Sec. 225-40). Although each of these provisions allow for smaller sized branch devices, the fact is that the parent device could trip on overload, and the tenant would have no access to reset it. This proposal is a very modest extension of this well-established concept.
PANEL ACTION: Reject.

PANEL STATEMENT: Other provisions can be made, such as building a separate room in the basement or moving the service equipment outside the building. Acceptance of this proposal would create an unsafe situation for the occupants.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4435)

10- 43 - (240-24(b)(1)): Reject
SUBMITTER: Vinson Owyoung
RECOMMENDATION: Revise text as follows:
(1) In multiple occupancy buildings, (excluding apartment buildings).
SUBSTANTIATION: In multiple occupancy buildings (apartments) when the building manager is not on site how do you check your power when only authorized management personnel have access.
PANEL ACTION: Reject.
PANEL STATEMENT: 240-24(b)(1) requires tenant access directly or via continuous building management supervision.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1934)

10- 44 - (240-24(e)): Reject
SUBMITTER: Warren Kohm, Briner Electric
RECOMMENDATION: Revise as follows:
240-24. Location in or on Premises.
(3) Not Located in Bathrooms. ~~In dwelling units and guest rooms of hotels and motels,~~ Overcurrent devices, other than supplementary overcurrent protection, shall not be located in bathrooms as defined in Article 100.
SUBSTANTIATION: Overcurrent devices should not be allowed in bathrooms regardless of the type of occupancy. Many bathrooms have locks on the doors that can only be unlocked from the inside. When the bathroom is occupied and the door is locked, the overcurrent devices are no longer readily accessible to the other building occupants.
PANEL ACTION: Reject.
PANEL STATEMENT: A primary reason for not locating overcurrent devices in the bathrooms of dwelling units and guest rooms of hotels and motels is due to environmental conditions and the occupant's proximity to multiple grounded surfaces. It is not a question of access because, generally, a locked door would be associated with the presence of a person, within the bathroom, who could provide access. It is noted that a ban on overcurrent devices in all bathrooms would be extremely restrictive. For example, bathrooms within commercial buildings and recreational areas are usually of large size, and trained personnel would usually interact with panelboards in those areas.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #CP1003)

10- 44a - (240-30(a), (b)): Accept
SUBMITTER: CMP 10
RECOMMENDATION: Revise 240-30 to read as follows:
"240-30. General
(a) Protection from Physical Damage. Overcurrent devices shall be protected from physical damage by one of the following:
(1) Installation in enclosures, cabinets, cutout boxes, or equipment assemblies
(2) Mounting on open-type switchboards, panelboards, or control boards that are in rooms or enclosures free from dampness and easily ignitable material, and are accessible only to qualified personnel
(b) Operating Handle. The operating handle of a circuit breaker shall be permitted to be accessible without opening a door or cover."
SUBSTANTIATION: The proposed change is to provide titles to second level subdivisions as required by 2.1.5.2 of the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3795)

10- 45 - (240-33): Reject
SUBMITTER: John I. Williamson, Minnesota Board of Electricity
RECOMMENDATION: Modify the wording in this section as follows:
Vertical Position. Enclosures for overcurrent devices shall be mounted in a vertical position. Circuit breaker enclosures shall be permitted to be installed horizontally where the circuit breaker is installed in accordance with Section 240-81. Enclosures for overcurrent devices shall not be mounted in a face-up position. Listed busway plug-in units shall be permitted to be mounted in orientations corresponding to the busway mounting position.
SUBSTANTIATION: The change in the 1999 NEC that permitted horizontal mounting of overcurrent device enclosures has been interpreted to mean that such enclosures are permitted to be installed in a face-up position. Installing such enclosures in a face-up position increases the risk of physical damage or contamination by foreign materials.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any substantiation indicating an existing problem or hazard that needs to be corrected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4178)

10- 46 - (240-33): Accept in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Enclosures for overcurrent devices shall be mounted in a vertical position unless that is shown to be impracticable. Circuit breaker enclosures ~~shall be permitted to be installed~~ mounted horizontally ~~where the circuit breaker is installed in accordance~~ shall comply with Section 240-81. Listed busway plug-in units shall be permitted to be mounted in orientations corresponding to the busway mounting position.
SUBSTANTIATION: In the process of removing exceptions, CMP 10 completely, and apparently inadvertently, discarded the practicability threshold for mounting circuit breakers horizontally which had been in the NEC for over 70 years. This proposal restores that principle, while retaining the rest of the 1999 changes. Since the second sentence is enforceable independently, and applies to any circuit breaker mounting position, CMP 10 should consider accepting this proposal in principle and removing that sentence. The Section 240-81 reference was added by CMP 4 in the 1984 cycle as part of an editorial change without any specific substantiation. Should CMP 10 elect to retain the reference, the wording in this proposal is in better form.
PANEL ACTION: Accept in Part.
1. The panel accepts the proposed addition of the wording "unless that is shown to be impracticable".
2. The panel rejects the remainder of the proposal.
PANEL STATEMENT: 1. The Panel agrees with the submitter.
2. The present wording is clear and the proposed changes do not provide additional clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #739)

10- 47 - (240-40): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Disconnecting Means for Fuses. ~~A~~ An approved disconnecting means shall be provided on the supply side of all fuses in circuits of over 150 volts to ground and cartridge fuses in circuits of any voltage where accessible to other than qualified persons, so that each individual set of fuses, ~~circuit containing fuses~~ can be independently and simultaneously disconnected from the source of power.
(remainder unchanged)
SUBSTANTIATION: Editorial. The phrase "individual circuit" per definition limits application of the rule to fuses for a circuit which supplies only a single utilization equipment.
In the absence of other pertinent rules which may specify simultaneous opening of all conductors of the circuit, or specific type of disconnecting means, the present wording would allow single-pole disconnects for each fuse of a two or three wire circuit. A requirement for "approved" and "simultaneously" would preclude use of terminals, or wire connectors, which are devices by which conductors can be disconnected, per definition of disconnecting means.
PANEL ACTION: Reject.
PANEL STATEMENT: No substantiation has been provided to insert the word "approved." A circuit is all the circuit conductors including the grounded and grounding conductors. When a circuit is disconnected, all ungrounded circuit conductors shall be disconnected. The word "simultaneously" should not be added as some circuit configurations may require a specific sequence of disconnecting to facilitate orderly shutdown.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4487)

10- 47a - (240-60(c)): Reject
SUBMITTER: Stephen E. Anderson, Rep. IBEW
RECOMMENDATION: Revise as follows :
~~A label attached to the barrel showing the following:~~
Labels attached to the barrel on both sides so that nomenclature shall be visible despite improper installation showing the following:.
SUBSTANTIATION: Severe injury occurred to an individual trying to read nomenclature on fuses improperly installed by trying to hold a mirror behind energized fuses in high voltage switchgear.
PANEL ACTION: Reject.
PANEL STATEMENT: Fuses should be disconnected prior to inspection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #311)

10- 48 - (240-81): Reject
SUBMITTER: Paul Hesselroth, Washington State Dept. of Labor & Industries, Electrical Section
RECOMMENDATION: Add new third paragraph to 240-81 to read as follows:
The line side conductors shall terminate at the top or "on" position of the circuit breaker.
SUBSTANTIATION: This has been a common industry practice for some time in the name of safety. This is not addressed in the National Electrical Code that I am aware of. Manufacturers and installers can and do at times install line side conductors on the bottom of a circuit breaker. When this is done, it can create a safety concern because the electricians may assume the line side is on the top.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 240-81 deals with indications of the "On" and "Off" positions. It does not, and should not, deal with the installation of line conductors. Many circuit breakers are capable of being "reverse fed", with the line conductors being connected to the base of the circuit breaker. This provides flexibility to the user. The submitter has not provided any technical substantiation for this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1878)

10- 49 - (240-83(a)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Revise to read as follows:
(a) Durable and Visible. Circuit breakers shall be marked in white with their ampere rating in a manner that will be durable and visible after installation.
SUBSTANTIATION: I find black-on-black breakers very difficult to read. Judging by the number of misapplied breakers I find, other people have the same problem. Visibly marked wires would be a good idea also.
PANEL ACTION: Reject.
PANEL STATEMENT: The code demands that the ampere rating be durable and visible after installation. A demand that circuit breakers be marked in white would not necessarily improve visibility since many circuit breakers are made from white molding material. This is a certifier's issue rather than a code issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #230)

10- 50 - (240-83(c)): Accept in Principle
NOTE: The following proposal consists of Comment 10-80 on Proposal 10-110 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 10-110 was:
Add new Exception:
Exception: A circuit breaker shall be permitted to be used on a circuit having an available fault current greater than its marked interrupting rating if protected on the line side by a suitable current-limiting device selected under engineering supervision. This additional series combination rating including identification of the up stream current-limiting device shall be permitted to be field marked on the end use equipment.
SUBMITTER: George W. Farrell, Carey, IL
RECOMMENDATION: Continue to accept this proposal.
SUBSTANTIATION: This proposal is required for the situation where the available fault current has increased beyond the interrupting rating of an airframe circuit breaker.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Panel Action and Substantiation on Proposal 10-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
KIMBLIN: The impact of this proposal is to permit series ratings to be determined under engineering supervision for load side circuit breakers that are "passive" for the first 1/2 cycle of a fault and with no test or third party evaluation. This added method of determining series ratings is in addition to the present method of testing. We are not aware of a calculation method that will determine, in practice, the suitability of a series rating for each of the conditions for which tests are applied under industry standards. Furthermore, we are concerned that the estimates for series-rating suitability will not take into account the characteristics of the circuit breakers located downstream from the supposedly "passive" circuit breakers. In series ratings we are dealing with a systems issue where the downstream circuit breakers are underrated relative to the available fault current. Safety is of paramount importance, and this safety can only be assured by rigorous testing of the series combinations.
ZAPLATOSCH: Substantiation has not been submitted that demonstrates that a safe series combination can be selected solely based on the performance characteristics of the two (or more) series devices. When a manufacturer identifies a series combination for their listed equipment, the suitability of the host equipment is also considered. For this reason, the circuit breaker-series connected information published in the Recognized Component Directory of Underwriters Laboratories is not intended to be used in field applications to determine proper coordination and protection of load side circuit breakers. Testing may be necessary to determine the suitability of such series combinations. This is especially true as the determination of a suitable series combination of overcurrent devices must include an evaluation of the host equipment, not only a calculation of the performance characteristics of the two (or

more) series connected devices. The full system of overcurrent devices, host equipment and connections must be reviewed, and perhaps tested, to determine the suitability of the system for use on a circuit with an available fault current greater than the marked rating of the overcurrent protective device(s). Determination of the need for tests and the method to conduct the tests must be in accordance with established safety standards.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67.

(Log #231)

10- 51 - (240-83(c)): Accept in Principle in Part
NOTE: The following proposal consists of Comment 10-81 on Proposal 10-110 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 10-50 (Log #230)].
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: The proposal should be accepted in principle. Delete the fine print note and revise as follows:
A circuit breaker shall be permitted to be used on a circuit having an available fault current greater than its marked interrupting rating if protected on the supply side by a suitable current-limiting device selected under engineering supervision. Where the desired combination of overcurrent protective devices has not been included in appropriate published material by a qualified testing laboratory, the engineering process shall include appropriate engineering representation from the manufacturer of the circuit breaker. A written record of this participation shall be made available to the Authority Having Jurisdiction upon request. This additional series combination rating, including identification of the upstream current-limiting device, shall be field marked on the end use equipment.

SUBSTANTIATION: The problem with the fine print note is that you really can't know whether or not a circuit breaker is passive and for how long unless you put it on a bench and test it. On the other hand, the proposal submitter is addressing a very genuine problem. We simply cannot be expected to upgrade our entire installed plant every time the available fault changes.
This comment is an attempt to bridge that gap, by first acknowledging the recognized component publications that have many combinations in them that have already been tested. If that doesn't work, then the next step would be to make sure the manufacturer is in the loop. Whether they would dare speculate is another question; some might try for the full upgrade by hanging tough on the suitability of the existing breakers. Its a very difficult call. I think something like this just might create enough of a market that there would be genuine cooperation.
PANEL ACTION: Accept in Principle in Part.
1. The panel accepts in principle the first three sentences, and the last sentence of the recommendation.
2. The panel rejects the remainder of the proposal.
PANEL STATEMENT: 1. See panel action and statement on Proposals 10-67 and 10-69.
2. The requirement for a written record is at the discretion of the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: Although the validity of the "up-over-down" method for determining the proper engineering of series ratings for equipment combinations was demonstrated, the opportunity for abuse and misapplication is significant. Power air circuit breakers are larger, more expensive types of equipment where testing of series ratings has often been justified, and these breakers are typically repaired, not replaced, to correct deficiencies found during maintenance. Molded-case circuit breakers must be replaced when found to be defective. Molded-case circuit breakers, particularly the smaller frame sizes are relatively inexpensive devices where testing combinations is harder to justify and the incentive to use engineered combinations would be much greater. Replacement of an older, passive unit with a newer, interchangeable, nonpassive breaker is very likely to occur, even if personnel ensure that the replacement breaker has the same continuous and interrupting ratings as the unit being discarded.
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-50.
ZAPLATOSCH: See my Explanation of Negative Vote on Proposal 10-51.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67.

(Log #232)

10- 52 - (240-83(c)): Reject
NOTE: The following proposal consists of Comment 10-82 on Proposal 10-110 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 10-50 (Log #230)].
SUBMITTER: James T. Pauley, Square D Co.
RECOMMENDATION: The proposal should be rejected.
SUBSTANTIATION: The proposal is not technically feasible. If the circuit breaker manufacturers had an acceptable method of using some engineering method to determine the series rating, it would already be in use. In fact, the testing required by the product standard is the only acceptable method today. If the manufacturer has the series rating as a permitted combination it will exist on the labeling or markings of the product. The proposed FPN provides absolutely no useful guidance in determining the applicability of a series rating. The concept of passivity cannot be determined without a very detailed understanding of the circuit breaker and its interaction with other devices. This is what the testing program accomplishes.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 10-67 where the panel agrees this can be done.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51 (Log #231).
KIMBLIN: The impact of rejecting this proposal and accepting Proposal 10-67 is to permit series ratings to be determined under engineering supervision for load side circuit breakers that are "passive" for the first 1/2 cycle of a fault and with no test or third party evaluation. This added method of determining series ratings is in addition to the present method of testing. We are not aware of a calculation method that will determine, in practice, the suitability of a series rating for each of the conditions for which tests are applied under industry standards. Furthermore, we are concerned that the estimates for series-rating suitability will not take into account the characteristics of the circuit breakers located downstream from the supposedly "passive" circuit breakers. In series ratings we are dealing with a systems issue where the downstream circuit breakers are underrated relative to the available fault current. Safety is of paramount importance, and this safety can only be assured by rigorous testing of the series combinations.
ZAPLATOSCH: The submitter's recommendation should be accepted. Substantiation has not been submitted that demonstrates that a safe series combination can be selected solely based on the performance characteristics of the two (or more) series devices. When a manufacturer identifies a series combination for their listed equipment, the suitability of the host equipment is also considered. For this reason, the circuit breaker-series connected information published in the Recognized Component Directory of Underwriters Laboratories is not intended to be used in field applications to determine proper coordination and protection of load side circuit breakers. Testing may be necessary to determine the suitability of such series combinations.
This is especially true as the determination of a suitable series combination of overcurrent devices must include an evaluation of the host equipment, not only a calculation of the performance characteristics of the two (or more) series connected devices. The full system of overcurrent devices, host equipment and connections must be reviewed, and perhaps tested, to determine the suitability of the system for use on a circuit with an available fault current greater than the marked rating of the overcurrent protective device(s). Determination of the need for tests and the method to conduct the tests must be in accordance with established safety standards.

COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67.

(Log #3058)

10- 53 - (240-83(c)): Reject
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Recognizing that CMP 10 has a held issue on their docket relative to "engineered series ratings," this proposal is to recommend that the concept outlined in held Proposal 10-110 from the 1998 Report on Proposals not be added to the 2002 NEC.
SUBSTANTIATION: Proposal 10-110, as modified by the Panel, and the associated eight comments, was held by the NEC Technical Correlating Committee. This proposal, as modified by the Panel, reads:

"A circuit breaker shall be permitted to be used on a circuit having an available fault current greater than its marked interrupting rating if protected on the supply side by a suitable current-limiting device selected under engineering supervision. This additional series combination rating, including identification of the upstream current-limiting device, shall be permitted to be field marked on the end use equipment."

This proposal was held for further study by the TCC. The reason was that a new Section 240-86 was being added through an entirely separate proposal, Proposal 10-114, which conflicted with the requirements of Proposal 10-110. NEMA had consistently opposed this proposal throughout the Code cycle, and the present proposal is aimed at maintaining that opposition when Proposal 10-110 is reconsidered in the NEC 2002 cycle.

Part of the problem of "determining series ratings under engineering supervision" is captured in the January 1999 EC&M Magazine article "Don't Be Felled By Higher Fault Currents" that was written by Mr. Vince Saporita in support of the 1999 NEC Code Proposal. Here, in the concluding paragraph, we read: "If the AHJ will allow it (under either a local amendment or under Section 90-4), you may be able to use this approach. Just be sure you only apply it to suitable equipment. For example, don't apply it to modern MCCBs or you may create a significant hazard. Properly applied, however, this method may be what allows an overall improvement in a plant electrical system to be economically viable."

During the past Code cycle, UL and NEMA took consistent exception to the concept of "series ratings under engineering supervision" precisely because the concept could only be applied to "suitable equipment," and that "significant hazards" would result from any misjudgment. In particular, under high current fault conditions, the vast majority of molded case circuit breakers open during the first half cycle. They are designed to be active rather than passive.

The EC&M magazine article distinguishes between air frame circuit breakers (UL 1066 and ANSI power circuit breakers) and molded case circuit breakers (UL 489). It is certainly true that a power circuit breaker might be passive during the first fault current half cycle whereas a molded case is highly unlikely to be passive. However, even in the case of power circuit breakers, such breakers are typically applied upstream from molded case circuit breakers, and it would therefore be dangerous to consider a series rating, under engineering supervision, for the power breaker alone. The whole system needs to be considered. Here, as already stated, the downstream molded case circuit breakers are highly unlikely to be passive since they are deliberately designed to open during the first half cycle.

In more detail, since 1970, only tested combinations have been considered suitable under UL 489 and the NEC. The reason is that series ratings cannot reliably be selected by "engineering judgment" because of a number of factors. The major factor is the dynamic behavior of the circuit breaker nearest the fault. The contacts of virtually all molded case circuit breakers open during the first 1/2 cycle of a short circuit, though in a number of cases, the circuit breaker will not clear the circuit immediately. With contacts open, this circuit breaker is taking some of the energy of interruption that would otherwise go to the device on its supply side, causing that device to open and protect the circuit. Also included in tested series ratings are tests in the enclosure to determine that interaction with the enclosure does not occur. Further, there are tests at low fault conditions that would determine that the combination clears the circuit safely below the threshold of current limitation of the supply side device. These many factors covered by testing cannot be determined by "engineering judgment.

NEMA shares Mr. Saporita's concern that personnel "should not be felled by higher currents." For safety, system upgrades with associated fault currents that exceed the downstream breaker ratings, require extremely careful evaluation. In general, downstream molded case circuit breakers are involved, and these circuit breakers are active during the first current half cycle. Any engineering supervision calculation would need to predict the behavior of these molded case circuit breakers at the maximum available fault current and at intermediate fault current levels. Such calculations are unreliable and hence unsafe, and experience has shown direct testing to be the only safe evaluation method.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 10-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51.
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-52.
ZAPLATOSCH: See my Explanation of Negative Vote on Proposal 10-52.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67.

(Log #3155)

10- 54 - (240-83(c)): Reject
SUBMITTER: George D. Gregory, Square D Company
RECOMMENDATION: This proposal is to reject the 1999 NEC cycle Proposal 10-100 (see NEC A98 ROP, page 229), as modified by the Panel (see NEC A98 ROC, page 179), which was held for further study.

The Panel recommendation in the ROC, which I propose to be rejected, reads as follows:

"A circuit breaker shall be permitted to be used on a circuit having an available fault current greater than its marked interrupting rating if protected on its supply side by a suitable current-limiting device selected under engineering supervision. Where the desired combination of overcurrent protective devices has not been included in appropriate published material by a qualified testing laboratory, the engineering process shall include appropriate engineering representation from the manufacturer of the circuit breaker. A written record of this participation shall be made available to the Authority Having Jurisdiction upon request. This additional series combination rating, including identification of the upstream current-limiting device, shall be field marked on the end use equipment."

SUBSTANTIATION: Although it is clear that any new wording must be in harmony with other wording in the NEC as the TCC pointed out, the reasons to reject this proposal are technical.

The primary reason to reject the proposal is that there is no known method of calculation that will determine whether an overcurrent protective device will protect another overcurrent protective device above its interrupting rating. A series of tests (not just a single test) have been shown to be necessary.

A second reason to reject the proposal is related to the substantiation. This proposal is intended to address installations for which the supplying service has been upgraded such that the prospective fault current becomes greater than the circuit breaker's interrupting rating. Even if calculations could show protection for an individual circuit breaker at the higher prospective fault current, can they show that the entire installation is protected including conductors and equipment on the load side of the circuit breaker? If the added current limiting device provides that protection, all is well. However, such protection is already covered in the NEC and no additions are necessary. This proposal does not address protection of the system and must be considered incomplete until it does.

Addressing the proposal to calculate protection for a circuit breaker, any evaluation method must consider the following points:

Dynamic Behavior.

Dynamic behavior begins when the contacts separate, not when clearing occurs. Even for larger circuit breakers that may take several electrical cycles to clear, contact opening may occur considerably earlier. In order to predict protection, an engineer will need to understand the contact arrangement, operating

mechanism and trip device behavior under conditions above its interrupting rating. Testing is necessary.

Intermediate Current Levels.

Current-limiting devices have a threshold of current limitation, above which they exhibit specific current limiting capabilities. Below that level, operation will be slower and will not exhibit the degree of limitation that is seen at higher currents. The threshold is generally somewhere above 20 times the continuous current rating. For a 2000 ampere fuse, its threshold is somewhere above 40,000 amperes. If the interrupting rating of the circuit breaker is below 40,000 amperes it may not be protected, in this case. Series rating and fused circuit breaker test programs carefully test this lower current condition. Does engineering supervision have the tools or training to address this point?

Equipment Tests.

Peak current, let through I^2t and rate of current rise seen in a series device test with a fault current above the interrupting rating of the load side circuit breaker are frequently greater than are seen in tests of the individual circuit breaker at its rating. Listed equipment containing the circuit breaker is also tested at its short-circuit current rating with the circuit breaker installed. Listed equipment in which series ratings are applied is tested at the higher ratings at which the series will be applied. If the calculated series rating is above the equipment rating, how will engineering supervision know that the equipment is suitable?

The Up-Over-Down method may have some merit in determining protection by a fuse used above its threshold of current-limitation and when the load it is protecting is passive. However, circuit breakers are active devices under fault conditions. Also, the Up-Over-Down method is only useful at highest fault levels above the threshold of limitation of the fuse.

To the knowledge of the proposer, there are no other methods available to engineering supervision to evaluate whether protection is provided. It is for that reason that an enormous amount of testing is done to establish third party recognized, tested series ratings. That work is done at great expense and effort of circuit breaker manufacturers. If there were a simpler method, manufacturers would surely use it.

As related to larger circuit breakers protecting electrical systems, ANSI C37.13 recommends in Paragraph 10.8 that cascade ratings not be applied.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 10-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51 (Log #231).
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-52 (Log #232).
ZAPLATOSCH: See my Explanation of Negative Vote on Proposal 10-52.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67.

(Log #3640)

10- 55 - (240-83(c)): Reject
SUBMITTER: Jim Brozer, Acton, MA
RECOMMENDATION: Add the following as the second sentence in 240-83(c):
"The marking for a multi-pole circuit breaker shall include both its single-pole and multi-pole interrupting ratings."
SUBSTANTIATION: The importance of single-pole interrupting ratings has recently been uncovered, thanks in part to the ground breaking IEEE article "Single-Pole Short-Circuit Interruption of Molded-Case Circuit Breakers" by George Gregory of Square D. Based upon that article, it is critical that multi-pole circuit breakers be marked with their single-pole interrupting ratings so that they can be properly applied. There are few issues with low voltage power circuit breakers because they are tested at 87 percent of their multi-pole rating, but it is very easy to misapply molded case circuit breakers on several types of systems.

These are systems that can impose full line-to-line voltage across only one pole. With a corner grounded delta system, it takes only one fault to ground to have full line-to-line voltage on one pole (assumes a 2-pole circuit breaker). On resistance-grounded and ungrounded systems, the first fault to ground produces very little current, so little in fact, that it does not open the overcurrent device. Thus, the facility can continue to run, giving time for the maintenance crew to find and fix the problem. However, if another phase goes to ground, it becomes a phase-to-phase fault. Without the intentional impedance of the resistance grounded system or the system impedance of the ungrounded system, the actual fault can be quite high. If the faults are at different levels of the distribution system, one circuit breaker may be asked to clear the fault with the full system voltage across only one pole. This becomes critical because the standard for molded case circuit breakers (UL 489) tests for full voltage across one pole for only the minimum short circuit tests. For example, 3-pole, 480 volt molded case circuit breakers, up through 800 amperes, are tested at only 8,660 amperes with full voltage across one pole. A 600 ampere 3-pole molded case circuit breaker could have a 100,000 ampere 3-pole interrupting rating, but its single pole rating would be 8,660 amperes when used on a resistance grounded system. See Table 7.1.7.2 from UL 489.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: Marking a single pole interrupting rating on a multi-pole, molded case, circuit breaker is not required for proper application. For corner grounded delta systems, 240-85 requires "1 phase-3 phase" to be marked on two-pole circuit breakers used for this application. For impedence grounded wye systems, 250-36 requires ground detection systems. No problems are known to exist in applying circuit breakers on center point grounded systems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DEATON: The need for marking interrupting ratings on circuit breakers is clear and has long been required in the NEC. Since multi-pole circuit breakers may be applied on circuits where short-circuit currents may appear on either a single pole or more than one pole of such multi-pole breakers. Depending on the design of a particular circuit breaker, its interrupting rating may vary significantly for single-pole short-circuit currents versus multi-pole short-circuit currents. Labeling is needed to enable proper application of multi-pole circuit breakers.

(Log #3844)

10- 56 - (240-83(c) and (d)): Reject
SUBMITTER: Al Fitzgerald, Riviera Electric
RECOMMENDATION: Revise text as follows:
(c) Circuit breakers having an interrupting rating of <u>5000 amperes</u> shall have its interrupting shown on (location) of the circuit breaker.
(d) Every circuit breaker having an interrupting rating <u>other than</u> 5000 amperes...etc.
SUBSTANTIATION: Paragraph needs an inclusive statement for circuit breakers of 5000 amperes or needs an additional paragraph.
PANEL ACTION: Reject.
PANEL STATEMENT: Any circuit breaker that has no marked interrupting rating is automatically rated for 5000 amperes RMS symmetrical by ANSI/UL 489. This adequately distinguishes it from higher rated circuit breakers which, indeed, need to be marked.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #233)

10- 57 - (240-83(c), Exception): Reject
NOTE: The following proposal consists of Comment 10-83 on Proposal 10-110 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 10-50 (Log #230)].
SUBMITTER: Jerome W. Seigel, West Hartford, CT
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: This proposal does NOT provide any technical substantiation that this method will provide an increase in safety that the submitter claims. In fact the adoption of this method of analytically determining the series ratings may in fact be a great reduction in safety and compromise the Code.

The only justification seems to be monetary, i.e. "causing an excessive waste of dollars and resources."

Also the new proposed Fine Print Note that the Panel has added to the proposal in response to the last paragraph of the substantiation may in fact introduce an additional trap since it implies that the only real consideration has to be the "the first 1/2 cycle". This assumes a lot and is furthermost from the truth.

The problem of this type of analytical approach is that the engineer has to analyze an infinite number of variables and would require and need to make use of a greater amount of information from manufacturers of both the fuses and circuit breakers than is presently or may ever be available.

The engineer can NOT stop at the first 1/2 cycle but must look at a whole host of other conditions. The use of the first 1/2 cycle is quite limited to, for the location in the system under consideration, where the fault levels for all cases is above the threshold value of the fuse in consideration. There is much more to the problem. The engineer would have to look at all locations in the system, at all types of faults as well as at all fault levels and durations. If the fault lasts longer than the first 1/2 cycle because the fuse has not cleared this presumably lower level fault that is lower than the fuse threshold value and the circuit breaker does try to now clear the fault that is higher than its own rating, what is going to happen?

There is a very large gray area due to the fact that the fault level can be anywhere from a minor overload up to whatever the available fault current is at whatever point in the system the fault occurs. This is the major problem of an "engineered" approach in place of a "Tested and Listed System."

The vote and "Comment on Affirmative" by Mr. Eldridge has in its last paragraph information attributed to Mr. Ockly that is not recorded in the proposal itself. Also I do not understand the reference to "the relative age of a circuit breaker" as this has little to do with the problem.

The engineered approach of course assumes that the engineer involved has the experience, knowledge, and background to realize the scope of the task and the areas to be addressed. Unfortunately, not all engineers are "qualified" in this important area that the proposal is addressing and have the necessary background and knowledge to analyze this major area of safety. As a result the NEC could then be allowing the use of approaches that could end up further compromising the safety of the electrical system instead of increasing it.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 10-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51.
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-52.
10-52.
ZAPLATOSCH: See my Explanation of Negative Vote on Proposal 10-52.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67.

(Log #234)

10- 58 - (240-83(c), Exception): Accept in Principle

NOTE: The following proposal consists of Comment 10-85 on Proposal 10-110 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 10-50 (Log #230)].

SUBMITTER: Morton L. Mullins, Chemical Manufacturers Assn.
RECOMMENDATION: Continue to accept the original proposal in principle.
SUBSTANTIATION: CMA agrees with Eldridge's and Fredericks' Comment on Affirmative.

There is a need to safely provide for existing equipment that has its interrupting rating exceeded by a system change. For equipment where the older "up, over, and down" calculations are no longer considered applicable, it is felt that the manufacturers should provide updated guidance, rather than force the user to buy new equipment. The users should also have access to guidance that would allow a broader mixing of devices than is available from existing listed series combinations.

The following additional comments are from Fredericks' comment on affirmative vote:

There are a large number of existing and potential applications that are not covered by a tested series rating, and the users could very much benefit from consistent and technically credible direction from the manufacturers on how to properly engineer these applications.

It is troubling to see representatives from the "breaker community" of NEMA present a fundamentally different technical position than the representatives from the "fuse community" do on this issue.

A huge number of successful self-engineered series applications exist, albeit generally with older design downstream breakers with relatively low interrupting ratings. It is difficult to believe that the manufacturers could not provide engineering guidance that would lead to safe self-engineered series ratings, at least for those devices that will remain passive for 1/2 cycle or less of a specified amount of i^2t.

The calculation of the i^2t seen by the downstream device is inherently conservative if it does not include the impedance of that device, which is generally very difficult for users to obtain.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 10-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51.
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-50.
ZAPLATOSCH: Substantiation has not been submitted that demonstrates that a safe series combination can be selected solely based on the performance characteristics of the two (or more) series devices. When a manufacturer identifies a series combination for their listed equipment, the suitability of the host equipment is also considered. For this reason, the circuit breaker-series connected information published in the Recognized Component Directory of Underwriters Laboratories is not intended to be used in field applications to determine proper coordination and protection of load side circuit breakers. Testing may be necessary to determine the suitability of such series combinations. This is especially true as the determination of a suitable series combination of overcurrent devices must include an evaluation of the host equipment, not only a calculation of the performance characteristics of the two (or more) series connected devices. The full system of overcurrent devices, host equipment and connections must be reviewed, and perhaps tested, to determine the suitability of the system for use on a circuit with an available fault current greater than the marked rating of the overcurrent protective device(s). Determination of the need for tests and the method to conduct the tests must be in accordance with established safety standards.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67

(Log #235)

10- 59 - (240-83(c), Exception): Reject

NOTE: The following proposal consists of Comment 10-86 on Proposal 10-110 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 10-50 (Log #230)].

SUBMITTER: John W. Young, Siemens Energy & Automation, Inc.
RECOMMENDATION: Reject proposal.
SUBSTANTIATION: The substantiation notes that all possible series combinations are not cataloged by circuit breaker manufacturers. It is incorrect to assume that because a combination does not appear on the list that it has not been tested. Combinations that do not pass the tests are also not published. Essentially, circuit breaker manufacturers have tested every possible combination and the lists include those devices that pass. Any combinations that are "engineered" that are not on the manufacturers' lists will probably be a combination that the manufacturer has shown to be a combination that will not pass the tests.

The substantiation goes on to note that this would allow a current limiting device to be installed ahead of existing equipment that would have to be changed to comply with increased available currents. This approach would allow equipment to be installed at

current levels higher than the short circuit rating of the equipment. A current limiting device does not automatically protect equipment such as panelboards.

In his comment, Mr. Eldridge notes that the article by Mr. DiMarco stated that "if" the downstream device is passive and "if" its withstand current is known that fuse characteristics could be used. These are two large "ifs". Circuit breakers are dynamic devices intended to interrupt the circuit as circuit breaker manufacturers have repeatedly noted. They are not intended to be passive devices. The last sentence quoted from the article, which was not underlined, is the key in that it states "However, if the downstream device is active and capable of developing dynamic impedance concurrently with the fuse, then analytical fuse selection is in question."

Mr. Fredericks' comments that "...users could very much benefit from consistent and technically credible direction from the manufacturers on how to properly engineer these applications." Circuit breaker manufacturers have provided consistent and technically credible direction, i.e., that a series rating was only valid when supported by tests and cannot be engineered. If it were possible to "engineer" a combination, the breaker manufacturers would take this route rather than testing the combinations and doing follow-up testing of the combinations.

Mr. Fredericks further notes that it is troubling for the "breaker community" of NEMA to present a fundamentally different technical position than the representatives from the "fuse community". He is correct, but it should be noted the community most familiar with circuit breakers and their capabilities is the "breaker community". The concern should be that the "fuse community" presents a fundamentally different approach than the "breaker community."

Finally, Mr. Fredericks notes that "it is difficult to believe that the manufacturers could not provide engineering guidance that would lead to self-engineered series ratings, at least for those devices that will remain passive for 1/2 cycle or less of a specified amount of I^2t." The engineering guidance he requests is that a series rating is only valid when supported by tests.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 10-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51.
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-52.
ZAPLATOSCH: See my Explanation of Negative Vote on Proposal 10-52.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67

(Log #236)

10- 60 - (240-83(c), Exception): Reject

NOTE: The following proposal consists of Comment 10-87 on Proposal 10-110 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 10-50 (Log #230)].

SUBMITTER: Larry Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: It should be noted that the engineers who designed the circuit breaker, and have the most knowledge about it, may have already determined that it could not be used in a series rating application, and that is why it does not appear in the lists of series ratings. It should be further noted that few, if any, breakers are passive in a high fault situation, and this is not information available to application engineers. No clarification is provided regarding who may engineer the series combination or by what method. No method of determining what circuit breakers are passive is given. The impact of this proposal is to permit series ratings to be determined under engineering supervision with no test or third party evaluation, in addition to the present method of determining series ratings by tests which are witnessed by a third party Circuit breaker manufacturers have found by tests that calculated methods do not accurately anticipate protection unless the protected devices are fully passive during the fuse melting period or supply side circuit breaker unlatching period. However, tests to determine whether a device is "passive" relative to a given supply side fuse or circuit breaker would be roughly as extensive as the series test and would most generally indicate that the circuit breaker is not passive. It does not seem prudent to permit evaluation under "engineering supervision" without tests and with guidelines as loose as those proposed.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 10-67.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51.
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-52.
ZAPLATOSCH: See my Explanation of Negative Vote on Proposal 10-52.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67

(Log #2588)

10- 61 - (240-83(d)): Accept in Principle

SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Add a new second sentence to Section 240-83(d) so the Section will read as follows:

(d) Used as Switches. Circuit breakers used as switches in 120-volt and 277-volt fluorescent lighting circuits shall be listed and shall be marked "SWD or HID." Circuit breakers used as switches in high intensity discharge lighting circuits shall be listed and shall be marked as "HID."

SUBSTANTIATION: Circuit breakers with the "SWD" markings are used with 120-volt and 277-volt fluorescent lighting perform well for switching duty. However, there have been reports of circuit breakers being used as switches failing where they are used with HID fixtures. There are currently circuit breakers listed as suitable for HID use. The new language proposed here is intended to solve the problem of circuit breaker failure when used as switches with HID lighting.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 10-63.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3446)

10- 62 - (240-83(d)): Accept in Principle

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Add a new second sentence to Section 240-83(d) so the Section will read as follows:

(d) Used as Switches. Circuit breakers used as switches in 120-volt and 277-volt fluorescent lighting circuits shall be listed and shall be marked "SWD or HID." Circuit breakers used as switches in high intensity discharge lighting circuits shall be listed and shall be marked as "HID."

SUBSTANTIATION: Circuit breakers with the "SWD" marking are used with 120-volt and 277-volt fluorescent lighting perform well for switches failing where they are used with HID fixtures. There are currently circuit breakers listed as suitable for HID use. The new language proposed here is intended to solve the problem of circuit breaker failure when used as switches with HID lighting.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 10-63.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3728)

10- 63 - (240-83(d)): Accept
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Add a new second sentence to Section 240-83(d) and revise the first sentence so the section will read as follows:
(d) Used as Switches. Circuit breakers used as switches in 120-volt and 277-volt fluorescent lighting circuits shall be listed and shall be marked "SWD" or HID." Circuit breakers used as switches in high intensity discharge lighting circuits shall be listed and shall be marked as "HID."
SUBSTANTIATION: Circuit breakers with the "SWD" marking used with 120-volt and 277-volt fluorescent lighting perform well for switching duty. However, there have been reports at International Association of Electrical Inspector chapter meetings of circuit breakers being used as switches failing where they are used with HID fixtures. There are currently circuit breakers listed as suitable for HID use. The new language proposed here is intended to solve the problem of circuit breaker failure when used as switches with HID lighting by requiring that the circuit breaker be listed and marked "HID."
"HID" and "SWD" listed and marked circuit breakers are both tested for switching duty. "HID" circuit breakers are tested with a more severe power factor than "SWD" circuit breakers. Because "HID" circuit breakers are tested at a more severe power factor and for switching duty they would be suitable for use on fluorescent lighting circuits.
PANEL ACTION: Accept.
The panel accepts the proposal with the editoral request that quotation marks be placed on both sides of the word "HID" in the first sentence of the proposed wording.
PANEL STATEMENT: The correction is editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2898)

10- 64 - (240-83(f) (New)): Reject
SUBMITTER: Scott McComber, McComber Electric
RECOMMENDATION: Add new paragraph (f) to read as follows:
(f) Heat Activated Indicators. Circuit breakers shall be equipped with heat activated indicators.
SUBSTANTIATION: As electrical contractors, we've seen numerous electrical panel fires started by dangerously overheated circuit breakers. Over 39,000 structure fires annually are caused by a building's own electrical distribution system, of which overcurrent devices are included. Electrical distribution equipment fires ranked: fifth in number of home structure fires; fourth in home fire deaths; seventh in home fire injuries; and second in direct property damage.
Source, NFPA, 5/99 U.S. Fire Problem Report.
Monitoring circuit breakers for dangerous overheating, whether part of the service, or branch circuit equipment can be economically accomplished by adhering heat activated temperature indicators to the breaker's face, or other regions of the circuit breaker (product literature submitted). Periodic visual inspections of the breakers can then be implemented to help reveal dangerous overheating, thereby drastically minimizing the potential for electrical equipment fires.
Arc Fault Circuit Interrupters do not address overheating circuit breakers, and periodic infrared scans are costly, require special skills and equipment, and the distribution equipment must be properly loaded.
Heat activated indicators require no special tools or skills to implement, and constantly monitor the breaker under all load conditions. Once the indicator's rated temperature is reached, the indicator changes permanently to visually reveal the overheated circuit breaker.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not present information on the number of fires that are supposed to be caused by overheated circuit breakers. Further, this code change would apply to all circuit breakers, many of which are already subjected to periodic inspection; for example to NEMA AB-4 or NETA. Finally, the panel, while rejecting the proposal, certainly encourages routine circuit breaker inspection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3090)

10- 65 - (240-85): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise the second paragraph of 240-85 as follows:
A circuit breaker with a slash rating, such as 120/240V or 480Y/277V, shall be permitted to be applied in a solidly grounded circuit where the nominal voltage of any conductor to ground does not exceed the lower of the two values of the circuit breaker's voltage rating and the nominal voltage between any two conductors does not exceed the higher value of the circuit breaker's voltage rating.
SUBSTANTIATION: The intention of this proposal is to clarify that slash-rated circuit breakers must be applied on solidly grounded systems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3639)

10- 66 - (240-85): Accept in Principle
Note: The Technical Correlating Committee directs the panel to reconsider the action relative to the inclusion of a recommendation in the Fine Print Note to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Jim Brozer, Acton, MA
RECOMMENDATION: Add a new third paragraph to read:
"On corner grounded delta systems, resistance grounded wye systems, ungrounded systems and center point grounded delta systems, multi-pole circuit breakers shall be applied so that their three-pole interrupting rating is not exceeded by the available 3 phase bolted fault current and so that their single-pole interrupting rating is not exceeded by the available phase-to-phase bolted fault current."
SUBSTANTIATION: This new third paragraph is needed to assure that 2 and 3 pole circuit breakers are applied within their ratings on systems where full line-to-line voltage can easily appear across only one pole of the circuit breaker. For example, the first fault to ground on a 480 volt corner grounded delta system could put 480V across only one pole of a two-pole circuit breaker. That breaker needs to be able to safely open the available line-to-line short-circuit current at 480 volts with just one pole. On a 480 volt resistance grounded system, the first fault to ground from any phase will result in a very small amount of current flow at 277 volts, not enough current to open the overcurrent device. That's the advantage of this type of system – it allows the plant to continue to run. The problem occurs if a second phase goes to ground before the first ground fault is found and fixed. A second ground fault may require the circuit breaker to clear the now phase-to-phase 480V fault with only one pole. Section 250-36 requires ground detectors to be installed on the system. This helps the maintenance crew realize that the first fault occurred. Very disciplined facilities find and fix the fault within one shift. The fault may persist for months at less disciplined locations. It is a real safety concern when the second fault occurs and the single-pole interrupting rating is not adequate.
Table 7.1.7.2 of UL 489 lists the single-pole interrupting ratings under the "Individual" column. This table shows, for example, that the single-pole (Individual) interrupting rating for a 1000 ampere, 3-pole, 480 volt, molded case circuit breaker, is 12,120 amperes. The 3-pole rating may be 65,000 amperes, or 100,000 amperes, but the single-pole rating 12,120 amperes. It is independent of the 3-pole rating.
Low Voltage Power Circuit Breakers (LVPCB) are tested at 87 percent of their 3-pole interrupting rating. Since the maximum phase-to-phase fault is 87 percent of a 3-phase bolted fault, any LVPCB that is applied within its 3-pole rating, will automatically be applied properly within its single-pole rating.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
Insert a Fine Print Note at the end of the existing code Section 240-85 to read as follows:
"FPN: Application of circuit breakers on systems other than solidly grounded wye, particularly on corner grounded delta systems, should consider the individual pole interrupting capability."

PANEL STATEMENT: The submitter's concern is addressed in the informational Fine Print Note. Sections 110-9 and 110-10 provide the requirements for interrupting rating. Also, see the panel action and statement on proposal 10-55.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
KIMBLIN: The single pole interrupting capability is a standards performance issue. This Fine Print Note does not belong in the Code.

(Log #2885)

10- 67 - (240-86): Accept
NOTE: The Technical Correlating Committee directs the panel to reconsider the proposal relative to the use of permissive language in the first sentence. This action will be considered by the Panel as a Public Comment.
SUBMITTER: George J. Ockuly, Cooper Bussmann
RECOMMENDATION: Revise text to read as follows:
240-86 Series Ratings. A circuit breaker may be used on a circuit having an available fault current higher than its marked interrupting rating by being connected on the load-side of an acceptable overcurrent protective device having the higher rating, under conditions specified in (a) or (b), and (c).
(a) Selected Under Engineering Supervision. The line-side current-limiting device is selected under engineering supervision for load-side circuit breakers, which are passive during the first 1/2 cycle of a fault. This additional series combination rating, including identification of the upstream current-limiting device, shall be field marked on the end use equipment.
(b) Tested Combinations. The combination of line-side overcurrent device and load-side circuit breaker(s) is tested and marked on the end use equipment, such as switchboards and panelboards.
(c) Motor contribution [no change from exisiting (b)].
SUBSTANTIATION: All possible permutations of series rated combinations are not cataloged or identified by circuit breaker equipment manufacturers. This proposal permits a series combination to be engineered for specific installations. There is a major problem in existing installations where fault currents have increased beyond the circuit breakers original interrupting rating thereby causing an unsafe condition.
The proposal will permit a current-limiting device to be installed ahead of the circuit breaker(s) to obtain an increased series interrupting rating thus improving overall safety. Without this provision large amounts of otherwise serviceable equipment must be removed and scrapped causing an excessive waste of dollars and resources.
Suitable systems can be engineered when the circuit breaker is passive during the first 1/2 cycle of a fault. PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51.
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-50.
ZAPLATOSCH: The proposal should be rejected. The substantiation has not demonstrated that a safe series combination can be selected based only on the performance characteristics of the two series devices. The operation of both devices throughout the range of fault currents are needed to determine that a combination of the devices is likely to operate in a safe manner. It is not possible to determine in the field how long the downstream device remains passive under dynamic high fault current conditions to assure that it does not function at current levels above its short circuit rating. This proposal assumes that the down stream device is passive for the first 1/2 cycle.
In addition, the proposal only addresses the series combination of the two overcurrent devices. When a manufacturer identifies a series combination for their listed equipment, the suitability of the host equipment is also considered.
COMMENT ON AFFIRMATIVE:
DOLLARD: I am voting affirmative to the panel action to accept proposal 10-67. My reasons are as follows:
"In existing installations where the available short circuit current has increased to a value above the rating of the existing equipment, a very dangerous situation awaits all of those persons who service and maintain the equipment.
Presently, the owner of such an installation has only one option. Remove and scrap his/her equipment and replace it with new series rated equipment. This will represent a large financial investment to the owner of such a facility. Acceptance of this proposal will provide a cost effective option for providing the necessary level of protection.
Safety of persons is the primary purpose of the NEC. The safety of all of those persons who service and maintain the equipment will suffer if this cost prevents the owner from making the necessary changes."
ELDRIDGE: The IEEE Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems was approved by the IEEE Standards Board on February 10, 1997. In Chapter 4, Specific Applications, of that standard in Section 4-4, Selection Approach for Electrical Ratings, paragraph (d) states:
In cases where increases in available short-circuit current necessitates a system upgrade, a second approach shown in Figure 4-4, may be used for retrofitting existing older systems where a recognized series rating is not available. A line-side current-limiting circuit breaker or fuses, which limits peak current and let-through energy, may be added, only if the existing load side breakers do not exhibit dynamic impedance within the first half cycle. The distribution of short-circuit energy is shifted away from the slower, load-side circuit breaker to the higher speed current-limiting device. The downstream circuit breaker is then subject to no more short-circuit energy than its ratings.
In the March/April 1994 issue of the IAEI News, an article was written by NEMA concerning series ratings. On the second page of the article, in the section labeled Testing vs. Up-Over-and-Down and Up-And-Over, a sentence says: "While the concept seems plausible and was valid with some breaker designs twenty or thirty years ago, it is not a viable concept today with most breaker designs."
In the May/June 1993 IEEE Transactions on Industry Applications, an article was written by Bernie DiMarco and Steven R. Hansen titled Interplay of Energies in Circuit Breaker and Fuse combinations. In Part V of the article titled Fuse-Breaker Series Combinations and subsection "Are Analytical Methods Appropriate? the first paragraph says:
"If the downstream device is passive, that is, it does not react to the fault current and its "withstand current" is known, then fuse let-through characteristics can be used for fuse selections. Likewise, if the downstream device is active but remains passive during fuse clearing time, then fuse let-through characteristics can be used for fuse selections. However, if the downstream device is active and capable of developing dynamic impedance concurrently with the fuse, then analytical fuse selection is in question."
Mr. Ockuly's proposal is very nearly identical to the IEEE standard. Mr. Ockuly said the same thing in his proposal and in the panel meeting that the above referenced articles are saying. It would seem to me that a NRTL could test an older circuit breaker to provide data to an engineer that would allow a series rated circuit to be designed IF the circuit breaker is passive in the first half cycle of the fault.
This is an acceptable method for protecting some older circuit breakers under engineering supervision.
FREDERICKS: I agree in principle with the substantiation of the proposal and with the panel action, but I believe more restrictive text, such as was proposed in 10-69, would have been beneficial to help prevent misapplications that could occur even under engineering supervision.
It is not universally appreciated that current-limiting fuse operation may take longer than one half cycle, and further, data on interruption time for current-limiting fuse operation vs. prospective current is not readily available from most manufacturers. Nor is data on contact parting time vs. current for most circuit breakers.
Also, as pointed out by others, there is a need to consider all currents above the nominal rating of the breaker, at the full range of possible fault power factors and closing angles, and not just the maximum possible current at 15 percent power factor and maximum offset.

(Log #1782)

10- 68 - (240-86(b)(1)): Accept
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Add the word "and" to the end of the first condition and remove the period.
SUBSTANTIATION: Both conditions are required to prohibit the use of series ratings. The punctuation and sentence structure are not clear as written. As an alternative, the wording of (b) could be changed to "Series Ratings shall not be used where both (1) and (2) below are true."
PANEL ACTION: Accept.
PANEL STATEMENT: The submitter's intent is met by the errata in the first printing of the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2112)

10- 69 - (240-86(c)): Accept in Principle
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add a new paragraph 240-86(c) to read as follows:
(c) Engineered Ratings. Series ratings and applications may be made under conditions of engineering supervision. In these cases, one of the following conditions must apply:
(1) Test data exists to validate the series combination, or
(2) Both the protected and protecting device manufacturers have given their written approval of the series combination.
FPN: Calculations made per the "up, over, and down" method are not generally a reliable method of engineering series ratings.
Where nonlisted series ratings are applied in accordance with this paragraph, the additional series combination interrupting rating, including identification of the upstream current-limiting device, must be marked on the end use equipment, such as switchboards and panelboards.
SUBSTANTIATION: In some cases, system fault currents increase above the interrupting ratings of existing equipment. This proposal provides a framework that in some cases will allow for the safe protection of the existing equipment without requiring its replacement, which could be cost-prohibitive.
Suitable systems can be engineered, where under all conditions:
(1) The protected device remains passive while the current-limiting device is operating.
(2) The protected device can withstand the current let through by the current limiting device.
There are other cases where manufacturer's data exists to validate a series rating, but for some reason a listed rating does not exist.
In these cases, the manufacturer's data can be safely applied under conditions of engineering supervision.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 10-67. Short circuit let-through using the up-over-and-down method produce realiable results when applied on systems and circuits that are totally passive or remain passive for 1/2 cycle or longer. Consulation with the breaker manufacturer or the appropriate testing laboratory may be needed to determine the level of passivity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
DEATON: See my Explanation of Negative Vote on Proposal 10-51.
KIMBLIN: See my Explanation of Negative Vote on Proposal 10-50.
ZAPLATOSCH: See my Explanation of Negative Vote on Proposal 10-67.
COMMENT ON AFFIRMATIVE:
ELDRIDGE: See my Comment on Affirmative Vote on Proposal 10-67.
FREDERICKS: See my Comment on Affirmative Vote on Proposal 10-67.

(Log #3438)

10- 70 - (240-86(c) (New)): Reject
SUBMITTER: Erik Swendsen, Pierce, SD
RECOMMENDATION: Add the following new text:
(c) Noninterchangeable. Series rated circuit breakers shall be designed so that they are not interchangeable with circuit breakers, which have lesser or no series ratings.
SUBSTANTIATION: Because a series rating depends upon the finely tuned combination of the line side device and the load side circuit breaker, it is imperative that the circuit breakers not be accidentally interchanged for ones that have not been tested and found acceptable. The only sure way to require this is to insist on noninterchangeability.
PANEL ACTION: Reject.
PANEL STATEMENT: Product standards recognize marking as an acceptable form of rejection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2113)

10- 71 - (240-92(a) and (d) (New)): Accept in Part
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Modify 240-92(a) as follows:
(a) Feeder and Branch-Circuit Conductors. Feeder and branch-circuit conductors shall be protected at the point the conductors receive their supply, as permitted in Section 240-21, or as otherwise permitted in (b), ~~or~~ (c), or (d).
Add a new paragraph (d) to read:
(d) Protection by Primary Overcurrent Device. Conductors supplied by the secondary side of a transformer shall be permitted to be protected by overcurrent protection provided on the primary (supply) side of the transformer, provided the primary device time-current protection characteristic, multiplied by the maximum effective primary-to-secondary transformer voltage ratio, effectively protects the secondary conductors.
The following maximum per-unit ratios apply for some common transformer connections. (A higher number implies less primary protection.)
Delta Primary, Grounded Wye Secondary: 1.73
Single Phase Primary, Center-Tapped Secondary: 2.00
Delta Primary, Delta or Wye High-Resistance Grounded or Ungrounded 3-wire Secondary: 1.00
SUBSTANTIATION: This proposal recognizes safe overcurrent protection installations where a device in series with a transformer primary is used to protect secondary conductors. The ratios given in the proposal are recognized in numerous industry standards and references, including IEEE Standard C37.91. A response to similar proposals for the 1999 NEC was that this material should only be applied under engineering supervision, in Article 240 Part H. This proposal complies with that wish.
Further descriptive detail and substantiation follows:
The following examples will generally discuss per-unit currents, or transformers with a 1:1 line-line voltage ratio, but keep in mind that the same general principles apply for any voltage ratio.
For per-unit currents, or for transformers with a 1:1 line-line voltage ratio, the highest primary-to-secondary current ratio can be considered as n:1.
If n is equal to 1, a secondary fault or overload of a given amount will always produce that much current (or more) in at least one primary conductor. In these instances, the secondary conductors can be protected against both short-circuit and overload (where required) by the primary overcurrent device. This of course depends on the rating of the primary device and the sizing of the secondary conductors. For example, if a delta-delta transformer has a primary device sized at 125 percent of the transformer rating, the secondary conductors must also be sized at least at 125 percent of the transformer rating, if they are to be protected against overload by the primary device.
Common connections with a 1:1 worst case current ratio are:
1. Single-phase, with 2-wire (single voltage) secondary.
2. Delta-delta with 3-wire (single voltage) secondary. This includes delta-delta transformers with ungrounded, corner-grounded, or high-resistance grounded (by means of a zig-zag or other grounding transformer) secondaries.

3. Delta-wye with 3-wire loads and either ungrounded or high-resistance grounded neutral.

Those above three connections are those now provided for by this proposal. The first two are recognized by 240-21(c) of the 1999 NEC, and the first connection has been recognized in the NEC for many years.

Most commonly-used low-voltage connections will have more than a 1:1 worst-case current ratio, considering the ratio of secondary to primary per-unit currents. For example, if this ratio is 2:1, a secondary overcurrent of a given amount could produce only half that amount of current on the primary, and in general, it would be impractical to provide overload protection to the secondary conductors with a primary overcurrent device. However, in many cases, the primary device can still effectively protect the secondary conductors against short circuit.

Common connections with more than a 1:1 worst-case current ratio are:

1. Single-phase primary, single-phase 3-wire secondary (for example 480-120/240 volt. A 1:1 line-line voltage ratio example would be 240-120/240 volts). The worst case current ratio for this connection is 2:1, for a phase-neutral fault or unbalanced secondary load from line-to-neutral.

2. Three-phase delta-wye with solidly grounded neutral (for example 480-208Y/120. A 1:1 line-line voltage ratio example would be 208-208Y/120): The worst-case ratio for this connection is 1.732:1, for a phase-neutral fault, or for an unbalanced phase-neutral secondary load on a 4-wire system.

3. Three-phase, delta-delta, with 4-wire midpoint-grounded secondary (for example 480-240/120 delta. A 1:1 line-line voltage ratio example would be 240-240/120 delta). The worst-case ratio for this connection is 2:1, for phase-neutral fault, or for an unbalanced phase-neutral secondary load.

These three connections represent the great majority of transformers used for low voltage service, and it is not generally practical to provide overload protection for secondary conductors on these transformers with a primary device. This is probably one reason for the fairly widespread but not completely accurate belief that primary devices do not properly sense secondary currents and cannot protect secondary conductors.

For further reference on this subject, the interested reader can refer to any one of a number of industry references on the subject. One good reference is IEEE/ANSI standard C37.91, which contains figures presenting the same information discussed above.

PANEL ACTION: Accept in Part.

The panel accepts (a) and the first paragraph of (d) of the proposal, and rejects the remainder of the proposal beginning with "The following maximum...".

PANEL STATEMENT: The additional proposed text is not necessary. 90-1(c) states that the code is not intended as an instruction manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DOLLARD: I am voting negative to the panel action to accept in part proposal 10-71. My reasons are as follows:

"The proposed text is not user friendly. While this proposal is to "Part H. Supervised Industrial Installations" the user of the Code must be able to read and understand all parts of this code. In order to determine if "effective" protection has been provided, an inspector or installer must make the required calculation. This new text would require that the inspector or installer multiply the primary device time current characteristic by the effective primary to secondary transformer ratio.

I have had the opportunity to discuss this proposed change with inspectors, contractors and engineers. I am not convinced that the user of this code book will understand what this really means.

This new text is written by, and directed towards, engineers in supervised industrial installations.

Good code should be practical, easy to read and enforceable."

COMMENT ON AFFIRMATIVE:

FREDERICKS: I agree with the panel action, but some wording changes could have helped improve the clarity of the code text. The following would improve the clarity of the first paragraph of (d):

Conductors supplied by the secondary side of a transformer shall be permitted to be protected by overcurrent protection provided on the primary (supply) side of the transformer, where the primary protection has been determined to effectively protect the secondary conductors. The primary device time-vs-current protection characteristic shall be multiplied by the maximum effective primary-to-secondary transformer voltage ratio in making this determination.

Also, I believe the originally proposed text on maximum per-unit ratios of common transformer connections should have been retained. Even though the code is not intended as an instruction manual, I believe that small amounts of explanatory material should be considered acceptable when they relate to complex considerations such as this.

(Log #2114)

10- 72 - (240-92(b)(1)): Accept

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Delete the length limitations in 240-92(b)(1) (b) and (c), as follows:

b. The ~~length of the secondary conductors does not exceed 75 ft (22.86 m) and the~~ conductors are protected by a differential relay with a trip setting equal to or less than the conductor ampacity.

c. The conductors shall be considered to be protected ~~if the length of the secondary conductors does not exceed 75 ft (22.86 m) and~~ if calculations, made under engineering supervision, determine that the system overcurrent devices will protect the conductors within recognized time vs. current limits for all short-circuit and ground-fault conditions.

SUBSTANTIATION: The supporting material and comments found in the ROP and ROC produced during the development of the 1999 NEC did not substantiate a technical reason to support a length limitation under (b) and (c).

Differential protection, as covered by (b) does not depend on the length of the protected conductors. Also, calculations made under engineering supervision, as covered by (c), may determine that the system overcurrent devices will adequately protect the conductors, even through they are longer than 75 ft.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DOLLARD: I am voting negative to the panel action to accept proposal 10-72. My reasons are as follows:

"The length limitations were considered necessary in the 1999 cycle. The present limitations should remain in place. I do not believe that in the course of one cycle there is sufficient data to support the removal of all limitations on conductor length."

(Log #30)

10- 73 - (240-92(b)(1)a and b): Accept in Principle in Part

NOTE: The following proposal consists of Comment 10-95 on Proposal 10-115c in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 10-115c was:

Add a new Section 240-92 covering feeder and branch-circuit protection for supervised industrial installations in new Part H to read as follows:

240-92. Location in Circuit. An overcurrent device shall be connected in each ungrounded circuit conductor as follows:

(a) Feeder and Branch-Circuit Conductors. Feeder and branch-circuit conductors shall be protected at the point the conductors receive their supply, as permitted in Section 240-21, or as otherwise permitted in (b) or (c) below.

(b) Transformer Secondary Conductors of Separately Derived Systems. Conductors shall be permitted to be connected to a transformer secondary of a separately derived system, without overcurrent protection at the connection, where the conditions are met in (1), (2), and (3) below:

(1) Short Circuit and Ground Fault Protection. The conductors shall be protected from short-circuit and ground-fault conditions by complying with one of the following conditions:

a. The length of the secondary conductors does not exceed 50ft (l5.24 m) and the transformer primary overcurrent device has a rating or setting that does not exceed 150% of the value determined by multiplying the secondary conductor ampacity by the secondary-to-primary transformer voltage ratio.

b. The length of the secondary conductors does not exceed 75 ft. (22.86 m) and are protected by a differential relay with a trip setting equal to or less than the conductor ampacity.

c. The conductors shall be considered to be protected, if the length of the secondary conductors does not exceed 75 ft. (22.86 m) and if calculations, made under engineering supervision, determine that the system overcurrent devices will protect the conductors within recognized time vs. current limits for all short-circuit and ground-fault conditions.

(2) Overload Protection. The conductors shall be protected against overload conditions by complying with one of the following:

a. The conductors terminate in a single overcurrent device which will limit the load to the conductor ampacity.

b. The sum of the overcurrent devices at the conductor termination, limits the load to the conductor ampacity. The overcurrent devices shall consist of not more than six circuit breakers or sets of fuses, mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six overcurrent devices grouped in any one location.

c. Overcurrent relaying is connected (with current transformer(s), if needed) to sense all of the secondary conductor current and limit the load to the conductor ampacity by opening upstream or downstream devices

d. Conductors shall be considered to be protected if calculations made under engineering supervision determine that the system overcurrent devices will protect the conductors from overload conditions.

(3) Physical Protection. The secondary conductors shall be suitably protected from physical damage.

(c) Outside Feeder Taps. Outside conductors shall be permitted to be tapped to a feeder or to be connected at a transformer secondary, without overcurrent protection at the tap or connection, where all the following conditions are met:

(1) The conductors are suitably protected from physical damage.

(2) The sum of the overcurrent devices at the conductor termination limits the load to the conductor ampacity. The overcurrent devices shall consist of not more than six circuit breakers or sets of fuses mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard. There shall be no more than six overcurrent devices grouped in any one location.

(3) The tap conductors are installed outdoors, except at the point of termination.

(4) The overcurrent device for the conductors is an integral part of a disconnecting means or shall be located immediately adjacent there to.

(5) The disconnecting means for the conductors are installed at a readily accessible location either outside of a building or structure, or inside nearest the point of entrance of the conductors.

SUBMITTER: T. Neil Thorla, New Carlisle, IN

RECOMMENDATION: Accept Proposal 10-115c in principle with the revised text for 240-92(b)(1)a and b as follows:

a. The length of the secondary conductors does not exceed ~~50 ft (22.86 m)~~ 100 ft (30.48 m) and the transformer primary overcurrent device has a rating or setting that does not exceed 150 percent of the value determined by multiplying the secondary conductor ampacity by the secondary-to-primary voltage ratio.

b. The length of the secondary conductors does not exceed ~~75 ft (22.86 m)~~ 100 ft (30.48 m) and ~~are~~ the entire length of the secondary conductors ~~are~~ is protected by ~~a~~ differential relay protection with a trip setting ~~equal to or less than~~ not exceeding the conductor ampacity.

SUBSTANTIATION: The Panel has already accepted the concept that conductor lengths of up to 100 ft can be protected by an overcurrent device set at 300 percent of the ampacity of the conductors in 240-21(e). As explained in the substantiation for this proposal, the worst case condition for transformer secondary conductors is a line-to-neutral fault on the secondary conductors for which the primary conductors see only 50 percent of the fault current as compared to the corresponding line-to-line fault. An overcurrent device set at 150 percent, seeing 50 percent of the fault current, equates to an overcurrent setting of 300 percent of the conductor ampacity. Increasing the length to 100 ft makes this section technically consistent with other sections of this Article.

Please refer to the example presented in my companion comments on 240-92(b)(1)c. Case 2 of this example represents one of the most challenging overcurrent protection situations, since it uses the free air rating of the conductors, unrestrained by termination temperature ratings, resulting in the smallest possible size conductors operating at their highest possible temperature (90°C). Furthermore, the spacing of these cables makes the inductive reactance relatively large, leading to lower prospective fault currents and longer primary overcurrent operating times. Figure 1 shows the single line diagram for this example. Using the equations from this example, Table 1 shows the secondary conductor temperature rise for phase-to-phase and phase-to-ground faults, with primary overcurrent protection set at 150 percent. Note that the conductor temperature rise is very low for lengths up to 500 ft. Table 2 shows the effect of transformer impedance on conductor temperature rise with a 100 ft length for the secondary conductors. Even for an impedance of 10 percent, more than twice the standard impedance for this size transformer, the conductor temperature rise is well below the allowable short circuit temperature rise of the conductors. Curve 1 shows the generic Type E fuse curve, and the conductor short circuit I^2t curves. This example shows that even in an extreme case, the 100 ft conductor length, with 150 percent primary overcurrent, is quite conservative.

The remaining proposed changes are editorial to better convey intent, and to agree with C-1(e) of the NEC Style Manual.

(Figure shown on following page)

PANEL ACTION: Accept in Principle in Part.

The panel accepts the proposed wording in "a.".

The panel accepts in principle the proposed wording in "b.".

PANEL STATEMENT: See panel action and statement on Proposal 10-72 for the panel's wording for "b.".

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

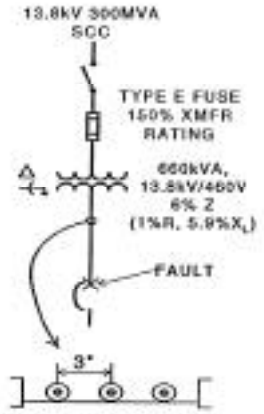
AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DOLLARD: I am voting negative to the panel action to accept in principle in part proposal 10-73. My reasons are as follows:

"The length limitations were considered necessary in the 1999 cycle. The present limitations should remain in place. I do not believe that in the course of one cycle there is sufficient data to support the increasing and/or removal of all limitations on conductor length."



750kcmil Single Conductor
Copper Cable

FIGURE 1

L	I_{PU}	t_{PP}	t_{PG}	T_{PP}	T_{PG}
50	13.9	.27	.75	1.6	4.5
100	12.3	.37	1.0	1.7	4.6
200	9.9	.50	1.8	1.5	5.4
500	6.3	1.4	10	1.7	12.2

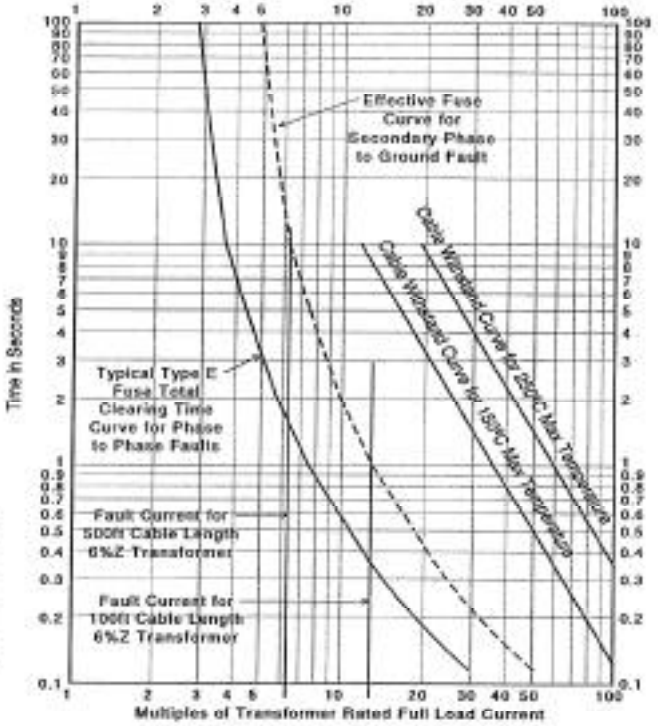
Effect of Cable Length with
Transformer Impedance = 6%

TABLE 1

%Z	I_{PU}	t_{PP}	t_{PG}	T_{PP}	T_{PG}
6	12.3	.37	1.0	1.7	4.6
7	10.9	.42	1.4	1.6	5.2
8	9.8	.50	1.8	1.5	5.4
9	9.0	.60	2.2	1.5	5.9
10	8.3	.72	2.7	1.5	5.7

Effect of Transformer Impedance with
Cable Length = 100 feet

TABLE 2



Time vs Current Curves for Fuse and Cable - Fault Currents Shown
for 6% Impedance Transformer

GRAPH 1

L = Conductor Length in (ft)
I_{PU} = Per Unit Fault Current in Multiples of Transformer Rating
t_{PP} = Fuse Clearing Time for Phase-to-Phase Fault in Seconds
t_{PG} = Fuse Clearing Time for Phase-to-Ground Fault in Seconds
T_{PP} = Conductor Temperature Rise in °C for Phase-to-Phase Fault
T_{PG} = Conductor Temperature Rise in °C for Phase-to-Ground Fault
%Z = Transformer % Impedance

NOMENCLATURE

(Log #31)

10- 74 - (240-92(b)(1)c): Accept

NOTE: The following proposal consists of Comment 10-96 on Proposal 10-115c in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 10-50 (Log #30)].

SUBMITTER: T. Neil Thorla, New Carlisle, IN

RECOMMENDATION: Accept Proposal 110-115c in principle with the revised text for 240-92(b)(1)c as follows:

c. The conductors shall be considered to be protected~~, if the length of the secondary conductors does not exceed 75 ft (22.86 m) and~~ if calculations, made under engineering supervision, determine that the system overcurrent devices will protect the conductors within recognized time vs. current limits for all short-circuit and ground fault conditions.

SUBSTANTIATION: The Panel is to be commended for their effort to correct the problems with the existing Code language. Many inspectors are ignoring the "be permitted" portion of the "shall be permitted" language of 240-21(d) and (j), and turning a permissive statement into a mandatory rule. The problem with 240-21 is that it does not contain a mandatory rule for transformer secondary conductors, and the permissive statement is an alternate to nothing. The two Panel members who voted negative on this proposal referred to existing Code "rules". According to the NEC Style Manual "shall be permitted" language does not constitute a rule, but rather a permissive statement. Although it may not be obvious, this proposal actually imposes length restrictions on transformer secondary conductors where none currently exist due to the lack of mandatory language.

With the Panel's proposed wording, the maximum secondary conductor length possible would be 75 ft. This length seems somewhat arbitrary, and could still be too short where the transformer is located outdoors at grade level and the equipment room is on the second or third floor, which frequently occurs in industrial facilities.

The engineering equations and skills required to determine if a 75 ft conductor length is acceptable vs. a 50 ft length are exactly the same equations and skills that are required to determine if a 100 ft (or any other length) conductor is acceptable. There is no reason to restrict the length if engineering calculations are made. Length is not the only parameter that controls the prospective fault current of a faulted conductor. Conductor resistance is controlled primarily by length and cross-sectional area, with frequency playing a secondary role effect due to skin effect. Conductor inductive reactance is a function of length, shape of cross section, conductor spacing, frequency, and permeability of nearby materials. Furthermore, different insulation types have different maximum allowable short circuit temperatures, typically ranging from 150-250°C. The engineer should be able to tradeoff one parameter vs. another to design an acceptable system. It makes no sense to put a limit on one parameter, while leaving the other parameters unrestricted.

The following example illustrates how a fault at the end of a 100 ft secondary conductor length would result in a lower conductor temperature rise than for a 50 ft length for the same transformer and supply system. The example illustrates the installation of a 500 hp adjustable speed motor drive. This drive receives its power from a 660 kVA, 13.8 kV/460V transformer. It is preferred to use a mineral oil filled transformer located outdoors, which will require a 100 ft cable run as illustrated in Case 1. A less desirable alternate, due to space and cooling restrictions, is to use a silicone fluid filled transformer located indoors to limit the cable run to 50 ft, as illustrated in Case 2.

Figure 1 shows the fault current and conductor temperature rise calculations for both cases. Figure 2 shows the calculations for conductor impedance. In all cases the conductor temperature rise for the 100 ft length of cable of Case 1 is lower than the corresponding value for the 50 ft length in Case 2. The highest temperature rise of 41°C in Case 2 is still well within the worst case limits for modern cable insulations.

The Panel may argue that this is not a typical example, and this is indeed correct. This example was selected to be near worst case as far as conductor fault temperature is concerned, to show that even a 100 ft limitation is extremely conservative. The following is a brief comparison of this example versus a more typical example:

1) The transformer impedance of 6 percent, while typical for drive transformers, is higher than standard for this size transformer. This higher impedance reduces prospective fault current and results in additional conductor temperature rise due to longer fuse clearing times.

2) Drive transformers are typically ungrounded or high resistance grounded. The grounded wye secondary leads to the worst case overcurrent protection case for a phase-to-ground fault.

3) The cable is sized for a 90°C operating temperature. In the typical case, the cable would be sized for a 75°C operating temperature due to termination temperature limitations. This results in a smaller cable size which causes a higher temperature rise for the same current value. It also results in higher cable impedance which has the effect as explained in 1) above. The 90°C vs. 75°C also results in 15°C less temperature margin between operating and short circuit temperature.

4) Case 2 results in the smallest possible cable size. Cable was sized based on the 90°C column of Table 310-17. It would be possible to use cable sized in this manner, if the equipment construction was such that the cable does not act as a heat sink. In the more typical case of UL listed equipment, even if the terminations were rated for 90°C, the listing is based on ampacities from Table 310-16, which result in larger conductor sizes. The maintained spacing of Case 2 also results in greatly increased conductor inductive reactance, which has the effect as explained in 1) above.

5) The fuse clearing curves assume that no load exists before the fault, in which case the conductors would not be at maximum operating temperature at the time of the fault,

If the conductors were carrying rated load prior to the fault, the melting time portion of the fuse total clearing time would be shorter. In either event, the conductor fault temperature will be slightly lower than what is predicted in this analysis.

(Figures shown on following pages)

PANEL ACTION: Accept.

PANEL STATEMENT: See panel action on Proposal 10-72.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DOLLARD: I am voting negative to the panel action to accept proposal 10-74. My reasons are as follows:

"The length limitations were considered necessary in the 1999 cycle. The present limitations should remain in place. I do not believe that in the course of one cycle there is sufficient data to support the removal of all limitations on conductor length."

(Log #3134)

10- 75 - (240-92(d) (New)): Reject

SUBMITTER: Christopher Henry, Fluor Daniel

RECOMMENDATION: Add the following:

(d) Conductors from Battery Terminals. Where conductors are protected from physical damage, overcurrent protection for battery feeder conductors shall be located no farther than 10 ft from battery terminals.

SUBSTANTIATION: For battery installations, there is a physical problem with providing overcurrent protection at the point the conductors receive their supply (battery terminals). In most installations, there will always be several feet of electrically unprotected cable. Many industrial UPS manufacturers provide the overcurrent protection as an integral part of the UPS cabinet. It is common industry practice to locate the battery rack next to the cabinet and connect directly together (without an external overcurrent device). The length of electrically unprotected cable for this application might reach 5 to 10 feet. The above recommendation provides a clear and reasonable requirement for industrial battery installations.

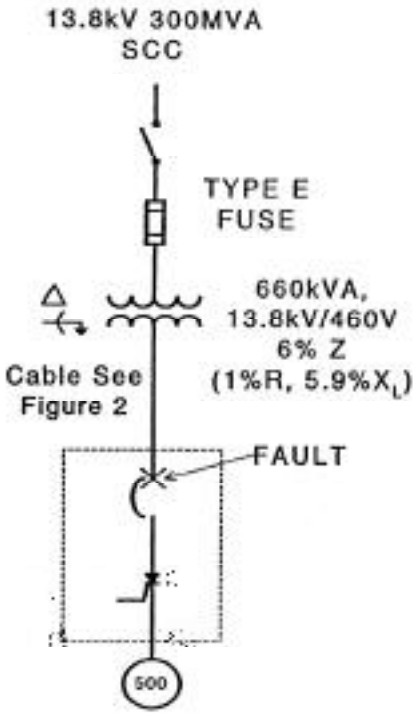
PANEL ACTION: Reject.

PANEL STATEMENT: The proposed length is arbitrary and there has been no consideration given to the potentially hazardous conditions around batteries. Sufficient information has not been provided to substantiate any particular length.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12



Short Circuit Calculations 100MVA Base for per unit

Source: $Z_S = 0 + j(100/300) = 0 + j.33$ 0/1

Transformer: $Z_X = (100/0.66)(.01 + j.059)$
$= 1.51 + j8.94$ 0/1

Cable Case I (See Figure 2):

$$Z_{C1} = \frac{(0.00135 + j0.00156)x100}{(0.46)^2} = 0.638 + j0.737 \text{ 0/1}$$

Cable Case II (See Figure 2):

$$Z_{C2} = \frac{(0.00095 + j0.00301)x100}{(0.46)^2} = 0.448 + j1.42 \text{ 0/1}$$

Case I:

Total Z: $Z_{T1} = 2.15 + j10.01$
$= 10.24\angle 77.9^{\circ}$

Prospective Fault Current:

$$Isym_1 = \frac{100x10^3}{(10.24)(\sqrt{3})(.46)}$$

$= 12,257$ A.

Case II:

Total Z: $Z_{T2} = 1.96 + j10.69$
$= 10.87\angle 79.9^{\circ}$

Prospective Fault Current:

$$Isym_2 = \frac{100x10^3}{(10.87)(\sqrt{3})(.46)}$$

$= 11,547$ A.

CASE I 100ft 2-500kcmil/leg PVC Conduit		
Primary Fuse Size % Rated	Fuse Clearing Time sec	Conductor Temp Rise Deg C*
3 Phase Bolted Fault: Iprimary = 408.6A.		
100	0.2	0.84
150	0.35	1.47
200	0.65	2.73
250	1	4.20
300	1.4	5.90
Phase to Ground Fault: Iprimary = 235.9A.		
100	0.4	1.66
150	0.7	2.94
200	1.7	7.18
250	3	12.78
300	4.5	19.36

CASE II 50ft 750kcmil 3" Spacing in Tray		
Primary Fuse Size % Rated	Fuse Clearing Time sec	Conductor Temp Rise Deg C*
3 Phase Bolted Fault: Iprimary = 384.9A.		
100	0.21	1.25
150	0.37	2.21
200	0.7	4.19
250	1.1	6.62
300	1.5	9.05
Phase to Ground Fault: Iprimary = 222.2A.		
100	0.43	2.57
150	0.75	4.50
200	1.8	10.90
250	3.3	20.25
300	6.5	41.10

Insulation	T_{OPER} °C	T_{SC} °C	T_{RISE} °C
PVC	60/75/90	150	90/75/60
XLPE	90	250	160
EPR	90	250	160

Source: IEEE Std 141, 1993

T_{OPER} = Maximum Operating Temperature

T_{SC} = Maximum Short Circuit Temperature

$T_{RISE} = T_{SC} - T_{OPER}$

* Temperature rise calculated from:

$$\left(\frac{I}{A}\right)^2 t = 0.0297 \log_{10} \frac{(T_2 + 234)}{(T_1 + 234)}$$

FIGURE 1 Fault Current Calculations

Data for determining conductor size:

1) Required ampacity of transformer secondary conductors

$$I_{SEC} = \frac{660}{(\sqrt{3})(.46)} = 828A.$$

2) Ambient temperature = 30°C

3) Conductor size not limited by termination temperature per 110-14(c).

Case I - 100' Triplex Cable in PVC Conduit:

500kcmil triplex copper
w/ equipment ground
2 circuits in parallel

Ampacity = 2 x 430 = 860A. using Table 310-16

Impedance ohms/1000' from NEC Chapter 9, Table 9

Adjustment for triplex vs random lay

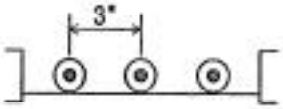
Length of run

$$Z = \frac{0.027 + j0.039(0.8)}{2} \cdot \frac{(100)}{(1000)}$$

2 cables in parallel

$Z = 0.00135 + j0.00156 = 0.00206 \angle 49°$ ohms

Case II - 50' Single Conductor Cable Maintained Spacing in Aluminum Cable Tray:



750kcmil Single Conductor Copper Cable
Maintained spacing per 318-11(b)(3)
Conductor Diameter = 0.964"
Condutor Radius = 0.482"
Overall Cable Diameter = 1.4"

Ampacity = 885A. using Table 310-17

R = 0.019 (50/1000) = 0.00095 ohms for 50' run

$X_L = 0.377(1.26)(0.1404\log(3/0.492)+0.0153)(50/1000)$ ohms

Adjustment for horizontal lay

Spacing

Conductor radius

$X_L = 0.00301$ ohms for 50' run

$Z = R + jX_L = 0.00095 + j0.00301 = 0.00316 \angle 72.5°$ ohms

FIGURE 2 Conductor Size and Impedance Calculations

(Log #2784)

10- 76 - (240 Part I): Accept
SUBMITTER: Ivan DeWitt, Holland, MI
RECOMMENDATION: Change Part "I" to Part "J".
(no other change in heading)
SUBSTANTIATION: The leters I and O have been omitted as identification of headings in the format of other articles of the NEC to eliminate any possible confusion with the numbers one and zero. Article 240 Part I is not consistent with this format and the style manual of the NEC. References: Articles 250, 410, 424, 430 and 620 (1999 Edition).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #580)

10- 77 - (240-100(a)): Accept
SUBMITTER: James T. Dollard, Jr., IBEW Local Union 98
RECOMMENDATION: Revise to read as follows:
240-100. Feeders and Branch Circuits.
(a) Feeder and branch-circuit conductors shall have overcurrent protection in each ungrounded conductor located at the point where the conductor receives its supply, or at ~~a~~ an alternate location in the circuit ~~determined~~ when designed under engineering supervision that includes but is not limited to considering the appropriate fault studies and time current coordination analysis of the protective devices and the conductor damage curves. The overcurrent protection shall be permitted to be provided by one of the following.
SUBSTANTIATION: This proposal is the work of a Task Group assigned to recommend specific actions for proposal 13-43 and Comments 13-46, 13-47, 13-48 to the 1999 NEC. The Task Group consisted of the following members of CMP 10 and CMP 13.
Chair, Jim Dollard CMP 10, John Brezan CMP 10, Carl Fredericks CMP 10, Clive Kimblin CMP 10, Charles Blizard CMP 10, Charles Eldridge CMP 10, Don Johnson CMP 10, Vince Saporita CMP 10, George Gregory CMP 10, Jim Carroll CMP 13, Bill Brunner CMP 13, Barry Hornberger CMP 13.
This additional text is proposed by the Task Group with the intent of giving some guidance to the design of a premises wiring distribution system by an engineer under "engineering supervision". This will also give a minimum outline for the inspector.
The intent is not to limit the engineer to a minimum outline but to allow him/her the flexibility to consider all factors which might affect the system. This language makes it clear that a properly engineered system may provide adequate protection without providing overcurrent protection in each ungrounded conductor located at the point where the conductor receives its supply.
The Task Group believes the over 600-volt feeder or branch circuit will be protected from short circuits and ground faults where properly engineered by an engineer who looks at the whole distribution system on the premises. Smaller tap conductors from larger feeder conductors may be adequately protected from short circuits and ground faults even though the tap conductors are not protected from overload at the point the tap conductors receive their supply. The tap conductors may be adequately protected from overload by the use of overcurrent protection provided at the load end of the tap conductors.
The words "when designed" (under engineering supervision) should be substituted for "determined" (under engineering supervision) because the word designed is more forceful in ensuring that the particular installation has been actively reviewed. This wording will also make it clearer that it is in the design phase that engineering supervision takes place. This is important when the general rule of placing the overcurrent protection at the point where the conductor receives its supply is no longer being followed.
The Panel is proposing that the words "engineering supervision" be qualified by the words "that includes but is not limited to considering the appropriate fault studies and time current coordination analysis of the protective devices and the conductor damage curves". Here the objective is to provide an inspector with additional information relative to judging the adequacy of the engineering supervision.
When departing from the code requirement that the overcurrent protection be provided at the point where the conductor receives its supply and applying engineering supervision as permitted, the installer shall provide adequate engineering supervision. As a guideline for an inspector, that supervision should include appropriate fault studies and time current coordination analysis of the protective devices and the conductor damage curves. However, additional factors might have to be considered depending on the particular installation. This is why the words "that includes but is not limited to" have been added to this section. Ultimately the engineers involved bear the responsibility.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1464)

10- 78 - (240-100(a)): Reject
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Revise the text as follows:
(a) Feeder and branch-circuit conductors shall have short-circuit protection in each ungrounded conductor located at the point where the conductor receives its supply or at a location in the circuit determined under engineering supervision. For supervised installations as defined in Section 225-48, where 240-101(b) does not apply, the location of the short circuit protection may be as allowed in Section 240-92, except length limitations from 240-92 are doubled for circuits of from 2400 to 5000 volts phase-to-phase, and quadrupled for circuits greater than 5000 volts phase-to-phase. The overcurrent protection shall be permitted to be provided by one of the following.
SUBSTANTIATION: Two changes are proposed here:
1. Correction of the 1999 NEC change from requiring "short-circuit" to requiring "overcurrent" protection in this section. Historically, the Code has required short circuit protection of these conductors, and this wording is consistent with the rating and setting requirements given in 240-101. The term "overcurrent" is a more general term which includes both short circuit protection and overload protection. As such it does not specifically imply fault clearing capability. Overload protection does not require fault clearing capability. Short Circuit protection does imply fault clearing capability.
2. To provide specific tap allowances and restrictions for supervised installations above 600 volts. Similar tap allowances and restrictions are provided in Article 240 Part H of the 1999 NEC for supervised industrial installations up to 600 volts.
The only difference vs. the low-voltage 240-92 allowances that is proposed here is to increase the allowable lengths based on the circuit voltage. The allowances proposed here are conservative, and intended to be the minimum that would reasonably allow for the increased scale of the larger high-voltage systems. Since the fault-energy limiting effect of an impedance is reduced by an increase in the voltage squared, the technically-justifiable tap lengths are much greater than those proposed here.
For reference, the proposed wording of Section 225-48 is:
225-48 Supervised Installations.
For the purposes of Part C, the term supervised installation is defined as the portions of a facility where all of the following conditions are met.
1. Conditions of design, and installation are provided under engineering supervision.
2. Qualified persons provide maintenance, monitoring and servicing of the system.
3. The premises wiring system has 2500 kVA or greater of load as calculated in accordance with Article 220.
4. The premises has at least one service that is more than 600 volts nominal.
This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized by utilities as necessary for safe installation of over 600 volt systems; and may not be familiar to inspectors who rely on the NEC for direction.
The Task Group participants consisted of William M. Lewis, (CMP 4), committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E. William Long, NEMA
Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel's decision is that "overcurrent" is the correct term for this section. It is understood that overload

protection may be provided in circuits above 600 volts via load limitation. The panel does not agree that any length limitations should be imposed on the designing engineer. See panel action on Proposal 10-77.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3264)

10- 79 - (240-100(a)): Reject
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise NEC 240-100(a) with the deletion (strike through) as shown. The entire text of 240-100(a) is shown for clarity, but only the change shown strike through is part of this proposal.

240-100. Feeders and Branch Circuits.

(a) Feeder and branch-circuit conductors shall have overcurrent protection in each ungrounded conductor located at the point where the conductor receives its supply ~~or at a location in the circuit determined under engineering supervision~~.

SUBSTANTIATION: The requirement in 240-100(a) states the feeder and branch-circuit conductors shall have "overcurrent protection." Locating the protection at any other location than where the conductor receives its supply does not afford the "overcurrent" protection as defined in Article 100. The definition in Article 100 states, "Overcurrent. Any current in excess of the rated current of equipment or the ampacity of a conductor. It may result from overload, short circuit, or ground fault."

The intent of Ted Stutheit Comment 10-97 (1999 ROC) has been completely missed by allowing overcurrent protection devices to be placed at locations in the circuit other than where the conductor receives its supply. Placement of the overcurrent device in any location other than at the supply of the conductors can result in the loss of short circuit, ground fault, and overload protection of the unprotected portion of the conductors located on the line side of the protection device. The panel appears to "believe" that a system can be installed safely but provided no substantiation of current practice or restrictions to support reducing the safety requirements in the 240-100.

Deregulation is moving the maintenance and control of high voltage equipment into the hands of owners other than utilities and heavy industry. These owners are looking to the public service sector such as product manufacturers and local electrical contractors for assistance with their high voltage electrical system. Utilities and heavy industry that once serviced nearly all of the high voltage equipment is no longer the norm.

The panel also deems the application issues Over 600V systems as "unique." This should place additional safety concern on such systems instead of just being dismissed to "Engineering Supervision." Those performing the "Engineering Supervision" must have a set of safety rules by which they operate or the panel has just reduced the level of safety to the public. These governing safety rules need to be introduced into the NEC for high voltage.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and submitter's substantiation on Proposal 10-77.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3758)

10- 80 - (240-100(a)): Accept in Part
SUBMITTER: Timothy M. Croushore, Allegheny Power Service Corp.
RECOMMENDATION: Please reword the existing Section 240-100(a) to read as follows:

240-100. Feeders and Branch Circuits.

(a) Location and Type of Protection. Feeder and branch-circuit conductors shall have short circuit protection in each ungrounded conductor located at the point where the conductor receives its supply or at a location in the circuit determined under engineering supervision. The short circuit protection shall be permitted to be provided by one of the following.

SUBSTANTIATION: The changes identified in this proposal would add a title to the section and revert back to the 1996 NEC concept of short circuit protection for high voltage feeders and branch circuits.

As the section currently reads in the 1999 NEC, the installer would have to provide overcurrent protection which would include short circuit protection, overload protection and ground fault protection at the point where each conductor receives its supply. Providing overload protection and ground fault protection at this point is not always feasible in a high voltage electric system. High voltage fuses as permitted in (2) of 240-100 will not provide adequate overload protection for all high voltage cables. Overload protection in this application is best applied at the load overcurrent protective device rather than at the cable supply source.

Fuses for ungrounded high voltage circuits or high impedance grounded circuits cannot provide ground fault protection. Rather, overcurrent relays and current transformers are necessary to provide this protection when necessary. The main issue at the electric supply source is short circuit protection. This section should be changed back to the concept in the 1996 NEC so only short circuit protection is required at the point where the conductor receives its supply.
PANEL ACTION: Accept in Part.
The panel accepts the proposed subsection title, "Location and Type of Protection.", and rejects the remainder of the proposal.
PANEL STATEMENT: The panel accepts the subsection title which is in conformance with the NEC Style Manual. See panel action on Proposal 10-77 and panel action and statement on Proposal 10-78.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1474)

10- 81 - (240-100(a)(1)): Accept

NOTE: The Technical Correlating Committee directs the panel to reconsider the proposal relative to the use of permissive language in the second sentence. This action will be considered by the Panel as a Public Comment.

SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Revise the text as follows:

(1) Overcurrent Relays and Current Transformers. Circuit breakers used for overcurrent protection of 3-phase circuits shall have a minimum of three overcurrent relay <u>elements</u> operated from three current transformers. <u>The separate overcurrent relay elements (or protective functions) may be part of a single electronic protective relay unit.</u>

On 3-phase, 3-wire circuits, an overcurrent relay <u>element</u> in the residual circuit of the current transformers shall be permitted to replace one of the phase relay <u>elements.</u>

An overcurrent relay <u>element</u>, operated from a current transformer that links all phases of a 3-phase, 3-wire circuit, shall be permitted to replace the residual relay <u>element</u> and one of the phase-conductor current transformers. Where the neutral is not regrounded on the load side of the circuit as permitted in Section 250-184(b), the current transformer shall be permitted to link all 3-phase conductors and the grounded circuit conductor (neutral).

SUBSTANTIATION: This change is intended to recognize present-technology multifunction electronic overcurrent relays. These types of devices provide equal or better protection to the single-function relays that were previously the norm.

This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4179)

10- 82 - (240-101(a), FPN (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Insert a new Fine Print Note as follows:
FPN: The minimum trip setting of an electronically actuated fuse is the minimum amount of current that will cause the device to open. It is equivalent to the long-time trip element setting of a circuit breaker.
SUBSTANTIATION: While giving a seminar, several people came up to me and asked if the word "minimum," in the context of a Code section that supposedly sets the maximum values for overcurrent protection, were a misprint. It seems to suggest that the six-times parameter, which is a maximum ceiling for circuit breakers, is only the minimum floor for these devices. Although the manufacturers understand how the term is used, it is counterintuitive. After discussing this with a manufacturer, who didn't want the Code to change to the point where he would have to relabel his products, we hit on the idea of a fine print note. Based on the way the question resonated at the seminar, I think there is likely to be quite a bit of confusion on this point, and the note will put it to rest.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree with the submitter's definition. This information is presently available in the manufacturer's documentation. This is design information that does not belong in the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3779)

10- 83 - (240-102): Reject
SUBMITTER: Behzad Eghtesady, City of Los Angeles, CA
RECOMMENDATION: Where an orderly shutdown is required to minimize hazard(s) to personnel and equipment in an ungrounded system, a means shall be provided to protect the system from destructive transient over voltage(s) due to ground fault(s) based on the following conditions:
(1) Coordinated short-circuit protection.
(2) Impedance grounded system.
(3) Overload indication based on monitoring systems or devices.
(4) Cables with 133 percent insulation level.

For the purpose of this section, coordination is defined as properly localizing a fault condition to restrict outages to the equipment affected, accomplished by a choice of selective fault-protective devices.

Impedance grounding of a system shall be accomplished through the use of either a derived or readily available neutral. Due to complexity of such installations, they shall be done under supervision of a registered professional engineer.

FPN: The monitoring system may cause the condition to go to alarm, allowing corrective action or an orderly shutdown, thereby minimizing personnel hazard and equipment damage.
SUBSTANTIATION: Currently, there is no equivalent requirement for a high voltage system as there is for low voltage system as specified in section 240-12. This new requirement will produce an equivalent protection for high voltage systems that are similar to what is currently offered in the code for low voltage installations. Furthermore, majority of plant failures in high voltage systems are contributed to the overvoltage and their build up in ungrounded systems due to ground faults. This overvoltage can easily reach six to eight times the phase voltage due to restriking ground faults. Since such an installation would require detail engineering analysis, it would be prudent that such a work to be done under supervision of a professional registered engineer.

This new requirement will establish a safe and reliable installation with minimal cost. Lack of such protection will continue to create a wiring system that fails often and cause dangerous operating conditions for the employees or occupants of plants, beside any economic loss.
PANEL ACTION: Reject.
PANEL STATEMENT: Part I of Article 240 deals with overcurrent not with overvoltage protection. The panel does not agree that impedance grounding should be required for such systems. The proposal would not add flexibility to code users other than what is already provided by the panel's acceptance of proposal 10-77. See panel action and submitter's substantiation on Proposal 10-77.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

Note: The sequence no. 10-84 was not used.

ARTICLE 250 — GROUNDING

(Log #457)

5- 54 - (250): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 250-30(a)(3)(b), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".
2. In Section 250-50, replace "5 ft (1.52 m)" with "1.5 m (5 ft)".
3. In Section 250-50(a), replace "10 ft (3.05 m)" with "3.0 m (10 ft)".
4. In Section 250-50(c), replace "2 in. (50.8 mm)" with "50 mm (2 in.)".
5. In Section 250-50(c) in 2 locations, replace "20 ft (6.1 m)" with "6.0 m (20 ft)".
6. In Section 250-50(c), replace "1/2-in. (12.7 mm)" with "12.7 mm (1/2 in.)".
7. In Section 250-50(d), replace "2 1/2 ft (762 mm)" with "750 mm (30 in.)".
8. In Section 250-50(d), replace "20 ft (6.1 m)" with "6.0 m (20 ft)".
9. In Section 250-52, replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
10. In Section 250-52(c), replace "8 ft (2.44 m)" with "2.5 m (8 ft)".
11. In Section 250-52(c)(2) in 2 locations, replace "5/8 in. (15.87 mm)" with "15.87 mm (5/8 in.)".
12. In Section 250-52(c)(2), replace "1/2 in. (12.7 mm)" with "12.7 mm (1/2 in.)".
13. In Section 250-52(c)(3) in 2 locations, replace "8 ft (2.44 m)" with "2.5 m (8 ft)".
14. In Section 250-52(c)(3), replace "21/2 ft (762 mm)" with "750 mm (30 in.)".
15. In Section 250-52(d), replace "2 ft^2 (0.2 m^2)" with "0.2 m^2 (2 ft^2)".
16. In Section 250-52(d), replace "1/4 in. (6.35 mm)" with "6.35 mm (1/4in.)".
17. In Section 250-52(d), replace "0.06 in. (1.52 mm)" with "1.52 mm (0.06 in.)".
18. In Section 250-52(d), replace "2 1/2 ft (762 mm)" with "750 mm (30 in.)".
19. In Section 250-56, replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
20. In Section 250-56, FPN, replace "8 ft (2.44 m)" with "2.5 m (8 ft)".
21. In Section 250-56, FPN, replace " 6 ft (1.83 m)" with "1.8 m (6 ft)".
22. In Section 250-64(a), replace "18 in. (457 mm)" with "450 mm (18 in.)".
23. In Section 250-80, Exception, replace "18 in. (457 mm)" with "450 mm (18 in.)".
24. In Section 250-86, Exception No. 1(b), replace "25 ft (7.62 m)" with "7.5 m (25 ft).
25. In Section 250-86, Exception No. 3, replace "18 in. (457 mm)" with "450 mm (18 in.)".
26. In Section 250-92(b), FPN No. 1, replace "6 in. (152 mm)" with "(150 mm (6 in.)".
27. In Section 250-102(e), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
28. In Section 250-106, FPN No. 2, replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
29. In Section 250-106, FPN No. 2, replace "3 ft (0.92 m)" with "900 mm (3 ft)".
30. In Section 250-110(1), replace "8 ft (2.44 m)" with "2.5 m (8 ft)".
31. In Section 250-110(1), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

32. In Section 250-110(1), Exception No. 2, replace "8 ft (2.44 m)" with "2.5 m (8 ft)".
33. In Section 250-118(6)(c), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".

34. In Section 250-118(7)(d), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
35. In Section 250-118(8)(b), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
36. In Section 250-184(a), Exception No. 2 FPN, replace "10 ft (3.05 m)" with "3.0 m (10 ft)".
37. In Section 250-188(e), replace "20 ft (6.1 m)" with "6.0 m (20 ft)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show the SI units as the preferred and inch-pound units immediately following in parenthesis. A soft conversion was used for product related items such as ground rods.
PANEL ACTION: Accept.
PANEL STATEMENT: Editorially, add hard conversions where ever necessary to CMP 5 proposals in all revised or altered accepted text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
RAPPAPORT: I agree with the change to metric but I do not agree with some of the specifics. Distances less than 0.1 meters (100 mm) would normally be measured with a ruler and it is appropriate to state the distance in millimeters. A distance of 0.5 meter (500 mm) would be measured with a tape and should be given in meters. I, therefore, suggest that distances of 0.5 meters and longer be stated in meters and distances less than 0.5 meters be stated in millimeters. The conversions of small numbers should also take into account the tolerance (not given) of the inch values. For example, 5/8 in. is translated to 15.87 mm. If the tolerance on the 5/8 in. is 1/64 in., then the millimeter value would be 16.27 mm. It would seem that for item 11, for example, the new rod diameter should be given as "16 mm (5/8 in)". Similar arguments can be given for item 16: "6.5 mm (1/4 in.)" and for item 17: "1.5 mm (0.6 in.)".

(Log #2815)

5- 55 - (250): Reject
SUBMITTER: Joseph Kenning, St. Cloud, MN
RECOMMENDATION: Grounding system is very important, but should be noncurrent carrying system. To correct this issue, 110 volts should be retransformed to fully balance the coil. Transformers should never be bonded to earth, to stop alternating electrical magnetic field.
SUBSTANTIATION: I have provided a video that describes the serious problems of grounding system. My system has been in operation for 14 years and is open for review.
When this system is hooked up right it is safer and more fire proof.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no specific recommendation made by the submitter in the proposal. Section 4.3.3(c) of the Regulations Governing Committee Projects requires proposals to include proposed text, including the wording to be added, revised (and/or) revise, or deleted
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4088)

5- 56 - (250-2): Reject
SUBMITTER: Thomas E. Trainor, City of San Diego, CA
RECOMMENDATION: Add a new Section 250.2 Definitions, to define technical terms used in Article 250. The proposed new section would read as follows:
250.2. Definitions.
Fault Current Path. An electrically conductive path from the point of a ground fault on a wiring system to the grounded conductor at the service. The path may consist of any combination of equipment grounding conductors, metallic raceways, metallic cable sheaths, electrical equipment, and any other electrically conductive material such as metal water and gas piping, steel framing members, stucco mesh, metal ducting, reinforcing steel, phone or TV cables, and the earth itself.
Effective Fault Current Path. An electrically conductive path from the point of a ground fault on a wiring system to the grounded conductor at the service designed and intended to carry current under fault conditions. An effective fault current path is created by effectively bonding together all of the electrically conductive materials that are likely to be energized by the wiring system. Effective bonding is accomplished through the use of equipment grounding conductors, bonding jumpers or bonding conductors, approved metallic raceways, connectors and couplings, approved metallic sheathed cable and cable fittings, and other approved devices. A ground fault path is effective when it is an intentionally constructed, permanent, low impedance circuit that will safely carry fault current at a level which is at least four times the trip setting of the related overcurrent device.
Ground Fault. An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the earth or some electrically conductive material which is connected to earth.
SUBSTANTIATION: The term Fault Current Path is a new technical term used in the 1999 NEC. The term Effective Fault Current Path is a new technical term proposed for the 2000 NEC. The term Ground Fault is not defined in Article 100 and requires a definition to describe why a fault current path is required.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation has not indicated that there is a need to define these terms. The panel does not agree with the submitter's definitions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
MELLO: This proposal should be accepted in principle. The terms identified for definition are either in use or proposed for use. The incorrect understanding of "bonding" is a direct result of not understanding the terms used around "ground faults." The starting point of understanding the issues of "grounding" and "bonding" must be from having defined terms. I agree with the panel's comment on not accpeting the definitions as proposed, and that there is not technical substantiation provided for the four times rating, but the principle is correct and the panel should act to find wording that is acceptable to the majority. The submitter's substantiation for having the definitions is adequate and correct.
JOHNSTON: This proposal should be Accept in Principle. Adding definitions to define some of the critical performance based terms used in Article 250 can add to the increased understanding of the purposes of grounding and bonding and promote a more user friendly Article 250. I do concur with the Panel's Statement that the Panel does not agree with the submitter's definitions. I do feel as though there is a strong need for these definitions and terms in the beginning of Article 250. The definitions and terms submitted in the proposal may need to be reworded a bit by the Panel. This proposal would further clarify the performance requirement to enhance not only usability but promote a better understanding and grasp of the critical fundamentals in this section.

(Log #4089)

5- 57 - (250-2): Reject

SUBMITTER: Thomas E. Trainor, City of San Diego, CA

RECOMMENDATION: Amend Section 250.2 to read as follows:

250.2. General Requirements for Grounding and Bonding. The following general requirements identify what grounding and bonding of electrical systems are required to accomplish. The prescriptive methods contained in Article 250 shall be followed to comply with the performance requirements of this section.

(a) Grounded Systems.

(1) Electrical System Grounding. Electrical systems that are required to be grounded or are optionally grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher voltage lines and that will stabilize the voltage to earth during normal operation.

(2) Grounding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials.

(3) Bonding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded conductor in a manner that establishes an effective fault current path.

(4) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are likely to become energized shall be connected together and to the supply system grounded conductor in a manner that establishes an effective fault current path.

(5) Creating an Effective Fault Current Path. Electrical equipment and wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit capable of safely carrying fault current at a level which is at least four times the trip setting of the related overcurrent device from any point on the wiring system where a fault may occur to the grounded conductor at the service. The earth shall not be used as the sole equipment grounding conductor or fault current path.

(b) Ungrounded Systems.

(1) Grounding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth in a manner that will limit the voltage imposed by lightning or unintentional contact with higher voltage lines and limit the voltage to ground on these materials created by capacitance.

(2) Bonding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the supply system grounded equipment in a manner that facilitates the use of ground fault detection devices.

(3) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are likely to become energized shall be connected together and to the supply system grounded equipment in a manner that facilitates the use of ground fault detection devices.

(4) Ground Fault Detection Devices. Electrical equipment, wiring and other electrically conductive material likely to become energized shall be installed in a manner that creates a permanent, low impedance circuit from any point on the wiring system where a fault may occur to the grounded service equipment to facilitate the use of ground fault detection devices. The earth shall not be used as the sole equipment grounding conductor or fault current path.

FPN: See Figure 250.2 for information on the organization of Article 250.

Figure 250.2. Grounding.

SUBSTANTIATION: The revision of Section 250-2 for the 1999 NEC originated with the NFPA Usability Task Group. The intent was not identify general performance requirements for grounding and bonding to clarify what needs to be accomplished in order to have a safely "grounded" installation. The proposal was editorial in nature, consisting of the information previously contained in old Section 250-51 and the Fine Print Notes to old 250-1. The requirements for ungrounded systems were intentionally omitted because a rewrite would require more than editorial changes. The assumption was that the panel would take appropriate action on these requirements. Unfortunately, some of the comments accepted results in a negative impact on the usability of this Section.

The following are examples, in support of this proposed revision for the 2002 NEC, to show how the amended text is more accurate and makes the Section more easily read and understood.

Example 1. Section 250-2(b) it titled "Grounding of Electrical Equipment" but only the first sentence deals with grounding. Both the second and third sentences describe how equipment must be bonded to form a fault current path. This is not "grounding" and it is inaccurate to describe it as such. The fault current path connects equipment to the grounded service conductor while grounding connects equipment to earth. Although these paths are typically the same from the point where a fault occurs to the service, they separate at the service and perform two radically different functions. The connection to the grounded service conductor is part of the "fault current path" which completes a low impedance circuit allowing a high level of fault current to return to the serving transformer and force an overcurrent device to operate. The connection to earth is an effort to protect electrical equipment from damage by lightning or high voltage. Combining these two requirements in a section entitled "grounding" is inaccurate, confusing to the user and serves to foster the ongoing confusion regarding the purposes of grounding and bonding.

The intent of the original Usability proposal was to clearly identify and differentiate between these two functions. This proposal separates the requirements for grounding and bonding as was originally intended and states them in a clear and accurate manner.

Example 2. The third sentence of Section 250-2(b) deals with ungrounded systems and requires equipment to "be connected together in a manner that establishes an effective path for fault current". Unfortunately, it is impossible to establish an effective path for fault current on an ungrounded system since there is no path for fault current to return to the serving transformer. Connecting equipment together and to the earth will provide some protection from lightning but it will not create a path for fault current. In point of fact, the first fault to metal equipment on an ungrounded circuit causes no change in the operation of the circuit. No current flows because there is no path for it to return to the source. No circuit - No current. However, a faulted circuit poses a potential hazard to equipment and personnel since a second fault can create a low impedance connection between the ungrounded conductors of the system. The only protection against ground faults on an ungrounded system is the use of ground fault detection devices. These devices can sound an alarm or shut down circuits when a fault is sensed.

This proposal more accurately described what grounding and bonding are intended to accomplish on ungrounded systems.

Example 3. Section 250-2(c) also requires electrically conductive materials on an ungrounded system to "be connected together in a manner that establishes an effective path for fault current".

The comments above apply equally to this path. No Circuit - No Current.

Example 4. Section 250-2(d) deals with "performance of the fault current path". The first issue is that this is anew technical term which is undefined in the NEC. A definition is being submitted in a separate proposal. The second issue is which fault current path? From a point where a fault occurs, there may be multiple "fault current paths". Many of them are paths that we do not want fault current to flow on, such as across stucco mesh to earth or along metal air ducts to the heating equipment. There is no way to eliminate all of the potential paths for fault current. In order for the performance requirement to be meaningful, it needs to be clear that it applies to the fault current path that we designed to carry fault current. The designed path is the one that must be a permanent part of the circuit and of low impedance to safely carry fault current and force an overcurrent device to operate. The only effective way to eliminate the fire and electrocution hazards associated with fault current is to turn off the circuit as soon as possible after a fault occurs. The overcurrent device will do this if, and only if, an effective fault current path exists.

This proposal makes it clear that electrical installations have to be made in a manner that creates an effective fault current path. This also creates another technical term which is undefined in the NEC. A definition of "effective fault current path" is submitted as a separate proposal.

In summary, this proposal (and the separate proposal for definitions) continues the work started by the original Usability Task Group. It clearly separates the performance requirements

for grounding and bonding on grounded systems because they are different. It provides different performance requirements grounding and bonding of grounded and ungrounded systems as they operate differently. It provides clearer, more measurable performance standards for the fault current path which is critical to the safe operation of electrical circuits. These proposed changes are intended to make the section easier to read, use, and enforce.
PANEL ACTION: Reject.
PANEL STATEMENT: The additional wording does not add clarity to requirements as written. There is no justification for the four times rating. There is no substantiation for the additional requirements in 250-2(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
JOHNSTON: This proposal should be Accept in Principle and in Part. I agree with the submitter's proposal to clarify this section. The nature and spirit of the proposal are well intended and are continuing in the direction of further expanding on the performance aspect of Article 250. In (a) (1) change "or are optionally grounded" to "or other electrical systems specified in Section 250-21 that are grounded by choice". In (b)(2) that facilitates the operation of ground fault detection devices if utilized. Ground detectors are not a requirement of the NEC for ungrounded systems at the present other than as specified in Section 250-21(3)(d). The proposal would clarify some of the performance issues associated with an ungrounded system. This proposal would possibly need rewording and a companion proposal in Section 250-21 that requires ground fault detection systems for ungrounded systems. Many of the more recent ungrounded systems do have some form of ground detection system installed for monitoring, but it still only appears as a FPN in Section 250-21. I agree with the submitter's intent to remove ungrounded systems from this section or add a new subsection and locate the requirements for ungrounded systems in the new section. Both systems do require an effective path for fault current, but the separation and info on the specific performance requirements of the fault current path for each system can use clarification in this section. I concur with the Panel's conclusion that the four times rating of the device has no substantiation with it to warrant the new wording in the Code.
MELLO: The proposal should be accepted in principle. The substantiation provides clear statements on how the present wording makes no sense. To apply common peformance criteria to grounded systems where a ground fault will have a high current and should be cleared by overcurrent protection to an ungrounded system only creates confusion. The concept to separate the requirements for grounding and for bondng and also to separate grounded and ungrounded systems goes a long way to resolve the confusion. I agree with the panel's action on rejecting the four times overcurrent device rating as that was not technically substantiated.

(Log #4289)

5- 58 - (250-2): Reject
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
The following general requirements identify what grounding and bonding of electrical systems are required to accomplish. The prescriptive methods contained in Article 250 shall be followed to comply with the performance requirements of this section.
(a) Grounding of Electrical Systems. Electrical systems that are required to be grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher voltage lines and that will stabilize the voltage to earth during normal operation.
(b) Bonding and Grounding of Electrical Equipment. Conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be bonded together and connected to earth so as to limit the voltage to ground on these materials. Where the electrical system is required to be grounded, these materials shall be connected together and to the supply system grounded conductor as specified by this article in a manner that establishes an effective path for fault current. Where the electrical system is not solidly grounded, these materials shall be connected bonded together to form an electrically continuous path in ~~a manner that establishes an effective path for fault current.~~
(c) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, that are likely to become energized shall be bonded as specified by this article to the supply system grounded conductor in a manner that establishes an effective path for fault current or, in the case of an ungrounded electrical system, to the electrical system grounded equipment~~, in a manner that establishes an effect path for fault current~~.
SUBSTANTIATION: The present wording misuses the term grounding in paragraph (b) when it is actually the bonding of the noncurrent carrying parts that provide for the fault current path. In addition, the fault current path for ground fault current only makes sense for grounded systems and does not make sense for an ungrounded system. This revision of the text will clarify the purposes of grounding and bonding separately as well as when combined.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text does not add clarity. The new wording could suggest that even grounded equipment electrically connected together may require additional bonding. Even systems that are not solidly grounded do require effective path for fault currents.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
MELLO: The proposal should be accepted in principle. In paragraph (b), the word "connected" and the word "in" in the last sentence should be deleted as editorial changes. The present code text is not clear and was substantiated to be incorrect so some clarity is needed. The panel comment itself indicates confusion on what "grounding" and "bonding" are for. If equipment is electrically connected together, then it is bonded as long as that electrical connection is adequate to carry the ground fault current likely to be imposed. When this electrically connected equipment gets to the service or souce of a separately derived system, then the connection to the grounding electrode is what makes it "grounded".
RAPPAPORT: This proposal should be "Accept in Principle". The proposal introduces the purpose of bonding which has been missing. It identifies, but not clearly, the difference between "system grounding" and "equipment grounding". In order to emphasize the differences in (a) and (b), subsection titles should be changed to "System Grounding" and "Equipment Bonding and Grounding", respectively. The proposal incorrectly refers to "fault current" which also includes line-to-line faults. "Fault current" should be changed to "ground fault current" which is the intended condition.
WHITE: This proposal should be accepted in principle. The words "connected" and "in" in the last sentence of proposed 250-2(b) should be deleted. The concept of bonding of electrical equipment is not presently covered in 250-2. I think this concept is an important part of the performance requirements that the panel has tried to establish in this section. I think this proposal accurately clarifies the difference between grounding and bonding and the purposes of each and therefore does add needed clarity to this section.

(Log #741)

5- 59 - (250-2(a), (d)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Grounding of Electrical Systems. Electrical systems ~~required~~ to be grounded shall be ... (remainder unchanged)
Add to first paragraph of (d):
This requirement shall not be construed as requiring an equipment grounding conductor or equipment bonding jumper larger than the largest ungrounded associated circuit conductor.
SUBSTANTIATION: The provisions of (a) should also apply to systems grounded by choice. The requirements of (d) and the FPN for Table 250-122 may be inferred as requiring a grounding conductor larger than the largest conductor where the overcurrent device rating exceeds the circuit conductor ampacity.

PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the deletion of the words "required to be" to Section 250-2(a). The panel rejects the proposed revision to Section 250-2(d).
PANEL STATEMENT: See panel action on Proposal 5-60 for the accepted text of 250-2(a). Section 250-2(d) provides fault current path performance requirements. The proposed requirements in 250-2(d) are redundant because the sizing requirements for equipment bonding jumpers and equipment grounding conductors are covered in Section 250-102(c) and (d) and Section 250-122 respectively.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3354)

5- 60 - (250-2(a)): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise Section 250-2(a) as follows:
(a) Grounding of Electrical Systems. Electrical systems that are ~~required to be~~ grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher voltage lines and that will stabilize the voltage to earth during normal operation.
SUBSTANTIATION: The requirements for how to ground a system should be followed whether the system is grounded by choice or requirement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2589)

5- 61 - (250-2(b)): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise Section 250-2(b) to read as follows:
(b) Grounding of Electrical Equipment. Noncurrent-carrying ~~C~~conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials. Where the electrical system is required to be grounded, these materials shall be connected together and to the supply system grounded conductor as specified by this article. Where the electrical system is not solidly grounded, these materials shall be connected together in a manner that establishes an effective path for fault current.
SUBSTANTIATION: The current wording of the first sentence of this section requires all conductive materials, such as conduits, cabinets, etc. to be connected to earth. The wording also includes normal current carrying conductive materials forming a part of the equipment. Taken literally, this wording includes items such as busbars. Including the phrase noncurrent-carrying limits the sentence to noncurrent-carrying conductive parts.
PANEL ACTION: Accept in Principle.
Revise Section 250-2(b) to read as follows:
(b) Grounding of Electrical Equipment. Noncurrent-carrying ~~C~~conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials. Where the electrical system is ~~required to be~~ grounded, these materials shall be connected together and to the supply system grounded conductor as specified by this article. Where the electrical system is not solidly grounded, these materials shall be connected together in a manner that establishes an effective path for fault current.
PANEL STATEMENT: The phrase "required to be" was removed beacuse the panel intends 250-2(b) to cover all grounded systems, whether they are required to be grounded or permitted to be grounded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: I agree with the deletion of "required to be" but I am concerned with the addition of "Noncurrent - carrying". The proposed wording is technically correct but the previous wording was also correct. The substantiation that the present wording includes current carrying conductors is not correct because the present wording refers to materials "enclosing electrical conductors". I am concerned that someone out there will try to find some ulterior motive for the CMP change in wording.

(Log #3447)

5- 62 - (250-2(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise Section 250-2(b) to read as follows:
(b) Grounding of Electrical Equipment. Noncurrent-carrying ~~C~~conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials. Where the electrical system is required to be grounded, these materials shall be connected together and to the supply system grounded conductor as specified by this article. Where the electrical system is not solidly grounded, these materials shall be connected together in a manner that establishes an effective path for fault current.
SUBSTANTIATION: The current wording of the first sentence of this section requires all conductive materials, such as conduits, cabinets, etc. to be connected to earth. The wording also includes normal current carrying conductive materials forming a part of the equipment. Taken literally, this wording includes items such as busbars. Including the phrase noncurrent-carrying limits the sentence to noncurrent-carrying conductive parts.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-61.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3732)

5- 63 - (250-2(b)): Accept in Principle
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Revise Section 250.2(b) to read as follows:
(b) Grounding of Electrical Equipment. Noncurrent-carrying conductive ~~Conductive~~ materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected to earth so as to limit the voltage to ground on these materials. Where the electrical system is required to be grounded, these materials shall be connected together and to the supply system grounded conductor as specified by this article. Where the electrical system is not solidly grounded, these materials shall be connected together in a manner that establishes an effective path for fault current.
SUBSTANTIATION: The current wording of the first section requires all conductive materials, such as conduits, cabinets, etc., to be connected to earth. The wording also includes normal current carrying conductive materials forming a part of the equipment. Taken literally, this wording includes items such as busbars. Including the phrase noncurrent-carrying limits the sentence to noncurrent-carrying conductive parts.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-61.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1773)

5- 64 - (250-2(c)): Accept in Principle
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise to read as follows:
(c) Bonding of Electrically Conductive Materials and Other Equipment. Electrically conductive materials, such as metal water piping, metal gas piping, and structural steel members, ~~that are likely to become energized~~ shall be bonded as specified by this article to the supply system grounded conductor or, in the case of an ungrounded electrical system, to the electrical system grounded equipment, in a manner that establishes an effective path for fault current.
SUBSTANTIATION: Bonding is generally required and when it is only required where likely to become energized it is so stated. In this general requirement the allowance is inappropriate.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that the submitter's intent is met by the action on Proposal 5-65. The panel believes the words "likely to become energized" are important in both Sections 250-2(c) and in 250-104.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
WHITE: This proposal should be rejected. See my Explanation of Negative Vote on Proposal 5-65.

(Log #4180)

5- 65 - (250-2(c)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Delete the comma that follows "and structural steel members."
SUBSTANTIATION: In reference to Section 250-104, water pipe bonding and gas pipe bonding occur whether or not they are connected to electrical equipment that might energize them. The gas pipe bonding rule, for example, applies equally to gas-fired equipment that has no electrical connection whatsoever. Structural steel members, however, are only bonded if they "may become energized." Therefore this comma, which I'll have to take responsibility for as part of my comment that put this in the code, introduces a technical error. The "likely to become energized" phrase should only tie to structural steel and not to the other two items.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
MELLO: The proposal would possibly create a performance requirement that is beyond the intent of the panel. The panel has typically intended that the general requirement is that water and gas piping that is likely to become energized be bonded as well as the building steel. Section 250-104 provides the specifics of prescriptive requirements for water, gas and structural steel. What this proposal could do is to require multiple bonds be installed for example in a building plumbed in plastic where many short sections of copper or metal water pipes are stubbed out, even if these metal pipes were far from any possible enegizing source.
WHITE: It has always been the intent of the panel that the qualifying phrase "that are likely to become energized" applies to interior metal piping in reference to bonding. I think the submitter is incorrect in stating that structural steel is the only item it should apply to. In light of the panel's action on Proposal 5-229 and based on the wording in 250-104(c), I think this proposal should be rejected.

(Log #3868)

5- 66 - (250-2(d)): Reject
SUBMITTER: J. Philip Simmons, Simmons Electrical Services
RECOMMENDATION: Revise text to read as follows:
(d) Effective ~~Performance of~~ Fault Current Path. The fault current path shall be permanent and electrically continuous, shall be capable of safely carrying the maximum fault likely to be imposed on it, and shall have sufficiently low impedance to facilitate the operation of overcurrent devices under fault conditions.
The earth shall not be used as the sole equipment grounding conductor or fault current path.
SUBSTANTIATION: The text came from Section 250-51 of the 1996 NEC where the title of the section was "Effective Grounding Path." This section was quoted by many as containing the fundamentals of effective grounding. Incorporating the word "Effective" in the title of the section will aid the instructor and student in conveying the true meaning of the section.
Sorry, this is as technical as I can get in the Substantiation!
PANEL ACTION: Reject.
PANEL STATEMENT: The word "performance" more clearly identifies the content of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2764)

5- 67 - (250-3-Neutral (New)): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for comment.
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc
RECOMMENDATION: Add definition as follows:
Neutral. A grounded conductor having the same voltage to each ungrounded conductor of the same 3-wire, or 4-wire circuit.
SUBSTANTIATION: Here is a start, although I realize not all neutrals are grounded. The term should be defined in the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree with the submitter's definition. CMP 5 refers this proposal to CMP 1 for comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3892)

5- 68 - (250-4): Accept
NOTE: The Technical Correlating Committee directs the Panel to reconsider this Proposal and format this section to be consistent with similar sections in other articles. The Technical Correlating Committee directs the panel to relocate this Section to 250-3. This action will be considered by the Panel as a Public Comment.
SUBMITTER: J. Philip Simmons, Simmons Electrical Services
RECOMMENDATION: 250-4. Application of Other Articles. Change this section become a Fine Print Note.
SUBSTANTIATION: Since this section reads, "In other articles applying to particular cases of installation of conductors and equipment, there are requirements that are in addition to those of this article or are modifications of them" it does not contain a requirement but is information only. As such, it needs to be changed to be a fine print note in conformance with Section 90-5(c).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: This section should be relocated to Section 250-3 as encouraged by 2.4.1 of the NEC Style Manual. Consistency throughout all articles to the extent possible will increase usability.

(Log #2167)

5- 69 - (250-6(a) and (b)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
250-6(a) The grounding of electrical systems, circuit conductors, surge arresters, and conductive noncurrent-carrying materials and equipment shall be installed and arranged in a manner that will prevent an objectionable ~~flow of~~ current over the grounding conductors or grounding paths.

250-6(b) If the use of multiple grounding connections results in an objectionable ~~flow of~~ current, one or more of the following alterations shall be permitted,...
SUBSTANTIATION: The use of "flow of" is redundant and not needed. Current is defined as the flow of electrons; therefore, it is more proper simply to say "current." The word current is used over 350 times in the code without the use of words flow or flowing.
PANEL ACTION: Accept in Principle.
The Panel accepts the proposal and in addition deletes the word "an" before the word objectionable in both 250-6(a) and 250-6(b).
PANEL STATEMENT: This revision corrects the grammar of the text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2176)

5- 70 - (250-6(b)(4)): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(4) Take other suitable remedial and approved action. ~~satisfactory to the authority having jurisdiction.~~
SUBSTANTIATION: "Approved" is defined in Article 100 of the NEC as "acceptable to the authority having jurisdiction" which is the same as "satisfactory to the authority having jurisdiction."
"Standard terms have been established through accepted use or by definition and are to be used..." [NEC Style Manual 3.2.4 Standard Terms]. "Approved" is listed as one of the standard terms in Annex B of the NEC Style Manual and defined in the NEC; therefore, "approved" should be used in place of its definition.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #740)

5- 71 - (250-8 and Exception (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence:
Wire type ~~Grounding~~ grounding conductors and bonding jumpers shall be connected by exothermic welding, listed pressure connectors, listed clamps, or other listed means.
Add:
Exception: Machine screws shall be permitted for solid No. 10 and smaller conductors, where used for no other purpose.
SUBSTANTIATION: Equipment grounding conductors may be raceways, cable armor, cable tray, cablebus framework, etc. Screws/bolts are used in many applications for bonding/grounding continuity such as receptacles, switch yokes, box covers, faceplates, cabletray and cablebus framework, etc., where there is direct metal-to-metal contact, and are indicated in Sections 250-28(a); 250-102(a); 250-126(1); 250-148(a); 250-136(a); 370-40(d); 410-58(b)(3); 550-11(c)(4); 551-55(c),(2)(3); 551-56(b) Exception; 552-56(c)(2)(3), and inferred by 250-98. While some of these may be covered by listing, all are not. A common grounding or bonding connection in boxes is by a machine screw in a tapped hole covered by Section 370-40(d).
PANEL ACTION: Reject.
PANEL STATEMENT: Machine screws are used to secure conductor pressure connectors. Section 250-8 also covers connectors other than the wire type such as conduit grounding hubs.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #742)

5- 72 - (250-20): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first paragraph:
Alternating-current Circuits and Systems to be Grounded. Alternating-current circuits and systems shall be grounded as provided in (a), (b), (c), or (d). Other circuits and systems shall be permitted to be grounded, and where grounding is provided the provisions of this article shall apply.
Revise (c): Alternating Current Systems of 1kV and Over. Alternating current systems supplying mobile or portable equipment shall be grounded as specified in Section 250-188. Where supplying other than mobile or portable equipment such systems shall be permitted to be grounded. ~~Where such systems are grounded, they shall comply with the applicable provisions of this article.~~
SUBSTANTIATION: Editorial. Many requirements of this article apply only where grounding is "required" presumably by code. Where grounding is done by choice, it should comply with minimum standards for safety. The first sentence of (c) requires grounding of mobile equipment systems, the second sentence states other than portable (i.e. mobile) systems are permitted to be grounded, which is confusing.
If this proposal is accepted the last sentence of (c) becomes redundant.
PANEL ACTION: Accept in Principle.
Revise first paragraph:
"Alternating-Current Circuits and Systems to Be Grounded. Alternating-current circuits and systems shall be grounded as provided for in (a), (b), (c), or (d). Other circuits and systems shall be permitted to be grounded. If such systems are grounded, they shall comply with the applicable provisions of this article.
Revise (c): Alternating Current Systems of 1kV and Over. Alternating current systems supplying mobile or portable equipment shall be grounded as specified in Section 250-188. Where supplying other than mobile or portable equipment, such systems shall be permitted to be grounded." ~~Where such systems are grounded, they shall comply with the applicable provisions of this article.~~
PANEL STATEMENT: The panel found errors of missing text in the recommended text. The panel made those editorial corrections to match the 1999 NEC. The panel agrees with the submitter to move the last sentence in 250-20(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3752)

5- 73 - (250-20(b)(1)): Reject
SUBMITTER: George O. Stiles, Stiles Electric Service/Rep. IAEI
RECOMMENDATION: Revise text to read as follows:
"Where the system can be grounded so that the maximum voltage to ground on the ungrounded conductors does not exceed ~~150 volts~~ suggested replacement 480 volts or maximum phase voltage."
SUBSTANTIATION: Many of the systems listed in 250-26 and 250-20 FPN produce voltages that exceed 150 volts to ground.
The 1899 code and many succeeding codes did not recognize system grounding, only requirement grounding to protect from lightning damage. For many years only neutrals were considered groundable. Grounding other than neutrals is a relatively new concept and the code needs to be adjusted accordingly. Coordination between National Electric Code and National Electric Safety Code will be enhanced by this revision.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no substantiation to mandate grounding of systems that were previously permitted to be grounded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3869)

5- 74 - (250-20(b)(4) (New)): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Add new text to read as follows:
(4) Where the grounded system conductor is uninsulated in accordance with the exceptions to Sections 230.22, 230.30, and 230.41.
SUBSTANTIATION: It appears that this requirement in the 1996 NEC for when an electrical system is required to be grounded was inadvertently omitted during the processing of the 1999 NEC. See Section 250-5(b)(4) of the 1996 NEC.
PANEL ACTION: Reject.

PANEL STATEMENT: The following statement appeared in the 1998 NEC ROP, Proposal 5-57:
"This statement is redundant. Section 250-5(b) discusses the requirements for grounding AC premises wiring systems at 50 to 1000 volts. This section begins by stating that where a grounded service conductor is uninsulated as per Sections 230-22, 230-30 and 230-41. If it is a grounded service conductor, it must be supplied from a grounded system." The panel concludes this was intended action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3355)

5- 75 - (250-20(c)): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Delete the last sentence of Section 250-20(c).
SUBSTANTIATION: This concept is already covered by Section 90-3. The sentence is vague and does not provide sufficient detail to be enforceable.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-72.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3356)

5- 76 - (250-20(d)): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise Section 250-20(d) as follows:
(d) Separately Derived Systems. ~~If required to be grounded as in (a) or (b),~~ Sseparately derived systems, as covered in (a) or (b), shall be grounded as specified in Section 250-30.
SUBSTANTIATION: Whether the system is grounded by choice or requirement should have no effect on how the grounding is accomplished. If a system is grounded it functions as a grounded system and should be installed according to the requirements.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #743)

5- 77 - (250-20(d), FPN No. 1): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for comment on the comment on the affirmative vote.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
FPN No. 1: An alternating-current power source such as an on-site generator is not a separately derived system if ~~the neutral~~ there is a solid~~ly interconnected to a service-supplied neutral~~ interconnection between a conductor of the alternate power source and a conductor of another system.
or alternatively:
See Article 100 for definition of a separately derived system.
SUBSTANTIATION: Editorial. This section relates to separately derived systems. The fine print note is an example of, or defines what is not a separately derived system and is limited since it does not address a 2-wire generator or 3-phase 3-wire generator with a solidly interconnected conductor which is not a neutral. It also does not address a generator solidly interconnected to a nonservice transformer secondary.
PANEL ACTION: Reject.
PANEL STATEMENT: The present FPN is an example only. The FPN was not intended to be all inclusive.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: This proposal should be shared with CMP-1 for information. The submitter's substantiation identifies a possible flaw in the definition of a separately derived system. If two or more separately derived systems are interconnected (such as in parallel) they would literally not be considered separately derived according to the definition. This in effect removes all other requirements that are applicable to separately derived systems. See also the substantiation for Proposal 5-162.

(Log #2459)

5- 78 - (250-21): Reject
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: The following systems covered by Section 250-20(b) of 50 volts...
SUBSTANTIATION: To make it clear that Section 250-21 modifies Section 250-20(b) but does not prohibit other systems for operating ungrounded.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not believe the additional cross reference adds clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3158)

5- 79 - (250-21(4)): Accept
SUBMITTER: Robert R. Sallaz, City of Munroe Falls, OH
RECOMMENDATION: Delete Subsection (4) from 250-21.
~~(4) Isolated systems as permitted or required in Articles 517 and 668.~~
SUBSTANTIATION: Section 250-22 clearly states that isolated circuits SHALL NOT BE GROUNDED in (2) Health Care Facilities per Article 517 and (3) Electrolytic Cells per Article 668. Current 250-21(4) states "Ac systems 50 to 1000 volts shall be permitted to be grounded in isolated systems as permitted or required in Articles 517 and 668." A direct violation of 250-22.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BRENDER: Articles 517 and 668 contain provisions that govern circumstances and methods under which certain systems are allowed to be grounded, or not. Reference to those Sections within Section 5-21(4) is an aid to the user. The submitter is incorrect that Section 250-21(4) is a direct violation of 250-22.
DOBROWSKY: The proposal should be rejected. System grounding requirements are required, permitted, or not permitted depending on specific circumstances, as provided in each article.
JOHNSTON: The proposal should be Accept in Principle and the wording in Section 250-21(4) to read:
"Systems as permitted by Section 668-30(a)."
Section 250-22 deals with circuits as compared to 250-21 which deals with systems. Some rules in 668 are permissive while others are mandatory regarding system or circuit grounding. I feel that deleting Section 250-21(4) completely will leave a void in this section.
MELLO: There is no conflict between Sections 250-21(4) and 250-22 as one deals with systems and the other deals with circuits. The provisions in Section 250-21(4) are a good pointer that there are permissive and restrictive aspects in Articles 517 and 668 dealing with grounding that modifies the requirements in Section 250-21. The proposal should be accepted in principle and a more clear reference to Section 668-30(a) provided.

(Log #744)

5- 80 - (250-22(4), (5) (New)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
(4) Lighting Systems. Circuits as provided in Articles 411 and 680.
(5) A rectifier-derived dc system supplied by direct electrical connection to an ac supply system source.

SUBSTANTIATION: Editorial. Circuits for low-voltage lighting systems and low-voltage underwater pool lighting are also required to be ungrounded. A rectifier-derived system with direct electrical between the dc and ac sides without an isolating transformer should be required to be ungrounded. A ground on the dc side in effect provides a ground for the ac supply circuit either directly or through the rectifying device(s), dependent upon the type and configuration of the rectifier.
PANEL ACTION: Accept in Principle in Part.
The panel accepts in part No. 4 to read as follows: "(4) Lighting Systems. Secondary circuits as provided in 411-5(a)."
The panel rejects the remainder of the proposal.
PANEL STATEMENT: The panel added "secondary" for clarity and removed the reference to Article 680 since the submitter did not provide a specific reference. The submitter provided inadequate substantiation for item number 5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3357)

5- 81 - (250-24(a)): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise to read:
(a) System Grounding Connections. A premises wiring system ~~that is~~ supplied by ~~an~~ a grounded ac service ~~that is grounded~~ shall have ~~at each service~~ a grounding electrode conductor connected to the ~~grounding electrode(s) required by Part C of this article. The grounding electrode conductor shall be connected to the~~ grounded service conductor, at each service, in accordance with (1) through (5).
SUBSTANTIATION: The grounding electrode requirements are covered in Part C of Article 250. See also 250-24(c). Sections or portions of sections should not be redundantly repeated. All grounding electrode requirements should be in one part and sections of that part should be referenced were appropriate. Editorial changes were made to improve readability.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
JOHNSTON: I disagree with the submitter's substantiation that sections or portions of sections should not be redundantly repeated. The existing reference to Part C continues to add clarity and provides for better user friendliness in this section. Accept adding "at each service" in the last sentence.
MELLO: The panel action should be Accept in Part. The part to accept is the additional words in the last sentence, "at each service." The remainder should be rejected. Part C does not ever require that a grounding electrode conductor be installed to a service. It only establishes the grounding electrode system and how to install, size, protect and terminate the grounding electrode conductor on the grounding electrode. In fact, in Part C there are references back to Section 250-24 where it is established that a grounding electrode conductor is required. Deleting this text is not redundant and could have the effect of removing a very citical requirement for a safe system.

(Log #1508)

5- 82 - (250-24(a), Exception (New)): Reject
SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text as follows:
250-24. Grounding Service-Supplied Alternating-Current Systems.
(a) System Grounding Connections. A premises wiring system that is supplied by an ac service that is grounded shall have at each service a grounding electrode conductor connected to the grounding electrode(s) required by Part C of this article. The grounding electrode conductor shall be connected to the grounded service conductor in accordance with (1) through (5).
Exception: When the electric utility has installed a ground fault protection system ahead of the customer's service equipment, no bonding or electrical connection from the grounding electrode system shall be made to the grounded service conductor on the load side of the utility ground fault sensing device. The neutral or grounded service conductor, however, shall be grounded on the line side of the first ground fault sensor in a manner otherwise required at the customer's service equipment. The grounding electrode conductor shall be run to an equipment grounding bus or terminal at the service equipment as long as the equipment grounding conductor and the grounded neutral conductor are not connected to each other at this point. The on-site ground fault test required by Section 230-95 shall not be performed prior to the above installation requirements. Warning signs shall be installed. This exception is restricted to this type of system only.
(1) General. The connection shall be made at any accessible point from the load end of the service drop or service lateral to and including the terminal or bus to which the grounded service conductor is connected at the service disconnecting means.
FPN: See definition of Service Drop and Service Lateral in Article 100; see also Section 230-21 for overhead supply.
SUBSTANTIATION: When ground fault protection is installed by the serving utility, additional grounding and bonding of the grounded conductor downstream of the serving utility ground fault sensor defeats the ground fault protection. This type of installation is becoming more common with larger utility services from spot or full networks where protection of the collector bus and, service lateral and service entrance conductors is necessary. This exception provides the correct installation so the utility system is not affected and also provides the requirements for the alternate termination points for the grounding and bonding conductors for the service.
PANEL ACTION: Reject.
PANEL STATEMENT: Utility protection schemes are subject to change based on the needs of the utility system. With the passage of time, if the utility did modify its protection scheme, the chances of anyone knowing that the premise wiring would then need modification would be slim to none. This situation could result in a system that would provide no protection at all. Other solutions are available to overcome this problem without requiring unusual premise wiring arrangements. In addition, the on-site ground fault test required by 230-95(c) only applies to ground fault protection systems installed on the premise wiring system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1787)

5- 83 - (250-24(b)(1)): Accept in Principle
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Revise the heading of the subsection to read:
"Routing and Size."
SUBSTANTIATION: The majority of this subsection is concerned with sizing rather than routing, so the present heading is misleading and incomplete.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 5-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2024)

5- 84 - (250-24(b)(1)): Accept
SUBMITTER: Ronald P. O'Riley, Innovative Education, Inc.
RECOMMENDATION: Change title from (1) Routing to (1) Routing and Sizing.
SUBSTANTIATION: Make the Code more user friendly by adding "Sizing" in bold face type.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2871)

5- 85 - (250-24(b)(1)): Accept in Principle
SUBMITTER: Arthur L. Kilpatrick, Westminster, CO
RECOMMENDATION: Change the title to read:
Routing (and Conductor Sizing)
SUBSTANTIATION: The conductor sizing would be easier to find.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 5-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4104)

5- 86 - (250-24(b)(1)): Accept in Principle
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Add a new last sentence as follows:
(1) Routing. This conductor shall be routed with the phase conductors and shall not be smaller than the required grounding electrode conductor specified in Table 250.66, but shall not be required to be larger than the largest ungrounded service-entrance phase conductor. In addition, for service-entrance conductors larger than 1100 kcmil copper or 1750 kcmil aluminum, the grounded conductor shall not be smaller than 12 1/2 percent of the area of the largest service-entrance phase conductor. The grounded service entrance conductor of a three-phase three-wire delta service shall not be reduced and shall be the same size as the ungrounded conductors.
SUBSTANTIATION: The grounded leg of a three-phase delta service must not be reduced since under certain conditions it could carry full load current.
PANEL ACTION: Accept in Principle.
Add a new last sentence as follows:
"(1) Routing and Sizing. This conductor shall be routed with the phase conductors and shall not be smaller than the required grounding electrode conductor specified in Table 250.66, but shall not be required to be larger than the largest ungrounded service-entrance phase conductor. In addition, for service-entrance conductors larger than 1100 kcmil copper or 1750 kcmil aluminum, the grounded conductor shall not be smaller than 12 1/2 percent of the area of the largest service-entrance phase conductor. The grounded service entrance conductor of a three-phase three-wire delta service shall be the same size as the ungrounded conductors."
PANEL STATEMENT: The panel believes this action meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1054)

5- 87 - (250-24(b)(2)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 250 as follows:
250-24(b)(2) - change "No. 1/0" to "1/0 AWG"
250-30(a)(1), Exception No. 2 - change "No. 14 copper or No. 12 aluminum" to "14 AWG copper or 12 AWG aluminum"
250-36(b) - change "No. 8 copper or No. 6 aluminum" to "8 AWG copper or 6 AWG aluminum"
250-50(a)(2), last paragraph - change "No. 6 copper wire or No. 4 aluminum wire" to "6 AWG copper wire or 4 AWG aluminum wire"
250-50(c) - change "No. 4" to "4 AWG"
250-50(d) - change "No. 2" to "2 AWG"
250-64(b) - change:
"No. 4" to "4 AWG"
"No. 6" to "6 AWG" in two places
250-66(a) - change "No. 6" to "6 AWG" and "No. 4" to "4 AWG"
250-66(b) - change "No. 4" to "4 AWG"
250-92(b), FPN No. 1 - change "No. 6" to "6 AWG"
250-102(d) - change "No. 14" to "14 AWG"
250-119(a) - change "No. 6" to "6 AWG" in two places
250-120(c) - change "No. 6" to "6 AWG" in two places
250-122(e) - change "No. 18" to "18 AWG"
250-140(2) - change "No. 10 copper or No. 8 aluminum" to "10 AWG copper or 8 AWG aluminum"
250-166(a) - change "No. 8 copper or No. 6 aluminum" to "8 AWG copper or 6 AWG aluminum"
250-166(b) - change "No. 8 copper or no. 6 aluminum" to "8 AWG copper or 6 AWG aluminum"
250-166(c) - change No. 6 copper wire or No. 4 aluminum wire" to "6 AWG copper or 4 AWG aluminum"
250-166(d) - change "No. 4" to "4 AWG"
250-178 - change "No. 12 copper or No. 10 aluminum" to "12 AWG copper or 10 AWG aluminum"
250-190 - change "No. 6 copper or No. 4 aluminum" to "6 AWG copper or 4 AWG aluminum".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROSKY: The AWG designation should also be added to the NEC Style Manual.

(Log #745)

5- 88 - (250-24(d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise last sentence:
The grounding electrode conductor shall be connected to a metal enclosure of the service conductors or the nonflexible metal service raceway at any accessible point from the load end of the service-drop or service-lateral to the service disconnecting means. Where the service consists of more than one disconnect as permitted in Section 230-40 Exception No. 2, a single point of connection shall be permitted.
SUBSTANTIATION: Editorial. Nonflexible metal service raceways are proposed as a suitable connection point. The definition of enclosure and opinions of some do not equate raceways with enclosures. The last sentence of the proposal is to clarify that multiple connections are not required.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the proposed wording does not add clarity to the section. The panel does not agree with the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #746)

5- 89 - (250-26(4)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(4) Multiphase systems ~~requiring~~ where one ~~grounded~~ phase is grounded- one phase conductor.
SUBSTANTIATION: Editorial. The word "requiring" infers a code requirement. The common phase-grounded system is grounded by choice.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #432)

5- 90 - (250-28 Exception No. 3 (New)): Reject
SUBMITTER: Patricia Ballard, Framatome Connectors U.S.A. Inc.
RECOMMENDATION: Add an exception to 250-28 to read as follows:
Exception No. 3: It shall be permitted to splice the main bonding jumper by means or irreversible compression-type connectors listed for the purpose.
SUBSTANTIATION: • Compression connectors that are listed for grounding, have been used for many decades with a good time proven history.
• The grounding electrode conductor has been allowed to be spliced (see Sections 250-64(c) and 250-70 for several code cycles), and so should the bonding jumpers.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation provided for splicing wire type main bonding jumpers. The main bonding jumper performs a different function than the grounding electrode conductor. Bus bar splices are acceptable for the main bonding jumper.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1509)

5- 91 - (250-28 Exception No. 3 (New)): Reject
SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Add the following text:
250-28. Main Bonding Jumper. For a grounded system, an unspliced main bonding jumper shall be used to connect the equipment grounding conductor(s) and the service-disconnect enclosure to the grounded conductor of the system within the enclosure for each service disconnect.
Exception No. 1: Where more than one service disconnecting means is located in an assembly listed for use as service equipment, an unspliced main bonding jumper shall bond the grounded conductor(s) to the assembly enclosure.
Exception No. 2: Impedance grounded neutral systems shall be permitted to be connected as provided in Sections 250-36 and 250-186.
Exception No. 3: When the electric utility has installed a ground fault protection system ahead of the customer's service equipment and if the operation of the ground fault system relies on the absence of the main bonding jumper at the service equipment but includes an otherwise satisfactory main bonding jumper as a part of its sensing device, the main bonding jumper shall not be installed at the service equipment which would otherwise bond the grounded service conductor to the equipment ground. The on-site ground fault test required by Section 230-95 shall not be performed prior to the above installation requirements. Warning signs shall be installed. This exception is restricted to this type of system only.
(a) Material. Main bonding jumpers shall be of copper or other corrosion-resistant material. A main bonding jumper shall be a wire, bus, screw, or similar suitable conductor.
(b) Construction. Where a main bonding jumper is a screw only, the screw shall be identified with a green finish that shall be visible with the screw installed.
(c) Attachment. Main bonding jumpers shall be attached in the manner specified by the applicable provisions of Section 250-8.
(d) Size. The main bonding jumper shall not be smaller than the sizes shown in Table 250-66 for grounding electrode conductors. Where the service-entrance phase conductors are larger than 1100 kcmil copper or 1750 kcmil aluminum, the bonding jumper shall have an area that is not less than 12 1/2 percent of the area of the largest phase conductor except that where the phase conductors and the bonding jumper are of different materials (copper or aluminum), the minimum size of the bonding jumper shall be based on the assumed use of phase conductors of the same material as the bonding jumper and with an ampacity equivalent to that of the installed phase conductors.
Exception No. 2: Impedance grounded neutral systems shall be permitted to be connected as provided in Sections 250-36 and 250-186.
SUBSTANTIATION: When ground fault protection is installed by the serving utility, additional grounding and bonding of the grounded conductor downstream of the serving utility ground fault sensor defeats the ground fault protection. This type of installation is becoming more common with larger utility services from spot or full networks where protection of the collector bus and, service lateral and service entrance conductors is necessary. This exception provides the correct installation so the utility system is not affected and also provides the requirements for the alternate termination points for the grounding and bonding conductors for the service.
PANEL ACTION: Reject.
PANEL STATEMENT: Utility protection schemes are subject to change based on the needs of the utility system. With the passage of time, if the utility did modify its protection scheme, the chances of anyone knowing that the premise wiring would then need modification would be slim to none. This situation could result in a system that would provide no protection at all. Other solutions are available to overcome this problem without requiring unusual premise wiring arrangements. In addition, the on-site ground fault test required by 230-95(c) only applies to ground fault protection systems installed on the premise wiring system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3054)

5- 92 - (250-28 Exception No. 3 (New)): Reject
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add new Exception No. 3:
Exception No. 3: It shall be permitted to splice the main bonding jumper by means of irreversible compression-type connectors listed for the purpose or by exothermic welding process.
SUBSTANTIATION: Compression connectors that are listed for grounding have been used for many decades with a good time-proven history.
The grounding electrode conductor has been allowed to be spliced [see Articles 250-64(c) and 250-70 for several code cycles], and so should the bonding jumping.
PANEL ACTION: Reject.
PANEL STATEMENT: See action and statement on Proposal 5-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
STEINMAN: Equipment bonding jumpers are presently allowed to be spliced. The function of a main bonding jumper is the same as the function of an equipment bonding jumper. The panel provided no technical reason for rejecting the splicing of a main bonding jumper.

(Log #2333)

5- 93 - (250-30 Exception No. 3 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new Exception to read as follows:
Exception No. 3: For objectionable currents encountered in paralleled separately derived systems, the bonding jumper may be located at the paralleling switch gear.
SUBSTANTIATION: In systems that use parallel Uninteruptable Power Supplies (UPS) or systems that use parallel generators, there seems to be a problem with "circulating currents". The manufacturers of the systems state that if the bonding jumper is placed at the first overcurrent device (which in the case of a UPS is at the UPS unit per U.L. 1778) will create objectionable current and cause problems with their systems operation. If in fact this is the case then this proposal should be accepted.
One potential problem would be if the UPS units or generators were located remotely from the paralleling gear.
This proposal should help clarify if this would be an acceptable exception.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has failed to submit a history of documented problems with this proposal.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2807)

5- 94 - (250-30(3), Exception): Reject
SUBMITTER: Bud Swathwood, Bud Swathwood Consulting
RECOMMENDATION: Add the words "visible" between "is" and "the connection" to read in part:
"the grounding electrode is exposed and visible the connection shall..."
SUBSTANTIATION: This will clarify the interior metal water pipe must be visible so that any disconnection can be detected.
PANEL ACTION: Reject.
PANEL STATEMENT: Exposed as defined in Article 100 is the intent of the panel. The submitter has not provided any substantiation for this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #696)

5- 95 - (250-30(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Grounded systems. A separately derived ac system that is grounded shall comply with (1) through (4).
Exception No. 1: No change.
Exception No. 2: Separately derived systems supplied by a portable or vehicle mounted generator shall be permitted in accordance with Section 250-34.
(1) Bonding Jumper. A bonding jumper sized in compliance with Sections 250-28(a) through (d) that is sized for the derived phase conductors shall be used to connect the equipment grounding conductors to the derived grounded conductor. Except as permitted by Section 250-24(a)(4), this connection shall be made at any point on the separately derived system from the source to the first system disconnecting means or overcurrent device(s), ~~or it shall be made at the source of a~~ Where the separately derived system ~~that~~ has no disconnecting means or overcurrent device(s) or directly supplies multiple circuits the bonding connection shall be made at the source of the separately derived system and the sum of the area of the largest ungrounded phase conductor of each circuit shall be used to determine the size of the bonding jumper. ~~The point of connection shall be the same as the grounding electrode conductor as required in Section 250-30(a)(2).~~
Exception No. 1: Where a single set of derived conductors supply the total load ~~A~~ a bonding jumper at both the source and the first disconnecting means shall be permitted where doing so does not establish a parallel path for the grounded circuit conductor. Where a grounded conductor is bonded at the first disconnect/overcurrent device ~~used in this manner,~~ it shall not be required to be larger than the largest ungrounded conductor if of the same material or adjusted in size in accordance with the equivalent size columns of Table 250-66. For the purposes of this exception, connection through earth is not considered as providing a parallel path.
(Exception No. 2 - no change)
(2) Grounding Electrode Conductor. A grounding electrode conductor, sized in accordance with Section 250-66 for the derived phase conductors, shall be used to connect the grounded conductor of the derived system to the grounding electrode as specified in (3). Where multiple sets of circuit conductors are directly supplied the equivalent area of the largest derived phase conductor shall be considered as the sum of the largest ungrounded phase conductor of each circuit.
(remainder unchanged)
SUBSTANTIATION: Editorial. This section is straightforward and clear where the conductors supplied by the separately derived system are a single set and the disc/overcurrent devices are a single set or grouped together. However, there is no prohibition of multiple sets of conductors tapped to the system source. For transformers requiring secondary overcurrent protection there could be six sets of conductors. For transformer not requiring secondary ovrcurrent protection, and generators protected by inherent design there is no specified limit on the number of sets of conductors that may be tapped to the source, with disconnect/overcurrent devices located per tap rules. With multiple sets of conductors and disconnect/overcurrent devices, which is the "first"? Is bonding permitted at only one, or at each of the disconnect/overcurrent devices? What are the sizing requirements for the bonding jumpers and grounding conductor for such multiple sets? There are no specifics indicated and interpretations may vary.
Exception No. 1 does not specify a minimum grounded conductor size for fault current where the grounded conductor is bonded at the source or the first disconnecting means, but not at both locations, if the source is a transformer. Section 445-5 covers this for generator sources.
Since this section (1) mandates the point of connection for the bonding jumper it determines the point of connection of the grounding electrode conductor by virtue of (a)(2) and the last sentence of that section for the point of connection of the grounding electrode conductor is superfluous.
Where multiple tapped circuits and disconnect/overcurrent devices are installed, the provisions for dual bonding and bonding at the disconnect/overcurrent device is eliminated. With multiple and scattered bonding points, it is virtually impossible to avoid parallel return paths, especially in an occupancy where metal raceways, cables, piping, building steel, and equipment are in electrical contact.
The proposal does not eliminate dual bonding points where only one circuit is supplied. It does eliminate a bonding point at one disconnect/overcurrent device from being the connection point of the grounding electrode conductor where multiple sets of circuit conductors and disconnect/overcurrent devices are taped to the source. This is not presently prohibited.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that this proposal is not editorial. The substantiation does not clearly identify the reasons for the specific changes. The panel finds this proposal unclear and confusing.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3360)

5- 96 - (250-30(a), Exception): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise as follows:
Exception for (a), (b), and (c): Where a separately derived system originates in listed equipment suitable for use as service equipment ~~also used as service equipment~~, the grounding electrode used for the service or feeder ~~equipment~~ shall be permitted as the grounding electrode for the separately derived system provided the grounding electrode conductor from the service or feeder ~~equipment~~ to the grounding electrode is of sufficient size for the separately derived system. Where the equipment ground bus internal to the service equipment is not smaller than the required grounding electrode conductor, the grounding electrode connection for the separately derived system shall be permitted to be made to the bus.
SUBSTANTIATION: Frequently for campus style distribution systems the supply conductors to a building are feeders. This provision should also be acceptable for those applications installed according to Part B of Article 225.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel understands that this exception is to be placed after 250-30(a)(3)(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
MELLO: The word "equipment" that was deleted in 2 places after the inserted words "or feeder" needs to be left in. A grounding electrode and grounding electrode conductor does not go to a "service" or "feeder" circuit, but goes to the equipment served by the service or feeder circuit. In fact, the last part of the first sentence implies the grounding electrode conductor connects to the "service" or "feeder" wiring and not necessarily the equipment. Since this is an exception, this could

lead someone to believe the connection point on the grounding electrode conductor could be in locations other than the service equipment of feeder equipment, which is contrary to other sections. The substantiation provided by the submitter is very adequate to add the words "or feeder", but no substantiation was provided for deleting the word "equipment" in these two locations and change the meaning of this exception.

RAPPAPORT: This proposal should be "Accept in Principle" with the word "equipment" retained. The grounding electrode conductor is connected to equipment, not to a conductor (current carrying) such as a service or a feeder.

(Log #747)

5- 97 - (250-30(a) Exception No. 2 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:

Exception No. 2: Where the separately derived system power source is a portable or vehicle-mounted generator, the provisions of Section 250-34 shall be permitted.

SUBSTANTIATION: Editorial. To provide correlation with Section 250-34. That section permits a grounding electrode other than those which shall be indicated in (a)(3). It has been my impression that a "shall" provision is not negated by a permitted provision unless it is an exception.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal is not editorial. The panel does not agree that this section needs an exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4181)

5- 98 - (250-30(a)(1)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise by changing the internal reference from "250-24(a)(4)" to "250-24(a)(3)"
SUBSTANTIATION: This proposal addresses Section 250-30(a)(1) and (2). These NEC paragraphs were revised in an attempt to correct reference errors with respect to provisions in Section 250-24 in the prior Code [1996 NEC 250-23]. First, (a)(1) now only refers to Section 250-24(a)(4) [1996 NEC 250-23(a) Exception No. 5] instead of referring to both this section and Section 250-24(a)(3) [250-23(a) Exception No. 4] as before. Second, (a)(2) now refers to both of those provisions in Section 250-24(a), instead of only Section 250-24(a)(3) as before. The 1999 NEC change, to which this proposal responds, corrects one error (in a 1993 NEC change), but creates a new error.

In referencing former Exception No. 5 [1999 NEC: 250-24(a)(4)], the intent was to recognize that on large systems the grounding electrode conductor connection must be made so as to prevent desensitizing ground-fault detection relays. In some cases this may best be arranged if that connection is made to the equipment grounding bus.

Unfortunately, this 1993 code change was made in old subsection (a) [1999 NEC: 250-30(a)(1)] dealing with the main bonding jumper location, instead of (b) [1999 NEC 250-30(a)(2)] that contains rules on the location of the grounding electrode conductor connection. The 1999 NEC change did correct that error, and Section 250-30(a)(2) is now correct.

Section 250-30(a)(1) now refers to Section 250-24(a)(4), however, a provision that has nothing to do with the location of the bonding jumper. Before the 1999 change, the equivalent material referred (in part since 1993 and exclusively before that) to what is now Section 250-24(a)(3) on double-ended services. It did so going back to the 1975 NEC (resulting from a NEMA proposal), in order to accommodate selective ground-fault protection of equipment (GFPE) schemes that are available to permit dual-source systems to operate with maximum service continuity. Under these systems, a ground fault only disables half the loads, with the other side remaining operable.

The 1999 NEC inadvertently and with no substantiation effectively disallows placing the bonding jumper at the downstream center tie point in cases where separately derived systems are arranged in a double-ended design. Although Sec. 250-30(a)(2) now allows for the grounding electrode conductor to be connected at such a point, the bonding jumper must be connected at the same point in order to avoid parallel current over enclosures. Further, if the bonding jumper is connected at another location, the selective GFPE arrangements won't work correctly. This proposal corrects the error and allows our major industrial users to continue using a design that has been in the NEC for a quarter century.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4290)

5- 99 - (250-30(a)(1)): Reject
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:

(1) Main Bonding Jumper. A main bonding jumper in compliance with Sections 250.28(a) through (d), that is sized for the derived phase conductors, shall be used to connect the equipment grounding conductors of the separately derived system to the grounded conductor. Except as permitted by Section 250.24(a)(4), this connection shall be made at any point on the separately derived system from the source to the first system disconnecting means or overcurrent device, or it shall be made at the source of a separately derived system that has no disconnecting means or overcurrent devices. The point of connection shall be the same as the grounding electrode conductor as required in Section 250.30(a)(2).

SUBSTANTIATION: This revision incorporates the revised definition of "main bonding jumper" that was submitted under a separate proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no substantiation for this change. The submitter has not provided evidence that the term "bonding jumper" is not clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MELLO: The term "bonding jumper" is used to identify many things in Article 250, which creates confusion. Primarily it is used in various forms as that conductor or electrical connection to ensure the electrical continuity of noncurrent carrying metallic parts and to be adequate to carry any ground fault current likely to be imposed on it. A "bonding jumper" used to connect the current carrying grounded conductor (neutral) to the equipment grounding conductors and metal enclosure is rightfully called the "main bonding jumper". With the change in the 1987 NEC for the definition of the term "service", the terms used that are limited to "services" only must be revisited. Any purposeful connection or bonding between the grounded circuit conductor and the equipment grounding conductors should be called a main bonding jumper with all the same size, installation, termination and other requirements already being duplicated.

(Log #CP502)

5- 99a - (250-30(a)(1) Exception No. 1): Accept
SUBMITTER: CMP 5
RECOMMENDATION: Change the last sentence from "is not considered" to "shall not be considered."
SUBSTANTIATION: This change is needed for compliance with the NEC Style Manual Section 3.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2292)

5- 100 - (250-30(a)(2)): Reject
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Add a new paragraph as follows:
"Where the source of the separately derived system is located outside the building and the grounding electrode connection is made at the source, at least one additional grounding connection shall be made from the grounded conductor to a grounding electrode, either at the source or elsewhere outside the building."
SUBSTANTIATION: This change brings the requirement for services found in Section 250-24(a)(2) to outdoor derived systems.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is confusing and it is unclear as to the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3448)

5- 101 - (250-30(a)(3) (New)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Add a new section (3)(d) to read:
(3)(d) It shall be permissible to connect the grounded electrode conductor of a separately derived system to a continuous grounding electrode conductor which is connected to an effectively grounded metal water pipe within 5 ft (1.52 m) from the point of entrance into the building and extending through the building. All connections shall be made at an accessible location and either by an irreversible crimp, listed for the purpose, or by exothermic weld. The continuous grounding electrode conductor shall not be smaller than 3/0 copper or 250 kcmil aluminum. The grounding electrode conductor of the separately derived system must still comply with Sections 250-28(a) through (d).
SUBSTANTIATION: In a high-rise building or a large manufacturing facility where there is no effectively grounded structural metal members it is not practical to run an individual grounding electrode conductor form every separately derived system transformer back to the effectively grounded metal water pipe within 5 ft (1.52 m) of the entrance of the metal piping into the building. The same result can be accomplished by grounding each separately derived system back to a common grounding electrode conductor that is connected to the effectively grounded metal water pipe.
PANEL ACTION: Accept in Principle.
Add a new paragraph to Section 250-30(a)(2), placed before the exception, to read as follows:
"It shall be permissible to connect the grounding electrode conductor of a separately derived system to a continuous grounding electrode conductor which is connected to the building grounding electrode system and extended through the building. All connections shall be made at an accessible location by an irreversible compression connector listed for the purpose, listed connections to copper busbars not less than 6 mm x 50 mm (1/4 in. x 2 in.), or by the exothermic welding process. This continuous grounding electrode conductor shall not be smaller than 3/0 AWG copper or 250 kcmil aluminum. This continuous grounding electrode conductor and the grounding electrode conductor(s) of each separately derived system shall comply with 250-64(a) through (e)."
PANEL STATEMENT: This proposal provides an alternate solution to where effectively grounded building steel or effectively grounded water pipe are not near the location of separately derived systems, with equal and effective safety. This solution will reduce the excessive lengths of individual grounding electrode conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: I agree with the need for this method for high rise buildings and large manufacturing facilities. I am concerned that this provision will be misused in smaller facilities. I would suggest that there be specific proposals, with justification, as to what constitutes a high rise building and what constitutes a large facility. Perhaps the provisions of this proposal should be reworded to be limited to buildings of more than three floors (?) or length or width greater than three hundred feet (?).
COMMENT ON AFFIRMATIVE:
DOBROWSKY: I agree with he concept of extending a grounding electrode conductor but this new language includes some additional restrictions. Grounding electrode conductors are presently allowed to be spliced according to Section 250-50 and 250-64(c). The 3/0 AWG copper or 250 kcmil aluminum minimum conductor size and accessible splice location requirements are excessive in many situations. This provision should also be expanded to include structures.

(Log #2301)

5- 102 - (250-30(a)(3)(a)): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc./Rep. Associated Buildings and Contractors, Inc.
RECOMMENDATION: Revise text to read as follows:
"An effectively grounded structural metal member of the structure or a copper bus bar installed around the inside perimeter of the building that serves in place of the metal frame of the building or structure where effectively grounded."
SUBSTANTIATION: There are several manufacturers of modular, premanufactured steel frame substation buildings that contain MCCs and switchgear, typically the equipment is rated 480 V to 35 kV. The buildings are usually installed in supervised industrial facilities. Some manufacturers install a continuous copper bus bar mounted to the interior wall and routed around the building perimeter which is used to bond all equipment enclosures. The bus bar is also used as a grounding electrode to ground small lighting and power transformer neutrals. This installation would violate Section 250-30(a)(2) and (3) as presently found in the 1999 edition of the NEC even though the installation meets the intent of the Code and is safe.
PANEL ACTION: Reject.
PANEL STATEMENT: This connection method is not equivalent to a grounding electrode. A busbar is permitted to be a grounding electrode conductor according to Section 250-64(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4008)

5- 103 - (250-30(a)(3)b, Exception): Reject
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: This proposal is to delete all the wording in the Exception.
Section 250.30(a)(3)(b) Exception: In industrial and commercial buildings where conditions of maintenance and supervision ensure that only qualified persons will service the installation and the entire length of the interior metal water piping that is being used for the grounding electrode is exposed, the connection shall be permitted at any point on the water pipe system.
SUBSTANTIATION: This proposal allows the use of the metal water pipe in high rise buildings to carry all available fault back to the earth. I have concerns with this practice.
First, it is rare that one electrical contractor is awarded every tenant fit-out in a high rise structure. The changes of every electrical contractor finding the correct metal water pipe to ground each separately derived system is in question. Who would be the qualified persons on the site to guide the electrician?
Secondly, the phrase "where conditions of maintenance and supervision ensure that only qualified persons will service the installation" is not realistic and to think it does exist is wishful thinking. Most of the maintenance personnel in today's high rise buildings are light bulb changers and toilet fixers, i.e., basic handymen. Adding to this problem is the fact that, in today's climate, building owners change frequently thus eliminating any persons with any practical experience on the system. If I could further muddy the water, imagine the people on the maintenance staff looking for and accepting higher paying jobs. Maintenance personnel change jobs as often, if not more than, other sectors of society. This would deplete the building staff of any "tenured qualified personnel".
Finally, the metal water piping system installed during the initial construction changes frequently. In as little as 3, 5, or 10 years later, tenants move in/out or they may want an upgrade, changing

what was originally roughed in. However, this path for an electrical fault to ground is blessed and approved. Plumbers often substitute PVC or some other metal pipe (i.e., steel or brass in lieu of copper) for the original when it comes time to repair, alter, or add to the water system. This creates either no continuity to ground or one with increased impedance. Will this trip the circuit breaker under a fault? Probably, but hopefully my family or friends will not be the unfortunate statistic that may sway the panels vote.

Building steel is everywhere. With today's technological advances and products, it seems foolish to rely on a ground (in essence a conductor) that can be changed by others not familiar with the hazards of electricity.

PANEL ACTION: Reject.

PANEL STATEMENT: The effectively grounded water pipe is not intended to carry fault current. There are many instances where the conditions of maintenance and supervision do ensure that only qualified persons service the installation. There are many buildings and structures, constructed of wood or masonry, that do not have building steel.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

BRENDER: I agree with the submitter, that there is no way to ensure the electrical continuity of water piping, even in industrial and commercial buildings, and especially following initial construction. The proposal, if adopted, will ensure an electrically-continuous grounding electrode system, and will enhance safety.

(Log #2590)

5- 104 - (250-30(a)(3)(d) (New)): Accept in Principle

SUBMITTER: Donald R. Cook, Southern Section, IAEI

RECOMMENDATION: Add a new Section (3)(d) to read as follows:

(3)(d) It shall be permissible to connect the grounded electrode conductor of a separately derived system to a continuous grounding electrode conductor which is connected to an effectively grounded metal water pipe within 5 ft (1.52 m) from the point of entrance into the building and extending through the building. All connections shall be made at an accessible location and either by an irreversible crimp, listed for the purpose, or by exothermic weld. The continuous grounding electrode conductor shall not be smaller than 3/0 copper or 250 kcmil aluminum. The grounding electrode conductor of the separately derived system must still comply with Sections 250-28(a) through (d).

SUBSTANTIATION: In a high-rise building or a large manufacturing facility where there is no effectively grounded structural metal members it is not practical to run an individual grounding electrode conductor from every separately derived system transformer back to the effectively grounded metal water pipe within 5 ft (1.52 m) of the entrance of the metal piping into the building. The same result can be accomplished by grounding each separately derived system back to a common grounding electrode conductor that is connected to the effectively grounded metal water pipe.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 5-101

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

RAPPAPORT: See my Explanation of Negative Vote on Proposal 5-101.

COMMENT ON AFFIRMATIVE:

DOBROWSKY: See my Comment on Affirmative on Proposal 5-101.

(Log #3358)

5- 105 - (250-30(a)(4)): Accept

SUBMITTER: Paul Dobrowsky, Holley, NY

RECOMMENDATION: Delete this section.

~~(4) Grounding Methods. In all other respects, grounding methods shall comply with requirements prescribed in other parts of this code.~~

SUBSTANTIATION: This section is adequately covered by Section 90-3. By using the word "other" nonapplicable sections, such as for services, may be incorrectly applied.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #4291)

5- 106 - (250-30(a)(5) (New)): Reject

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Add new text to read as follows:

(5) Equipment Bonding Jumper Size. The bonding jumper run with the derived phase conductors from the source of a separately derived system to the first disconnecting means shall be sized in accordance with Sections 250.28(a) through (d) based on the size of the derived phase conductors.

SUBSTANTIATION: The bonding or grounding conductor that is installed between the source of a separately derived system such as a transformer and the first disconnecting means is not specifically defined by a name and there are not clear requirements for the size. Some individuals consider this strictly as an equipment grounding conductor sized per Section 250-122. Others consider it like a bonding jumper sized per Table 250-66. This conductor may have to carry a ground fault current for some time until the short circuit and ground fault protection on the primary of the source is able to operate. By defining what this conductor is and providing requirements for sizing, this issue in the Code is clarified. By using the same sizing criteria as for the main bonding jumper for the derived system, the conductor sizing is adequate to perform its intended function.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed wording does not add clarity. The proposed term may be misunderstood to require an additional conductor.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

JOHNSTON: I agree with the submitter that a problem exists in the field. This change would clarify any confusion. I disagree with the Panel's Statement that the wording does not add clarity to this section. By accepting this proposal, it would be clear how to accomplish the sizing of this conductor and add a proper term for this conductor.

MELLO: Section 250-96 specifically and other sections already establish that some sort of conductor must be installed between any two pieces of equipment to ensure continuity of metallic path and to carry the fault current that might be imposed. The conductor that provides "bonding" between the separately derived source (transformer, generator or converter), and the enclosure, which could be a metal raceway, on the secondary is not specifically defined and therefore there is confusion on how to size it. Some people believe this conductor is an equipment grounding conductor with size based on Table 250-122, but there is not an overcurrent device ahead for sizing to ensure this conductor has the proper withstand capacity for the secondary ground fault current. Others believe this conductor is a "bonding conductor" and should be sized similar to a bonding conductor on the line side of a service. This argument has more credibility because the derived phase conductors can be used and reference to Section 250-103(c) so adequate withstand is provided. This proposal attempts to resolve the issue by defining the conductor as an equipment bonding jumper and specifically requires the size to follow similar rules as the bonding conductor on the line side of a service. No additional conductor is intended nor specified, all this proposal said was that this conductor is to be sized this way.

RAPPAPORT: I agree with the submitter that sizing of this conductor is open to various interpretations. This proposal clarifies the requirement.

(Log #3359)

5- 107 - (250-30(b)(3)): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Delete this section:
~~(3) Grounding Methods. In all other respects, grounding methods shall comply with requirements prescribed in other parts of this code.~~
SUBSTANTIATION: This section is adequately covered by Section 90-3. By using the word "other" nonapplicable sections, such as for services, may be incorrectly applied.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2905)

5- 108 - (250-32): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
~~Two~~ One or more Buildings or Structures Supplied from a ~~common~~ remote service or separately derived system.
(a) Grounding Electrode. Where ~~two or more buildings or structures are supplied from a common ac service by~~ a feeder(s) or branch circuit(s) is supplied from a remote ac service(s) or remote stand-alone separately derived ac system(s), The grounding electrodes ~~required~~ specified in Part C of this article at each building or structure served shall be connected in the manner specified in ~~either~~ (b) ~~or (c).~~ Where there are no existing grounding electrodes, ~~the~~ a grounding electrode~~(s)~~ system that complies with Part C of this article shall be installed.
Exception: A grounding electrode at separate buildings or structures served shall not be required where only one branch circuit supplies the building or structure and the branch circuit includes an equipment grounding conductor. ~~for grounding the noncurrent carrying parts of all equipment.~~
(b) ~~Grounded System.~~ Grounding and Bonding Connections. ~~For a grounded system at~~ At the separate building or structure served, the connection to the grounding electrode and grounding ~~or~~ and bonding ~~of equipment, structures, or frames required to be grounded or bonded~~ shall comply with ~~either (1) or (2)~~ the following:
~~(1) Equipment Grounding Conductor.~~ An equipment grounding conductor as described in Section 250-118 shall be run with the supply conductors and connected to the building or structure disconnecting means and to the grounding electrode(s). The equipment grounding conductor shall be used for grounding ~~or~~ and bonding of metal piping, equipment, structures, ~~or~~ and frames ~~required~~ to be grounded or bonded. Any installed grounded conductor shall not be connected to the equipment grounding conductor or to the grounding electrode(s) at the building or structure served.
(2) Delete.
Add:
Exception: The equipment grounding conductor shall not be required where all the following conditions are met: (1) the grounded circuit conductor run with the supply to the building or structure is connected to the building or structure disconnecting means and to the grounding electrode(s) and used for grounding and bonding of metal piping, equipment, structures, and frames; (2) there are no other continuous metallic paths bonded to the grounding system of the building or structure served and other grounding electrode systems, (3) conductors on the supply side of the building or structure disconnecting means are not provided with ground-fault protection of equipment or personnel; (4) the grounded conductor size is not smaller than shown in Table 250-122 for equipment grounding conductors; (5) the supply to the building or structure consists of not more than one feeder or branch circuit.
(c) Delete.
SUBSTANTIATION: Present wording of this section does not apply to a separate building supplied by a service located in another building that does not supply any circuits in that building. For example, a building with a 1Ø and 3Ø service where the 3Ø service only supplies a circuit to the second building and is not "common" to both, whereas if the 1Ø service supplies both buildings it would be "common". It also does not apply to circuits supplied by stand-alone separately derived systems such as generators or solar photovoltaic systems since these are not services. If an outdoor service pedestal or substation supplies only one building this section only applies if they are considered as structures and contain equipment supplied by a branch circuit or feeder.
Grounding electrodes in (a) are indicated as required by Part C whereas the first sentence of Section 250-50 indicates there is no requirement to provide electrodes, but only specifies types, if available.
Specifying the purpose of the equipment grounding conductor in the exception for (a) is superfluous as that is indicated elsewhere in this section. It also literally indicates it is for grounding of "all" equipment which includes that which is completely nonelectrical.
Removal of reference to grounded systems in (b) would allow application to ungrounded systems also and make (c) unnecessary since the requirement for an equipment grounding conductor would then clearly apply, which is not covered by (c).
The phrase "required to be grounded or bonded" implies the requirements do not apply where such grounding and bonding is done by choice and not code-required.
In the present (b)(2) "where an equipment grounding conductor is not run with the supply to the building or structure" indicates a condition, but not literally a requirement or permission to omit the equipment grounding conductor of (1), nor does such wording modify mandatory requirements of other sections requiring an equipment grounding conductor.
The proposed exception for (b) refers to no "other" continuous metallic paths, so as not to exclude or conflict with the use of the grounded conductor for grounding, which does provide just such a path. Since a branch circuit may be supplied from a feeder which has GFCI protection and supplies other branch circuits, the reference to ground-fault protection is revised to include GFCI type.
Grounded conductor minimum size is specified to correlate with requirements for equipment grounding conductor size. The limitation to one supply circuit is to plainly state what in essence is already implied by the requirement that there be no continuous metallic paths (other than the regrounded grounded conductor) between grounding electrode systems in other buildings. Any additional supply circuit whether grounding is provided by an equipment grounding conductor or grounded conductor, provides such a parallel grounding path for grounded conductor current.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal submitted does not improve the clarity of this section. The term equipment as defined in Article 100 indicates that it is connected with an electrical installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4119)

5- 109 - (250-32(a)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: Revise the first sentence to read as follows:
"~~Where livestock is housed~~, Agricultural meeting the conditions described in Section 547.1(a) and (b) shall have any portion of the equipment grounding conductor run underground to the building or structure disconnecting means shall be insulated or covered copper."
SUBSTANTIATION: This requirement is intended to apply to all agricultural buildings meeting the conditions described in 547.1 not just the ones housing livestock.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that Section 250-32(e) is unnecessary because the specific requirement is already covered in Section 547-4(f). See Proposal 5-118a for the deletion of Section 250-32(e) and the associated FPN.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4292)

5- 110 - (250-32(a)): Reject
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
(a) Grounding Electrode. Where two or more buildings or structures are supplied from a common ac service by a feeder(s) or branch circuit(s), the grounding electrode(s) that are present and required in Part C of this article at each building or structure shall be connected in the manner specified in (b) or (c). Where there are no ~~existing~~ grounding electrodes present, then made grounding electrode(s) ~~required~~ identified in Part C of this article shall be installed as required in Part C of this Article.
SUBSTANTIATION: The present wording is not clear in that it could be interpreted that all of the grounding electrodes identified in Sections 250-50 and 250-52 must be installed and connected together. The revised text makes it clear in the first part that those electrodes as defined in Section 250-50 and 250-52 that are present are to be utilized. The second part clarifies that if no electrodes are available them made electrodes identified in Part C need to be installed to meet the requirements of Part C.
PANEL ACTION: Reject.
PANEL STATEMENT: The revised text does not add clarity. The panel disagrees that this could be intepretated to require all grounding electrodes identified in Sections 250-50 and 250-52 be installed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3934)

5- 111 - (250-32(a), Exception): Accept in Principle
SUBMITTER: William F. Laidler, South Shore Voc Tech School
RECOMMENDATION: Revise text to read as follows:
Exception: A grounding electrode at separate buildings or structures shall not be required where only one branch circuit supplies the building or structure and the branch circuit includes an equipment grounding conductor for grounding the noncurrent-carrying metal parts of all equipment.
SUBSTANTIATION: This exception presently only refer to noncurrent-carrying parts. I seriously doubt that anyone would require the grounding of nonmetal parts but in the interest of consistency the term metal should be inserted between the words carrying, and parts.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel believes that Proposal 5-112 meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
WHITE: This proposal should be accepted. The proposed wording "noncurrent-carrying metal parts" exactly matches the wording in the definition of an equipment grounding conductor in Article 100.

(Log #3935)

5- 112 - (250-32(a), Exception): Accept
SUBMITTER: William F. Laidler, Town of Hanover, MA
RECOMMENDATION: Revise text to read as follows:
Exception: A grounding electrode at separate buildings or structures shall not be required where only one branch circuit supplies the building or structure and the branch circuit includes an equipment grounding conductor for grounding the conductive noncurrent-carrying parts of all equipment.
SUBSTANTIATION: Article 250-6 refers to conductive noncurrent-carrying parts and this exception presently only refers to noncurrent-carrying parts. I seriously doubt that anyone would require the grounding of nonconductive parts but in the interest of consistency the term conductive should be inserted before the word noncurrent as indicated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
WHITE: This proposal should be accepted in principle. See my comment on negative vote for Proposal 5-111.

(Log #4182)

5- 113 - (250-32(a), Exception): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
"A grounding electrode at separate buildings or structures shall not be required where ~~only one branch circuit supplies the building or structure and~~ no branch circuits originate at that building or structure. The branch circuit(s) shall includes an equipment grounding conductor for grounding the noncurrent-carrying parts of all equipment."
SUBSTANTIATION: This rewrite differs from the 1999 NEC in that a second building fed with branch circuits from another can be wired without a grounding electrode if there is none available. The 1996 NEC, without any technical substantiation, removed the prior provision that an electrode had to be provided only if the second building itself supplied the multiple branch circuits (i.e., was supplied with a feeder.) In its rejection of this proposal in the 1999 cycle, the panel reiterated the intent while continuing to omit any technical substantiation for the 1996 change. The 1993 wording assured that a suitable enclosure (usually a panelboard) was available to make the connection. This proposal restores that allowance in those cases where there are multiple branch circuits, but they originate in the first building. This is very common in dwellings with detached garages. Note that if a qualified grounding electrode is available, however, it must be used. That was required in the 1993 NEC and would be unchanged under this proposed revision.
PANEL ACTION: Reject.
PANEL STATEMENT: It is the panel's intent that this exception shall only apply to a building or structure that is supplied by one branch circuit that contains an equipment grounding conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3870)

5- 114 - (250-32(b)(1)): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Add new text to read as follows:
"The equipment grounding conductor shall be sized in accordance with Section 250.122."
SUBSTANTIATION: The requirement for sizing the equipment grounding conductor needs to be added to this section to provide the complete requirements as well as for "user friendliness."
PANEL ACTION: Reject.
PANEL STATEMENT: Requirements for sizing the equipment grounding conductor are contained in Part F of Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1788)

5- 115 - (250-32(b)(2)): Accept in Principle
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Add the following to the end of the subsection:
"The size of the grounded conductor shall not be less than given in Table 250-122 based on the rating of the overcurrent device protecting the branch circuit or feeder. The grounded conductor shall not be required to be larger than the largest ungrounded supply conductor."

SUBSTANTIATION: The minimum sizing requirement for the grounded conductor was omitted when this rule was rewritten in the 1999 NEC. This omission was apparently inadvertent and should be corrected to be sure that the grounded conductor can function as a fault return path.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The action and statement on Proposal 5-117 meets the submitters intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2290)

5- 116 - (250-32(b)(2)): Accept in Principle
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Add a new second paragraph as follows:
"Where an equipment grounding conductor described in Section 250-118 is not run with the supply circuit conductors, the size of the AC system ground conductor on the supply side of the disconnecting means shall not be smaller than the size specified in Table 250-122 for equipment grounding."
SUBSTANTIATION: This rule was found in the 1996 NEC but was not included when Article 250 was revised. This requirement insures that the grounded conductor is of adequate size to carry ground fault currents.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-117.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3871)

5- 117 - (250-32(b)(2)): Accept in Principle
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Add new text to read as follows:
"The size of the grounded conductor shall be not smaller than required by Section 220.22 or as required by Section 250.122."
SUBSTANTIATION: It appears that the sizing requirement for the grounded conductor that serves as both the equipment grounding conductor and as the grounded system conductor was inadvertently omitted from this section during the processing of the 1999 NEC. The sizing requirements are essential to the user and enforcer of the NEC.
The size of the grounded conductor needs to be not smaller than required for a feeder as calculated in accordance with Section 220-22 and in addition must no to be smaller than required for equipment grounding conductors by Section 250-122.
PANEL ACTION: Accept in Principle.
Add a new last sentence to read as follows:
"The size of the grounded conductor shall not be smaller than the larger of
(1) that required by 220.22, or
(2) that required by 250.122."
PANEL STATEMENT: Section 220-22 is the minimum sizing criteria for feeder neutral conductors. Where the grounded conductor also serves as an equipment grounding conductor, that conductor must additionally meet the minimum sizing of 250-122. The panel concludes that this meets the submitters intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3872)

5- 118 - (250-32(c) (New)): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Add new text to read as follows:
(c) Bonding Means for Other Systems. An accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided at the building or structure disconnecting means by at least one of the following means that is effectively grounded:
1. Exposed nonflexible metallic raceways
2. Exposed metal enclosure for the building or structure disconnecting means
3. Exposed grounding electrode conductor
4. One or more grounding electrodes
5. External bonding conductor of copper or other corrosion-resistant material
FPN No. 1: A No. 6 copper conductor with one end bonded to the disconnecting means and with 6 in. (152 mm) or more of the other end made accessible on the outside wall is an example of the approved means covered in (c)(5).
FPN No. 2: See Sections 800.40, 810.21, and 820.40 for bonding and grounding requirements for communications circuits, radio and television equipment, and CATV circuits.
SUBSTANTIATION: The requirement for providing an accessible means for intersystem bonding needs to be added to this section that covers grounding requirements for more than one building or structure supplied by a common service.
A similar requirement is found in Section 250-92(b) but relates to services only.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is already covered in 250-92(b). The panel intends to keep all the requirements for intersystem bonding in Section 250-92(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #CP501)

5- 118a - (250-32(e)): Accept
SUBMITTER: CMP 5
RECOMMENDATION: Delete Section 250-32(e) and the associated FPN. Renumber Section 250-32 accordingly.
SUBSTANTIATION: The requirements for special occupancies are covered in Chapter 5. The requirements covered in this section are already covered in Section 547-4(f).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3140)

5- 119 - (250-32(e)): Reject
SUBMITTER: Andy Oleson, Nashville, MI
RECOMMENDATION: Revise text to read as follows:
Agricultural buildings meeting the conditions described in Section 547-1(a) and (b) shall be insulated or copper covered for any portion of the equipment grounding conductor run underground to the building or structure disconnecting means.
SUBSTANTIATION: Revising the first sentence to read as follows: Agricultural buildings meeting the conditions in 547-1(a), (b).
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 5-118a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3946)

5- 120 - (250-32(e), FPN): Reject
SUBMITTER: Bill Voisinet, Laingsburg, MI
RECOMMENDATION: Delete the fine print note in 250.32(e) and add that note to 250.32(f).
SUBSTANTIATION: 250-32(e) is not related to fine print note following 250-32(e). Fine print note is related to 250-32(f).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the requirements are better located in Article 547.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2460)

5- 121 - (250-32(f)): Accept in Principle
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Revise as follows:
... not less than given in Table ~~250-122~~ 250-66.
SUBSTANTIATION: The use of Table 250-122 could result in the connection of an 800 kcmil conductor to a 1/2 inch ground rod. Section 250-66 is used for this conductor in all other applications.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement in Proposal 5-123.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3151)

5- 122 - (250-32(f)): Reject
SUBMITTER: Dennis Harrison, Paris, MI
RECOMMENDATION: Add the following words after Table 250-122 in the first sentence to read as follows:
"Shall not be less than given in Table 250-122 or Section 547-8(c)(3),..."
SUBSTANTIATION: This section is in conflict with Section 547-8(c)(3) which requires the equipment grounding conductor to be of a size not smaller than the largest supply conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 5-121 for conductor sizing. The requirements for the special occupancy are located in Article 547.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3361)

5- 123 - (250-32(f)): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise as follows:
(f) Grounding Conductor. The size of the grounding conductor to the grounding electrode(s) shall not be less than given in Table ~~250-122~~ 250-66, and shall not be required to be larger than the largest ungrounded supply conductor. The installation shall comply with Part C of this article.
SUBSTANTIATION: The purpose of grounding in the separate building is to limit the voltage imposed by lightning, line surges, or unintentional contact with higher voltage lines and that will stabilize the voltage to earth during normal operation. This conductor should be sized according to Table 250-66 for the same reasons that service and separately derived system grounding conductors are.
PANEL ACTION: Accept in Principle.
Revise text to read as follows:
"(f) Grounding Electrode Conductor. The size of the grounding electrode conductor to the grounding electrode(s) shall not be less than given in ~~Table 250-122~~, 250-66, and shall not be required to be larger than the largest ungrounded supply conductor. The installation shall comply with Part C of this article."
PANEL STATEMENT: The panel added the word electrode to the title and in the body of this section to improve clarity. The word table was deleted to clarify that all provisions of 250-66 apply.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: The word "in" should not be struckthrough to be grammatically correct.

(Log #3362)

5- 124 - (250-32(f)): Accept in Principle
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise as follows:
(f) Grounding Conductor. The size of the grounding electrode conductor to the grounding electrode(s) shall not be less than given in Table 250-122, and shall not be required to be larger than the largest ungrounded supply conductor. The installation shall comply with Part C of this article.
SUBSTANTIATION: This is a corresponding proposal to one submitted to revise the definition of a Grounding Electrode Conductor in Article 100. The term grounding electrode conductor should be used consistently where circuits or systems are connected to a grounding electrode.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement in Proposal 5-123.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4293)

5- 125 - (250-32(f)): Accept in Principle in Part
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
(f) Grounding Conductor. The size of the grounding electrode conductor, from the connection point enclosure at the building or structure served, to the grounding electrode(s) shall not be less than given in Section ~~Table~~ 250-122~~66~~, and shall not be required to be larger than the largest ungrounded supply conductor. The installation shall comply with Part C of this article.
SUBSTANTIATION: Adding the word "electrode" properly identifies this conductor as defined in Article 100. The use of other terms for the same thing only creates confusion. The purpose of this conductor is the same as at a service, to provide a connection to earth through the grounding electrode to establish an earth potential reference for noncurrent carrying enclosures and for lightning protection. The difference with a service is that the ampacity of the feeder may be smaller than minimum 60 or 100 amps as required for a service. Since the purpose of the conductor is the same as for a service, the sizing on this conductor for a second building should be that same as for a service. In addition, by referencing the table only, the allowance for maximum size conductors for certain electrodes is not provided for. For the case where a small feeder or branch circuit is installed, the last part of the first sentence provides that this conductor need not be larger than the largest feeder or branch circuit ungrounded conductor which is not a change from the present requirement. By requiring the use of Section 250-122, as is presently set, larger feeders are having very large grounding conductors installed to grounding electrodes. For example, a 1600 amp feeder would have to have 4/0 copper "grounding conductor" where the 1600 amp service only requires a 3/0 copper grounding electrode conductor. Larger feeders only increase the difference.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: See panel action and statement in Proposal 5-123. The proposed addition of the phrase " from the connection point enclosure at the building or structure served" does not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4294)

5- 126 - (250-34): Reject
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
"Portable and vehicle mounted generators grounded and bonded under the provisions of this section shall not be used to serve fixed premises wiring systems, including connection with a flexible cord assembly. Portable and vehicle mounted generators serving utilization equipment shall comply with (a), (b), and (c) below:"
SUBSTANTIATION: Due to the need for standby power, particularly in residences, numerous installations of portable or vehicle mounted generators are being made. The installation of the generator serving fixed premises wiring should be in accordance with Article 445 and other parts of the Code. It is not clear to many installers that this section was not intended to cover using a portable generator to serve temporary power to a building or structure. Since many are connected with a portable cord, the

fixed premises wiring is being considered as if it were a piece of utilization equipment. Most of these generators have an internal bond between the neutral and the frame to meet the requirements of this section and to provide the protection intended when directly supplying utilization equipment. Without a proper grounding electrode installed to earth and with the possibility of grounding the premises wiring neutral downstream of the neutral disconnect link in violation of Section 250-24(a)(5) presents several safety concerns. The added text as an introductory statement clarifies when the grounding and bonding provisions allowed by this section are permitted.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is too broad and could be interpreted to prevent presently accepted and safe practices.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3688)

5- 127 - (250-34(a)(3) (New)): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add text as follows:
(3) Generators used where Section 525-23 applies.
SUBSTANTIATION: See related proposal to add text to Section 525-23.
The requirements of Section 250-2 can be met without grounding electrodes and grounding-electrode conductors. Especially with the 1999 NEC requirement of, "Section 525-18. Ground-Fault Circuit-Interrupter Protection for Personnel."
A lot of AHJ's time and effort is wasted in enforcing the use of grounding electrodes and grounding-electrode conductors. This is followed by a lot of expense and effort on the part of carnivals.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no Section 525-23 and the revised text referenced in the recommendation is unknown. The use of GFCI's does not replace the need for a grounding electrode system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2495)

5- 128 - (250-34(b)(2)): Reject
SUBMITTER: Edward Mitchell, City of Los Angeles, CA
RECOMMENDATION: Revise as follows:
(2) The generator supplies only equipment located on the vehicle or cord- and plug-connected equipment through receptacles mounted on the vehicle, or both equipment located on the vehicle and cord- and plug-connected equipment through receptacles mounted on the vehicle or on the generator, or the generator supplies power exclusively to portable wiring and equipment in compliance with Article 530, and...
SUBSTANTIATION: The motion picture industry employs trained, qualified persons to install all of their wiring and equipment. This wiring and equipment is used on a temporary basis for production purposes only. When the generator is the sole source of power for this equipment, it makes no difference in safety whether the equipment is plugged into receptacles mounted directly on the generator, or into receptacles mounted remotely from the generator; provided that all requirements of 250-34(b) are met, especially 250-34(b)(3) which requires equipment grounding all the way back to the generator frame which is bonded to the Vehicle.
The motion picture industry, frequently (text illegible) equipment or multiple locations during the course of a single day. Drilling locks in concrete to drive ground rods provides no additional electrical safety. There are no recorded incidents with the I.A.T.S.E Studio Electrical Lighting Technicians, Local 728 (Los Angeles County jurisdiction), of problems with generators grounded as proposed. This proposal will bring the code language into line with the safe, practical application of generator grounding for the motion picture industry.
PANEL ACTION: Reject.
PANEL STATEMENT: If supplying portable wiring, then 250-34 applies. If there is a need for a special occupancy, then it should be placed within that special occupancy article.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3136)

5- 129 - (250-34(b)(2)): Reject
SUBMITTER: Edward Mitchell, City of Los Angeles, CA
RECOMMENDATION: Add text as follows:
(2) The generator supplies only equipment located on the vehicle or cord- and plug-connected equipment through receptacles mounted on the vehicle, or both equipment located on the vehicle and cord- and plug-connected equipment through receptacles mounted on the vehicle or on the generator, or the generator supplies power exclusively to portable wiring and equipment in compliance with Article 530, and
SUBSTANTIATION: The motion picture industry employs trained, qualified persons to install all of their wiring and equipment. This wiring and equipment is used on a temporary basis for production purposes only. When the generator is the sole source of power for this equipment, it makes no difference in safety whether the equipment is plugged into receptacles mounted directly on the generator, or into receptacles mounted remotely from the generator; provided that all requirements of 250-34(b) are met, especially 250-34(b)(3) which requires equipment grounding all the way back to the generator frame which is bonded to the vehicle.
The motion picture industry frequently sets up and strikes their equipment at multiple locations during the course of a single day. Drilling holes in concrete to drive ground rods provides no additional electrical safety. There are no recorded incidents with the I.A.T.S.E Studio Electrical Lighting Technicians, Local 728 (Los Angeles County jurisdiction), of problems with generators grounded as proposed. This proposal will bring the Code language into line with the safe, practical application of generator grounding for the motion picture industry.
PANEL ACTION: Reject.
PANEL STATEMENT: If supplying portable wiring, then 250-34 applies. If there is a need for a special occupancy, then it should be placed within that special occupancy article.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3689)

5- 130 - (250-34(b)(5) (New)): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add text as follows:
(5) Generators used where Section 525-23 applies.
SUBSTANTIATION: See related proposal to add text to Section 525-23.
The requirements of Section 250-2 can be met without grounding electrodes and grounding-electrode conductors. Especially with the 1999 NEC requirement of, "Section 525-18. Ground-Fault Circuit-Interrupter Protection for Personnel."
A lot of AHJ's time and effort is wasted in enforcing the use of grounding electrodes and grounding-electrode conductors. This is followed by a lot of expense and effort on the part of carnivals.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-127.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #748)

5- 131 - (250-34(c)): Reject
Note: The Technical Correlating Committee directs the Code-Making Panel to reconsider the use of the words "grounded conductor" in 250-34(c) relative to two-wire generators.
This action will be considered by the Panel as a public comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(c) Grounded Conductor Bonding. A system conductor that is required to be grounded by Section 250-~~26~~ 20 shall be bonded to the generator frame by a conductor sized in accordance with

Section 250-102(c) where the generator is a component of a separately derived system.

FPN No. 1: For grounding of portable or vehicle-mounted generators supplying fixed wiring systems see Section 250-~~20(d)~~ 30.

FPN No. 2: For grounding of portable or vehicle mounted dc generators see Part H of this article.

SUBSTANTIATION: Editorial. Subsection (b)(4) requires compliance with Section 250-30(a)(1) (minimum No. 8 copper), but where the generator supply conductors are smaller than No. 8 it may be perceived that a direct bonding of such conductor is acceptable. If this is the intent specific wording to that effect is needed.

Vehicle-mounted generators covered by this section should be included in the present FPN. Proposed FPN No. 2 would correlate with Part H which doesn't have any provision stating "shall not be required to be grounded". Reference to Sections 250-26 and 250-20(d) relate to ac systems which infer this section was never intended to apply to dc systems.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel concludes that this proposal is not editorial. The substantiation does not clearly identify the reasons for the specific changes. The references in the recommendation are incorrect.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #2462)

5- 132 - (250-36(e)): Reject

Note: The Technical Correlating Committee understands that the action on this Proposal will be "Accept in Principle" based on the action on Proposal 5-134.

SUBMITTER: Dann M. Strube, Lanesville, IN

RECOMMENDATION: Add new sentence:

The equipment bonding jumper shall be permitted to be the same size or larger than the neutral conductor.

SUBSTANTIATION: The equipment bonding jumper will carry the same current as the neutral.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed language does not add to the requirements nor does it add clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #2461)

5- 133 - (250-36(f) (New)):

Note: The Technical Correlating Committee understands that the action on this Proposal will be "Accept in Principle" based on the action on Proposal 5-134.

SUBMITTER: Dann M. Strube, Lanesville, IN

RECOMMENDATION: Add new paragraph to read as follows:

Size of the grounding electrode conductor: The grounding electrode conductor shall not be required to be larger than the neutral conductor.

SUBSTANTIATION: The grounding electrode conductor should not be expected to carry more current than the neutral conductor.

PANEL ACTION: Reject.

PANEL STATEMENT: The equipment bonding jumper is the fault current carrying conductor. The sizing of the grounding electrode conductor is based on the system grounding requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #4295)

5- 134 - (250-36(g) (New)): Accept

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Add new text to read as follows:

(g) Equipment Bonding Jumper Size. The equipment bonding jumper shall be sized by (1) or (2) below.

(1) Where the grounding electrode conductor connection is to the grounded side of the grounding impedance, the equipment bonding jumper shall be sized per Section 250.66 based on the size of the service entrance conductors for a service or the derived phase conductors for a separately derived system.

(2) Where the grounding electrode conductor is located at the equipment with the equipment grounding conductors, the equipment bonding jumper shall be sized the same as the neutral conductor in Section 250.36(b).

SUBSTANTIATION: Under the present Code, the equipment bonding jumper is sized like a main bonding jumper. Because the grounding impedance limits the current to a very low value, the equipment bonding jumper is being oversized for the need. It is already recognized that the neutral, which is in series with the equipment bonding jumper on the line side of the grounding impedance, need not be sized any larger than required to carry the rated current of the impedance and not smaller than No. 8 AWG copper. For example, a 4000 amp derived system will require an equipment bonding jumper of 750 kcmil copper to the grounding impedance that has a No. 8 or No. 6 copper conductor from the other side of the impedance back to the source transformer. The expected current flow in high impedance grounded systems is typically 10 amps or less and may go up to 50 amps per the IEEE definitions. This revised text provides for the correct sizing of the equipment bonding jumper with consideration for where the connection of grounding electrode conductor for the system is located.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #CP503)

5- 134a - (250-50): Accept

SUBMITTER: CMP 5

RECOMMENDATION: Replace the text of the Section 250-50 with the following:

250-50 Grounding Electrode System.

If available on the premises at each building or structure served, each item in 250-52(a)(1)~~(a)~~ through (a)(6) ~~(d), and any made electrodes in accordance with Sections 250-52(c) and (d),~~ shall be bonded together to form the grounding electrode system. Where none of these ~~the~~ electrodes ~~specified in Section 250-50~~ is available, one or more of the electrodes specified in 250-52(a)(4)~~(b)~~ through (a)(7)~~(d)~~ shall be used.

SUBSTANTIATION: This is one of three companion proposals to rearrange the 1999 NEC Sections 250-50 and 250-52 to add clarity to these sections and to make the application more user friendly. The new section is made up of parts of the first paragraphs from the 1999 NEC Section 250-50 and Section 250-52 to establish the requirements for a grounding electrode system. The references within the text were revised to correlate with the correct references in the new section. Editorial changes were made as shown for clarity.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #750)

5- 135 - (250-50): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise last sentence of first paragraph:

The bonding jumper(s) shall be installed in accordance with Sections 250-64(a), (b), (c), and (e), and 250-66, and shall be connected in the manner specified in Section 250-70.

Revise (a)(2): Supplemental Electrode Required. A metal underground water pipe shall be supplemented by an additional electrode of a type specified in Sections 250-50 or 250-52. Where the supplemental electrode is a made electrode of the rod, pipe, or plate type, it shall comply with Section 250-56. The supplemental electrode shall ~~be permitted to~~ be bonded to one or more of the following: (1) the grounding electrode conductor;

(2) the grounded service-entrance conductor; (3) the nonflexible metal service raceway (4) ~~or~~ any grounded service enclosure. Except for connections to concrete-encased, driven, or buried electrodes, the points of attachment of the bonding jumper shall be accessible.

~~Exception:~~ The supplemental electrode shall be permitted to be bonded to the interior metal water piping that is a metallically continuous extension of the underground metal water pipe at any convenient point as covered in Section 250-50 Exception.

(remainder unchanged).

SUBSTANTIATION: The bonding jumper should comply with Section 250-64(c) since in case of loss of another grounding electrode such as a metal underground water pipe the bonding jumper may become a grounding electrode conductor, in effect. Why apply grounding electrode conductor requirements of Section 250-64(a), (b), and (e) but not (c)?

"Permitted to be" in (a)(2) does not invoke any requirement and the exception does not except any requirement.

Points of attachment should be specified as it is for bonding jumpers of other sections and grounding electrode conductors.

The exception does not appear to except a specific requirement of the rule. "Interior metal water piping" is not specific that it is the grounding electrode and can include isolated or independent systems in industrial processes. While such systems may be bonded in accordance with Section 250-104, it appears the intent is meant to cover piping extended from the metal underground piping.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel notes that the text shown as existing does not match the NEC. The first sentence of Section 250-50(a)(2) already requires that the underground water pipe be supplemented by an additional electrode and adequately covers the bonding points. The remainder of the changes do not add clarity to the Code. Adding 250-64(c) is too broad a change without supplying the panel with significantly better substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1789)

5- 136 - (250-50): Reject

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: Add the following to the end of the second paragraph:

"A grounding electrode conductor connecting to multiple made electrodes as permitted in Section 250-52(c) or (d) shall be sized according to Table 250-66. "

SUBSTANTIATION: According to the present rule, the conductor to a single rod, pipe, or plate electrode need not be larger than No. 6 copper (or No 4 aluminum). For a group of made electrodes, the largest conductor required for any electrode in the group is also No. 6 copper. Even where many such electrodes are used as a grounding electrode system, the largest is still No. 6. Therefore, where multiple made electrodes are used to increase the overall contact area, the conductor is not required to be increased under the present rule. This is inconsistent with the reasoning behind Section 250-66(a). The rule as written is not a problem when applied to concrete-encased electrodes or ground rings, because even where multiple connections are made they are all made to the same electrode(s).

PANEL ACTION: Reject.

PANEL STATEMENT: The panels intent is to permit the specified size of grounding electrode conductors when connected to single or multiple made electrodes.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1817)

5- 137 - (250-50): Reject

SUBMITTER: Xen George Anchales, San Bernardino County, CA

RECOMMENDATION: Revise to read as follows:

250-50. If available on the premises at each building or structure served, each item (a) through (d), and any ~~made~~ available electrodes in accordance with Sections 250-52 ~~(c)~~, (b), (c) and (d),shall be bonded together to form the grounding electrode system.

SUBSTANTIATION: Why exclude the electrodes allowed in 250-52(b)? If 250-50 references 250-52, and 250-52 refers to 250-50, they should be referring the same electrodes of each section. (i.e., 250-52 says it's ok to use 250-52(b), but 250-50 excludes 250-52(b) from being bonded into the grounding electrode system).

PANEL ACTION: Reject.

PANEL STATEMENT: There is no substantiation to require the use of other local metal underground systems or structures.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1881)

5- 138 - (250-50): Reject

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

RECOMMENDATION: Revise to read as follows:

250-50. Required Grounding Electrodes ~~System.~~ If available on the premises at each building or structure served, all ~~each~~ items....

SUBSTANTIATION: All required grounding electrodes are required. It's not supposed to be mix and match. I think a change in the headline would lead to increased compliance.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed text does not add clarity to the section. See Proposal 5-134a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1903)

5- 139 - (250-50): Reject

SUBMITTER: Richard Shanker, Shanker Electric

RECOMMENDATION: I recommend that water pipe ground size wire be no. 6 in residential home for 200 amp services.

SUBSTANTIATION: None.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no specific recommendation made by the submitter in the proposal. Section 4.3.3(c) of the Regulations Governing Committee Projects requires proposals to include proposed text, including the wording to be added, revised (and/or) revise, or deleted. Also, this proposal does not contain a substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1936)

5- 140 - (250-50): Reject

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise as follows:

Interior metal water piping located more than ~~5 ft (1.52 m)~~ 10 ft (3.04 m) from the point of entrance to the building shall not be used as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system.

SUBSTANTIATION: Where water piping enters the building in a finished wall, as in a building using slab type construction, an increase to 10 feet would allow the ground connection to be made above the finished ceiling. If the 5 foot rule is enforced and an access panel is provided in the middle of a living room or office wall, it will likely be done away with after the inspection is done. If access to the connection is important, this revision would better assure that this need is met. The 5 foot seems to be an arbitrary number to make the connection as close as practical.

PANEL ACTION: Reject.

PANEL STATEMENT: A length in excess of five feet will increase the probability of impacting the integrity of the grounding electrode.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 3

EXPLANATION OF NEGATIVE:
BOKSINER: The submitter's substantiation is plausible. If there are situations where the constraint to 5 ft creates a possibility of future maintenance problems, an increase to 10 ft is justified.
DOBROWSKY: The submitter has valid substantiation. Allowing the connection to be 10 ft (3 m) away from the point of entrance but in an accessible location, such as above a suspended ceiling, should be acceptable.
JOHNSTON: The proposal addresses installation concerns that can become a hardship in meeting this requirement. While there are many ways to accomplish the connection within the first 5 ft of entry to the building, there are occasions where the distance of 10 ft is more practical and does not affect the overall safety, especially if the piping were concealed for the first 10 ft after entry into the building or structure.
COMMENT ON AFFIRMATIVE:
RAPPAPORT: The submitter's substantiation is reasonable but globally changing the 5 ft rule to 10 ft for all applications is not reasonable for the reasons given in the panel statement. A carefully worded limiting exception might provide the relief for special conditions that the submitter is looking for.

(Log #2496)

5- 141 - (250-50): Reject
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
RECOMMENDATION: Revise first sentence as follows:
If installed or present on the premises at each building or structure served, each item (a) through (d), and any made electrodes in accordance with Section 250-52(c) and (d) shall be bonded together to form the grounding system.
SUBSTANTIATION: While this change may seem draconian in nature, it is desperately needed if the NEC is going to provide provisions for grounding systems that reflect the protection needed for year 2000 electrical and communication premises wiring. Consider that made electrodes (Circa 1920) become the electrodes of choice because one of the most effective electrodes, the concrete-encased, is not utilized due to lack of any planning or, worse yet, the problem of enforcement because of the present provision that the electrodes be "available on the premises". The only method that will work is to eliminate this "cop-out" and then designers will make provisions that effective electrodes are made available.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms the use of the term "where available" as the preferred text. An electrode may be present but is not available. No substantiation has been provided for changing the term available to the term present.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BOKSINER: This proposal would require the availability of concrete-encased electrodes where such electrodes exist. This would significantly improve the grounding electrode system in many installations. If such a requirement were adopted in the NEC, provisions to attach to the concrete-encased electrode would be made prior to building construction at very low cost. Thus, this proposal should be accepted.
MELLO: The issue presented here is real. I cannot agree with the Panel Statement that the term "where available" is the preferred text. The whole concept of using the metal water pipe, effectively grounded structural steel and the concrete encased electrode is based on one or more of these being installed as part of the construction of the building or structure. The word "available" is not enforceable and per the NEC Style Manual for 2000 is to be avoided. This situation is an excellent example of why the word "available" is not enforceable. The Panel Action on other proposals not to allow connection to metal water pipe electrodes at greater than 5 ft (substantiation was to make the pipe "available"), could now be construed to mean that if the first 5 ft of water pipe is in the wall that was covered before the electrician got to the site, and is no longer "available", that the water pipe does not need to be used. Also, if the effectively grounded building steel just happens to have the fire proofing applied before the electrician arrives, then it is not "available" so it does not have to be used. All the work and IEEE papers written by H. G. Ufer confirm that where steel reinforcing bars are installed in the foundation or footing, this electrode provides the best grounding electrode in both terms of low resistance and longevity. If the Panel follows this line of logic of availability, then no matter what is built will have two ground rods as the sole earth reference which will meet the Code because it was inconvenience or lack of coordination with other trades made the more superior electrodes "not available". The substantiation was correct; the word "available" is a "cop out" used by many. Numerous jurisdictions in the Western United States have had to write local amendments or ordinances requiring the use of the concrete encased electrode when rebar is used in the footing or foundation to get by this cop out. The NEC needs to recognize this and not start down the path with unenforceable language and permitting this kind of loophole.
I invite every electrical inspector in the United States to submit a comment on this proposal with substantiation and suggestions for enforceable language so that it is clear and unequivocally understood that the concrete encased electrode where used in the construction of the building is to be used as a grounding electrode for the electrical system.
COMMENT ON AFFIRMATIVE:
RAPPAPORT: The National Electrical Code, Section 90-1(a), indicates that the Code provides for safety but not necessarily an "efficient, convenient, or adequate" system. It may be desirable but it is not within the mandate of the Code to require that a grounding electrode that is present, but not available, be connected as part of the grounding electrode system.

(Log #2836)

5- 142 - (250-50): Reject
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Insert the following text: "…<u>for the largest conductor required if run singly to the electrode,</u>…":
250-50. Grounding Electrode System. If available on the premises at each building or structure served, each item (a) through (d), and any made electrodes in accordance with Sections 250-52(c) and (d), shall be bonded together to form the grounding electrode system. The bonding jumper(s) shall be installed in accordance with Sections 250-64(a), (b), and (e), shall be sized in accordance with Section 250-66 <u>for the largest conductor required if run singly to the electrode,</u> and shall be connected in the manner specified in Section 250-70.
An unspliced grounding electrode conductor shall be permitted to be run to any convenient grounding electrode available in the grounding electrode system or to one or more grounding electrode(s) individually. It shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it.
SUBSTANTIATION: Text no longer provides guidance on minimum size grounding electrode bonding jumpers as it did in 1996 Edition and earlier. It is now possible to go from the grounded conductor terminal at the service disconnect with a #3/0 AWG to a metallic water pipe or effectively grounded building steel, from there to a made electrode with a #6 AWG, from there to a concrete encased electrode with a #4 AWG and from there to a ground ring encircling the building with a #2 AWG.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the added text does not add clarity to the section. The panels intent is to permit the specified size of grounding electrode conductors when connected to a single electrode.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: The Panel Statement may appear to conflict with the Panel Statement for Proposal 5-136.

(Log #3315)

5- 143 - (250-50): Reject
SUBMITTER: Kenneth E. Isman, Nat'l Fire Sprinkler Assn.
RECOMMENDATION: Add a new paragraph to Section 250-50 as follows:
<u>"Interior piping for a water-based fire protection system shall not be used as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system."</u>

SUBSTANTIATION: Use of the fire sprinkler system piping, or other fire protection system piping, for grounding is bad practice and dangerous design. Removal of valves from the system for maintenance and repair such as alarm valves and check valves close to the point of entrance into the building is common enough to cause problems. Sprinkler fitters touching the pipe under these conditions could be electrocuted.

Some electrical contractors are assuming that the fire protection system piping continues to be metallic, even underground. This is no longer a valid assumption as there are a number of nonmetallic pipe and tube products now listed for underground service.

Another concern of the fire sprinkler industry with respect to this issue is the enhanced corrosion that may effect pipe, sprinklers and other attached components due to stray currents.

The NFPA Automatic Sprinkler committee agreed with the concept of this proposal while putting together the 1996 edition of NFPA 13, but thought that the issue was not within the scope of that document. They believed that the issue should be addressed by the NEC. See Proposal 13-27 of the Annual 1996 ROP for more details.

In addition, Section 8-3.5 of NFPA 24 agrees with this proposal. Failure to accept this proposal in some form allows a conflict between two different NFPA documents to continue.

PANEL ACTION: Reject.

PANEL STATEMENT: The recommended text starts with interior piping which can not be a "grounding electrode." The submitter appears to be referring to bonding. Bonding of all interior metal equipment frames and structures, including all metallic piping systems, is mandatory to provide an equipotential reference and thereby reduce shock and fire hazards.

"The intentional bonding of all the utilities in a building creates an equipotential ground plane that minimizes the voltage differential between the different systems under both normal and abnormal operating conditions. The result is an environment safer from the hazards of electrocution and fire. {excerpt from January/February, 2000, NFPA Journal, Grounding, Bonding and Sprinklers by John Caloggero}"

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #3911)

5- 144 - (250-50): Accept in Principle

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Revise this section as follows:

250.50. Grounding Electrodes.

(a) Grounding Electrodes. The following shall be defined as grounding electrodes suitable for use to form the grounding electrode system;

(1) Metal Underground Water Pipe. A metal underground water pipe in direct contact with the earth for 10 ft (3.05 m) or more including any metal well casing effectively bonded to the pipe. The metal water pipe shall be electrically continuous, or made electrically continuous by bonding around insulating points or sections or insulating pipe, to the point of connection of the grounding electrode conductor and the bonding conductors. The water pipe electrode shall be considered an electrode upon entering the building for a distance not to exceed 5 ft (1.52 m). Interior metal water piping located more than 5 ft (1.52 m) from the point of entrance to the building shall not be used as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system.

Exception: In industrial and commercial buildings where conditions of maintenance and supervision ensure that only qualified persons will service the installation and the entire length of the interior metal water pipe that is being used for the electrode is exposed.

(2) Metal Frame of the Building or Structure. The metal frame of the building or structure, where effectively grounded.

(3) Concrete-Encased Electrode. An electrode encased by at least 2 in. (50.8 mm) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 20 ft (6.1 m) of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 1/2-in. (12.7-mm) diameter, or consisting of at least 20 ft (6.1 m) of bare copper conductor not smaller than No. 4 AWG. Reinforcing bars shall be permitted to be bonded together by the usual steel tie wires or other effective means.

(4) Ground Ring. A ground ring encircling the building or structure, in direct contact with the earth consisting of at least 20 ft (6.1 m) of bare copper conductor not smaller than No. 2 AWG.

(5) Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than 8 ft (2.44 m) in length and shall consist of the following materials.

(a) Electrodes of pipe or conduit shall not be smaller than 3/4 in. trade size and, where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

(b) Electrodes of rods of iron or steel shall be at lest 5/8 in. (15.87 mm) in diameter. Stainless steel rods less than 5/8 in. (15.87 mm) in diameter, nonferrous rods, or their equivalent shall be listed and shall not be less than 1/2 in. (12.7 mm) in diameter.

(6) Plate Electrodes. Each plate electrode shall expose not less than 2 ft2 (0.186 m2) of surface to exterior soil. Electrodes of iron or steel plates shall be at least 1/4 in. (6.35 mm) in thickness. Electrodes of nonferrous metal shall be at least 0.06 in. (1.52 mm) in thickness.

(7) Other Local Metal Underground Systems or Structures. Other local metal underground systems or structures such as piping systems and underground tanks.

(b) Electrodes Not Permitted for Grounding. The following shall not be used as ground electrodes.

(1) Metal Underground Gas Piping System. A metal underground gas piping system shall not be used as a grounding electrode.

(2) Aluminum Electrodes. Aluminum electrodes shall not be permitted.

SUBSTANTIATION: The present code has the grounding electrodes defined along with several requirements for the installation. The grounding ring in the 1999 NEC Section 250-50(d) is really a made electrode and does not fit with others that are available from the building construction and not necessarily purposefully installed as an electrode. This then is confusing with the other "made electrodes" being defined in Section 250-52. The revised text in this proposal along with the revised proposal for 250-52 will define all the electrodes here and the installation issues in 250-52.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See Proposals 5-134a and 5-162a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

COMMENT ON AFFIRMATIVE:

BRENDER: I agree with the Panel vote to Accept in Principle, but I disagree with the inclusion of the Exception under 250-50(a)(1). See my comments in response to Proposal 5-103. My opinion is that the proposal should have been accepted in principle, with 250-5(a)(1), Exception deleted.

(Log #4475)

5- 145 - (250-50): Reject

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise the fourth paragraph to read as follows:

"Interior metal water piping located more than ~~5 ft (1.52m)~~ 10 ft (3.04m) from the point of entrance to the building shall not be used as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system."

SUBSTANTIATION: Where water piping enters the building in a finished wall, as in a building using slab type construction, an increase to 10 ft would allow the ground connection to be made above the finished ceiling. If the 5 ft rule is enforced and an access panel is provided in the middle of a living room or office wall, it will likely be done away with after the inspection is done. If access to the connection is important, this revision would

better assure that this need is met. The 5 ft seems to be an arbitrary number to make the connection as close as practical.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-140.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
BOKSINER: See my Explanation of Negative Vote on Proposal 5-140.
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-140.
JOHNSTON: The proposal addresses installation concerns that can become a hardship in meeting this requirement. While there are many ways to accomplish the connection within the first 5 ft of entry to the building, there are occasions where the distance of 10 ft is more practical and does not affect the overall safety, especially if the piping were concealed for the first 10 ft after entry into the building or structure.
COMMENT ON AFFIRMATIVE:
RAPPAPORT: See my Affirmative Comment on Proposal 5-140.

(Log #751)

5- 146 - (250-50, Exception and (a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception: The interior metal water piping shall be permitted as a conductor to interconnect electrodes in ~~In~~ industrial and commercial buildings or structures where all of the following conditions are met: (1) maintenance and supervision ensure that only qualified persons will service the installation and, (2) the entire length of the interior metal water pipe that is being used for the conductor is exposed and (3) the metal water pipe is a metallically continuous extension of a metal underground water pipe as specified in (a) below.
Revise last paragraph of (a)(2): Where the required supplementary electrode specified above is a made electrode as in Section 250-52(c) or (d), that portion of the bonding jumper that is the sole connection to the supplementary grounding electrode shall not be required to be larger than No. 6 copper wire or No. 4 aluminum wire.
SUBSTANTIATION: Editorial. The exception is revised to sentence form, includes structures other than buildings, and adds a proviso that the water piping be an extension of the underground water piping system. Piping systems may exist in systems and processes which are isolated from potable water supply systems. While such systems are required to be bonded in accordance with Section 250-104, the present wording permits their use as a conductor between electrodes. If it is intended that this exception apply to metal water piping that is connected to the underground water pipe electrode, it should be stated.
The proposal for (a)(2) is to clearly distinguish the electrode of this section from the supplementary electrode of Section 250-54.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal is not editorial and does not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4184)

5- 147 - (250-50, Exception): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise the Exception to the fourth paragraph as follows:
"In industrial and commercial buildings where conditions of maintenance and supervision ensure that only qualified persons will service the installation and the entire length, other than short sections passing directly through partitions, of the interior metal water pipe that is being used for the conductor is exposed."
SUBSTANTIATION: This revision adds the words "other than short sections passing directly through partitions" to the exception. This is necessary because at present, even a single 5-inch wall penetration in a 200-foot run kills the exception. Although CMP 5 rejected this wording, they did say that such a short penetration would not be considered to render the run unexposed. Unfortunately the only ones who will know that are those few that read the ROC. The text must be changed to incorporate the panel's understanding of intent.
The need is even more compelling now, because separately derived systems are no longer permitted to use local water piping as an electrode unless it complies with this exception (or the connection is within 5 ft of the building entrance). In the case of a high-rise building with all vertical passages through floors fire-stopped, the water risers would never be exposed over their entire length.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 5-162a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: The proposal should be accepted in part. The words "or structures" should be incorporated into the exception.

(Log #4183)

5- 148 - (250-50 Exception No. 1): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Identify the present exception as Exception No. 2 and add a new Exception No. 1 to follow the first paragraph as follows:
Exception No. 1: Where located on the premises and within 200 ft (61.0 m) of a new building or structure directly supplied by a well, and where none of the items (a) through (d) below are available, metallic well casings in direct contact with the earth for 10 ft (3.05 m) or more shall be included in the grounding electrode system.
SUBSTANTIATION: Over the past few years, evidence has been steadily accumulating that many soils, including granitic soils with relatively high annual water budgets, are poorly conductive. Ground rod resistance measurements frequently come in with higher resistance's than those being measured in the ongoing grounding electrode study in the Nevada desert near Las Vegas.
Five years ago I was involved in a grounding study in Heath, Mass. where the ground rod resistance exceeded 800 ohms, and the well casing resistance was below 20 ohms. In another study witnessed by the Paul Revere Chapter, IAEI, 10 ground rods were deployed in parallel in a broadly dispersed pattern in Westminster, Mass. The net resistance turned out to be 320 ohms. These extreme results are common in many areas of the country, and it is time reexamine the reluctance to modify this section of the Code. One reason for opposing this type of rule by CMP 5 has been concerns about voltage drop on long runs of grounding electrode conductors. The resistance of 200 feet of No. 4 copper wire is on the order of 0.06 ohms. This, added to typical well casing resistance's, obviously pales in significance when compared to typical ground rod re-si stances in poor soils. Under these extreme conditions, this will be true even after factoring in the high skin effects involved in lightning strokes.
This proposal only affects new buildings where a path to the well casing would probably be available. Other electrodes such as concrete-encased electrodes, could be substituted if necessary. With their greater depth and surface area well casings are far superior to ground rods.
The phrase "directly supplied by a well" in the first clause of the proposed exception addresses the practicality of this requirement with respect to additional structures being erected subsequent to the establishment of service during the construction of the principal building, where the trench to the well would be open as a matter of course. Additional buildings on a property, although sequentially served, would be unlikely to be directly served by the well. This provides a logical basis for practicability, since a trench would usually be opened for such water service. Should a direct water lateral be extended to such a building or structure, then the rule should be applied.
The Advisory Committee did discuss reducing the allowable distance from 200 ft to 100 ft due to a concern about potential differences between a remote electrode during fault conditions and conductive surfaces at the building. That concern is both true and beside the point. A conventional high resistance made

electrode as noted in the preceding substantiation (800W or more), if subjected to a typical 13.8 kV utility cross (8k V to ground), will pass about 10A. The result is a very steep step-potential gradient in the vicinity of the electrode, and almost the full voltage relative to pure ground elsewhere at the building. Furthermore, such a small current won't trip a utility protective device. On the other hand, a No. 4 conductor run 200 ft to a well casing with a 25W resistance (frequently a high number) will pass 320A. The short-time rating of No. 4 (based on 1A/42.25 cm for 5 sec.) is 988A. This amount of current will normally trip utility protective devices. In addition, the voltage drop on the conductor (E=IR) would be approximately (320A x 0.062W = 20V). This is a very substantial, perhaps lifesaving, improvement.

This proposal is a companion one to one for Section 250-66, which contains the other half of this initiative on well casings. These rules have been in place in Massachusetts for ten months now, and seem to be working quite smoothly given that this is a major initiative undertaken on a state level.

PANEL ACTION: Reject.

PANEL STATEMENT: As proposed, this is not an exception since there is no prohibition to connecting a metallic well casing to the grounding electrode system. See Section 250-52(b). Therefore, the well casing could be connected to the grounding electrode system, but not as a required to be connected electrode.

The substantiation refers only to a utility cross fault. Direct lightning strikes and induced current due to near lightning strikes could be prevalent and are not considered. The high inductance of 100 or 200 feet of conductor would present a high inductive reactance to a steep front lightning strike. There is, therefore, no justification for permitting this method as a primary grounding electrode.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #2109)

5- 149 - (250-50 Exception No. 2 (New)): Accept in Principle

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Add a new Exception No. 2 to read as follows:

"Where an additional electrode(s) is used to supplement the equipment grounding conductor, in accordance with 250-54, it shall not be required to be bonded to the other electrodes in Part C of this Article."

Identify the existing Exception as No. 1.

SUBSTANTIATION: Many manufacturers of computer controlled machines require that an electrode, typically a ground rod, be installed at the machine location and be connected to the machine frame. Denoting EMI, RF and "noise" as reasons for the "ground" they will not honor their warranty unless the additional electrode is installed. Whether necessary or not, the supplemental electrode is actually connected to the other electrodes required by Part C through the equipment grounding conductor that is run with the machine supply conductors. This connection should not be required to be sized per Table 250-66. Electrodes are installed at medium voltage motors to address touch and step potentials without this additional bonding. There is no intent to allow an isolated electrode.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See action on Proposal 5-172. The panel believes that this action meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

BRENDER: Supplementary electrodes installed in connection with CNC machines are covered by Section 250-54. There is no requirement under 250-54 that the supplementary electrode be bonded to the grounding electrode system, although to do so is good engineering practice.

The proposal does not add clarity. The substantiation submitted does not justify this change, and present code language, especially under 250-54, already addresses the submitter's concerns.

Note: Supporting material available for review upon request at NFPA headquarters.

DOBROWSKY: Adding the exception is still necessary. The first sentence of Section 250-50 (including the proposed new wording) requires that all of the available described electrodes to be bonded together. The second sentence provides the sizing requirements according to Section 250-66. Without the exception it appears that Section 250-50 and 250-54 still have opposing requirements.

(Log #1885)

5- 150 - (250-50(a)): Reject

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

RECOMMENDATION: Delete "~~including any metal well casing effectively bonded to the pipe)~~". Create new (b) Any metal well casing. Reletter (b) through (d) accordingly.

SUBSTANTIATION: Important code requirements should be spelled out fully not left to the vagaries of confused parenthetical remarks. Steel well casings are routinely left ungrounded and unbonded. 250-112(l) and (m) clearly require pump and casing grounding for safety. We need an equally clear requirement for system grounding using the well casing.

PANEL ACTION: Reject.

PANEL STATEMENT: This creates a new requirement that metal well casing must be used, and not just when it is effectively bonded to metal water pipe, without technical substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1913)

5- 151 - (250-50(a)): Reject

SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

(a) Metal Underground Water Pipe. A metal underground water pipe in direct contact with the earth at a depth below the earth's surface of not less than 2 1/2 ft (762 mm), and in direct contact with the earth for a length of 10 ft (3.05 m) or more (including any metal well casing effectively bonded to the pipe) and electrically continuous (or made electrically continuous by bonding around insulating joints or sections or insulating pipe) to the points of connection of the grounding electrode conductor and the bonding conductors.

SUBSTANTIATION: This section presently requires that the pipe be in direct contact with the earth but does not specify depth. The pipe could be scratched into the surface of the earth and still literally be in compliance with the existing wording but would not in most cases be an "effectively grounded" metal water pipe. Historically the utilities water lines have been required to be continuous and at specified depths which accomplished the effective connection to the earth. There were clarifications added in the 1999 NEC to require the minimum depth of the plate electrode at 2-1/2 ft and the grounding ring and horizontal ground rod installations are acceptable at 2-1/2 ft. This change to require a minimum depth of an effectively grounded metal water pipe would be consistent with these other depth requirements for electrodes and eliminate the gray area and questionable effectively grounded metal water piping systems. The wording may need to be adjusted.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no technical substantiation provided for the proposed depth requirement. Water pipes have been used as a grounding electrode for many years without a depth requirement with no incidents cited.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #2452)

5- 152 - (250-50(a)): Reject

SUBMITTER: Stanley T. Fletcher, City of St. Louis, MO

RECOMMENDATION: Delete text as follows:

(a) ~~Metal underground water pipe. A metal underground water pipe in direct contact with the earth for 10 ft (3.05 m) or more.~~

SUBSTANTIATION: Due to the safety hazard to Water Meter Repair Workers in our city and other cities across our nation, we are making an official request to strike Section 250-50 paragraph a "metal underground water pipe" from being used as a grounding electrode. Instead of allowing the grounding to water pipe, which has caused our Water Meter Repair Workers to be shocked, the grounding should be accomplished by use of a grounding rod.

Our Meter Repair Workers have either been shocked or narrowly avoided it by being warned by sparking at the locations within the past 3 or 4 years.

In these examples our Water Repair Workers could have been seriously injured. We need your help in eliminating this safety hazard. The grounded conductor or neutral that has a defective connection allows neutral current to be carried on the grounding conductor back to the source awaiting an unsuspecting Water Meter Repair Worker. It is unintentional and unpredictable when a connection fails causing neutral current on the water system. This has caused many plumbers and water workers to be shocked. Even though a bonding jumper may be present this only divides the current still allowing a shock hazard on the water meter and piping system.

As mentioned in the article in the July, 1998, issue of the AWWA Journal, a Water Worker somewhere in our country is the victim of a serious shock incident due to grounding once a day.

In summation, the Electrical Code, which is intended to promote safety, now permits a hazardous situation to continue. Please put yourselves in the shoes of the Water Service Worker and rectify this by taking the necessary action to have the requested portion of Section 250-50 paragraph (a) removed from the code. As it now stands the electrical code permits a dangerous condition to perpetuate.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Effectively grounded metal water piping has been, and continues to be, one of the most available and utilized electrodes in practice today. The water pipe workers must follow safe work practices to work on all water pipes.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SCHIFF: The American Water Works Association (AWWA) has consistently resisted the National Electrical Code requirement that utilized underground water pipe as an electrical ground electrode. Grounding to underground water pipe often results in a shock hazard to water utility personnel and contributes to corrosion of the pipelines.

The NEC took a step in the right direction when it called for a "supplemental" electrode in case the water pipe electrode was inadequate. However, the "supplemental" electrode should be "primary", rather than a back-up device. Although there is a requirement to check that the supplemental electrode has a resistance lower than 25 ohms, this is rarely performed. This can result in liability should the water pipe ground be replaced with nonmetallic pipe, especially in older buildings without the supplemental electrode.

If a ten ft long, underground water pipe ground is acceptable to the NEC, so should an equivalent rod paid for and installed by the electrical supplier or contractor, without reliance on the water pipe.

AWWA has no objection to using interior metal water pipe should to part of the grounding system.

AWWA hopes to enlist support of NFPA/NEC in accomplishing these ends in the future.

Note: Supporting material available upon request for review at NFPA headquarters.

(Log #3314)

5- 153 - (250-50(a)): Reject

SUBMITTER: Kenneth E. Isman, Nat'l Fire Sprinkler Assn.

RECOMMENDATION: Add the following to Section 250-50(a) as follows:

"... and the bonding conductors <u>as long as the underground water pipe is not a private fire service main or a portion of a water-based fire protection system.</u>"

SUBSTANTIATION: Use of the fire sprinkler system piping, or other fire protection system piping, for grounding is bad practice and dangerous design. Removal of valves from the system for maintenance and repair such as alarm valves and check valves close to the point of entrance into the building is common enough to cause problems. Sprinkler fitters touching the pipe under these conditions could be electrocuted.

Some electrical contractors are assuming that the fire protection system piping continues to be metallic, even underground. This is no longer a valid assumption as there are a number of nonmetallic pipe and tube products now listed for underground service.

Another concern of the fire sprinkler industry with respect to this issue is the enhanced corrosion that may effect pipe, sprinklers and other attached components due to stray currents.

The NFPA Automatic Sprinkler committee agreed with the concept of this proposal while putting together the 1996 edition of NFPA 13, but thought that the issue was not within the scope of that document. They believed that the issue should be addressed by the NEC. See Proposal 13-27 of the Annual 1996 ROP for more details..

In addition, Section 8-3.5 of NFPA 24 agrees with this proposal. Failure to accept this proposal in some form allows a conflict between two different NFPA documents to continue.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel concludes that the following statement applies:

"The intentional bonding of all the utilities in a building creates an equipotential ground plane that minimizes the voltage differential between the different systems under both normal and abnormal operating conditions. The result is an environment safer from the hazards of electrocution and fire. {excerpt from January/February, 2000, NFPA Journal, Grounding, Bonding and Sprinklers by John Caloggero}"

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #4381)

5- 154 - (250-50(a)): Reject

SUBMITTER: Paul Dobrowsky, Holley, NY

RECOMMENDATION: Add text to read as follows:

"An additional underground water pipe that is made of metal and used for supplying a fire sprinkler system shall be considered a metal underground water pipe. Where this is used with a metal underground water pipe a supplemental made electrode shall not be required."

SUBSTANTIATION: There are varying interpretations as to whether metal sprinkler piping is considered a metal water pipe. In some cases sprinkler and domestic water supply enter the building in separate pipes but originate from a single pipe some distance upstream. This addition will provide a clear position on what is accepted.

PANEL ACTION: Reject.

PANEL STATEMENT: The additional wording does not add clarity. There is no technical basis to remove the requirement for using a supplemental electrode.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1880)

5- 155 - (250-50(a)(1)): Reject

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

RECOMMENDATION: Revise to read as follows:

(1) ~~Continuity~~ <u>Bonding Jumper.</u> Continuity of the grounding path or the bonding connection to interior piping shall <u>be ensured by a bonding jumper around</u> water meters or filtering devices and similar equipment.

SUBSTANTIATION: The code should spell out what is required.

PANEL ACTION: Reject.

PANEL STATEMENT: Bonding may be accomplished using methods other than installing a jumper directly around the water meter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #4185)

5- 156 - (250-50(a)(2)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
(2) ~~Supplemental~~ Reserve Electrode Required. A metal underground water pipe shall be supplemented by an additional electrode, for reserve purposes, of a type specified in Sections 250-50 or 250-52. Where the ~~supplemental~~ reserve electrode is a made electrode of the rod, pipe, or plate type, it shall comply with Section 250-56 with the metal water pipe assumed to be unavailable. The ~~supplemental~~ reserve electrode shall be permitted to be bonded to the grounding electrode conductor, the grounded service-entrance conductor, the nonflexible grounded service raceway, or any grounded service enclosure.
SUBSTANTIATION: Section 250-56 allows a qualified water pipe to supplement a made electrode if the initial resistance exceeds 25 ohms. The panel intended that the additional electrode independently qualify under the 25 ohm rule and where necessary an additional made electrode must be provided. A very common interpretation, however, is that you never need more than one made electrode because Section 250-56 allows you to look back at the water pipe and use that to, in turn supplement the made electrode. That interpretation stands the panel intent on its head.
This rule went into the NEC because water suppliers commonly change water laterals from copper or iron to plastic. If the water pipe is the only electrode, with nothing in reserve, then the building completely loses its local ground reference. Unfortunately the word "supplemental" was used instead of "reserve."
"Supplemental" implies the necessity of use due to a deficiency on the part of that being supplemented. Some take supplemental vitamins, for example. Nothing could be further from the case here. As long as the water pipe is functioning and properly connected, it needs no supplementation. A made electrode under these conditions is a mouse helping to carry the burden of an elephant. The only use for these additional electrodes occurs when the water pipe is removed, and then they had better be as good as if they were the only electrodes ever installed. This proposal uses better terminology that won't continue the former confusion, and combines it with a change in the text that precludes the erroneous interpretations.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the term reserve in place of supplemental does not have a generally accepted meaning and would not improve the understanding of this section. The additional wording does not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: This proposal addresses a circular argument apparently made by some that the required electrode (water pipe) can be considered "supplementary" to a "Made Electrode" under 250-52, thus negating the desired requirement of 25 ohms under 250-56.
I believe this proposal should have been accepted in principle, with the words "with the metal water pipe assumed to be unavailable" added to the second sentence. The wording of the first paragraph of 250-50(a)(2) would then be as follows:
(2) Supplemental Electrode Required. A metal underground water pipe shall be supplemented by an additional electrode of a type specified in Sections 250-50 or 250-52. Where the supplemental electrode is a made electrode of the rod, pipe, or plate type, it shall comply with Section 250-56 with the metal water pipe assumed to be unavailable. The supplemental electrode shall be permitted to be bonded to the grounding electrode conductor, the grounded service-entrance conductor, the nonflexible grounded service raceway, or any grounded service enclosure.

(Log #1879)

5- 157 - (250-50(b)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Revise to read as follows:
(b) The metal frame of the building or structure~~, where effectively grounded~~ shall be grounded. In cases where the metal frame may be isolated from ground it shall be bonded and at least one other required or supplemental electrode shall be used.
FPN: Most steel frames are effectively grounded.
SUBSTANTIATION: (b) leaves too much to the imagination. Metal frames should be assumed to be grounded unless proven otherwise.
PANEL ACTION: Reject.
PANEL STATEMENT: This section lists grounding electrodes. There is no technical substantiation to warrant this change. The panel concludes that it would be improper to assume that metal frames are effectively grounded in most cases.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2303)

5- 158 - (250-50(b)): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.
RECOMMENDATION: Revise text to read as follows:
"The metal frame of the building or structure, or a copper bus bar installed around the inside perimeter of the building that serves in place of the metal frame of the building or structure, where effectively grounded."
SUBSTANTIATION: There are several manufacturers of modular, premanufactured steel frame substation buildings that contain MCCs and switchgear, typically the equipment is rated 480 V to 35 kV. The buildings are usually installed in supervised, industrial facilities. Some manufacturers install a continuous copper bus bar mounted to the interior wall and routed around the building perimeter which is used to bond all equipment enclosures. The bus bar is also used as a grounding electrode to ground small lighting and power transformer neutrals. This installation would violate Section 250-(a)(2) and (3) as presently found in the 1999 Edition of the NEC even though the installation meets the intent of the Code and is safe.
PANEL ACTION: Reject.
PANEL STATEMENT: The interior copper busbar in this case cannot serve as the grounding electrode but may serve as the grounding electrode conductor. See definition of "Grounded, Effectively" in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #361)

5- 159 - (250-50(c)): Reject
SUBMITTER: Gordon D. Brindley, Marion County Building Dept., FL/Rep. N. Florida Div. I.A.E.I.
RECOMMENDATION: Revise 250-50(c) to read as follows:
(c) An electrode encased by at least 2 in. (50.8 mm) of concrete located within and near the bottom of a concrete foundation or footing, that is in direct contact with the earth, consisting of at least 20 ft (6.1 m) of one ~~or more~~ contentious length of bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 1/2-in. (12.7 mm) diameter, or at least 20 ft (6.1 m) of bare copper conductor, not smaller than #4. This reinforcing ~~bars~~ bar shall be permitted to be bonded together with other reinforcing bars in the foundation or footing by the usual steel tie wires or other effective means.
SUBSTANTIATION: The Marion County Electrical Division has made numerous Grounding electrode resistance test with an A. W. Sperry, Model 4102 Analog Earth Resistance Tester; While testing the concrete encased electrodes in different areas of the county, with many different types of soil, we found when the 20 ft of rebar was installed in two, three or four pieces, the lowest resistance reading we were able to get was 38 ohms.
When we required this bar to be one contentious 20 ft length, tied off to the other footer steel, the highest reading we recorded was 3.7 ohms.
We feel this is adequate substantiation, when getting a good grounding system on any structure is of prime essence.
Also, this can be done without any additional cost to the user; and you are not dependent on how tight each wire-tie is made up on numerous pieces of rebar steel.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has knowledge of test data that varies substantially with the findings in this proposal. The panel finds this substantiation to be inadequate and lacking in detail. Such detail includes:

1.) the secureness of the ties
2.) method of testing
3.) curing time of concrete
4.) conductivity of the soil
5.) time of the year
6.) soil temperature and moisture level.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1174)

5- 160 - (250-50(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
"Concrete-Encased Electrodes. An electrode encased by at least 2 in. (50.8 mm) of concrete <u>for a distance of at 20 ft (6.1 m),</u> located within and near the bottom of a concrete foundation or footing...". (remainder unchanged)
SUBSTANTIATION: Present wording does not prohibit a number of short re-bars (such as five 4 ft lengths or ten 2 ft lengths) side-by-side or 20 ft of copper in short loops or coiled similar to wood pole butt grounds used by some utilities. During the 70's when this type electrode was tested by various agencies, I don't believe this type of installation incorporated in a few square feet of footing was contemplated.
Common perception seems to be that a linear length is intended. Subsection (d) infers a coiled electrode is not suitable due to the word "encircling". For services on poles, service pedestals, traffic controllers, and the like, where the foundation/footing comprises only a few square feet, such side-by-side re-bar or coiled copper offers an economic advantage which may deter the use of a ground ring which requires trenching and larger gauge copper, and is likely not to provide the low resistance usually associated with encased electrodes.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is unclear and the panel cannot determine the submitters intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

Note: The sequence no. 5-161 was not used.

(Log #749)

5- 162 - (250-51 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add new Section 250-51 to read as follows:
250-51 Grounding Alternate Power Sources.
(a) Other than Separately Derived Systems. Where a premises wiring system is supplied by an alternate power source located on the premises, such as a battery, a solar photovoltaic system, a generator, a transformer or converter windings, and that has a direct electric circuit conductor connection to a circuit conductor originating in another system, such systems, if grounded as required or permitted Section 250-20 and 250-162, shall be grounded in accordance with (b), (c), and (d) below.
(b) Alternating-Current systems. Where the alternate power source connection is to a conductor that has a direct electrical connection to a service-supplied system, the service grounding system shall be used for grounding the alternate power source system. Where the alternate power source connection is to a conductor of a system that does not have a direct electrical connection to a service-supplied system, such as the secondary of an isolating type transformer, a bonding jumper sized in accordance with Section 250-28, based on the largest derived phase conductor(s) of either system shall be used to connect the equipment grounding conductor(s) of the systems to the grounded conductor associated with the largest derived phase conductor(s). This connection shall be made at any point from the system source to the first disconnecting means or overcurrent device, or it shall be made at the source of a system that has no disconnecting means or overcurrent device. A grounding electrode conductor sized in accordance with Table 250-66 for the largest derived phase conductor(s) of either system shall be used to connect the grounded conductor to the grounding electrode conductor as specified in Section 250-30(a) and (b). Neutral conductors which must carry ground-fault current shall not be smaller than the size specified in Table 250-66 for grounding electrode conductors, based on the largest derived phase conductors of the system.
(c) Direct Current Systems. Where the alternate power source connection is to a conductor supplied by a service, the service grounding system shall be used for grounding the alternate power source system. Where the alternate power source connection is to a conductor supplied by a source located on the premises a bonding jumper sized in accordance with Section 250-166(a) and (b) shall be used to connect the equipment grounding conductors of the systems to the largest grounded conductor of the systems. This connection shall be made at the system source of the first system disconnecting means or overcurrent device. A grounding electrode conductor sized in accordance with Section 250-166 shall be used to connect the grounded conductor to the grounding electrode as described in Section 250-30(a)(3). This connection shall be made at the same point where the bonding jumper is installed. Neutral conductors which must carry ground-fault current shall not be smaller than the largest ungrounded conductor of the systems.
(d) Grounding Methods. In all other respects grounding methods shall comply with applicable requirements prescribed in other parts of this code.
SUBSTANTIATION: A standby alternate power source such as a generator with a solid direct conductor connection to a conductor of a transformer secondary, (commonly a neutral) may be utilized to provide for peak power loads or service outages that de-energize the transformer. Neither of these power sources meet the definition of separately derived system due to such interconnection, and Section 250-30 doesn't apply. If such an alternate power source has a direct conductor connection to a service-grounded system individual grounding is not required, and in fact is prohibited by Section 250-141(b), on the assumption that effective grounding is accomplished. However, if the interconnected conductors are derived from sources not defined as separately derived systems, the grounding requirements of Section 250-20 appear to require or permit individual grounding of each system source. However, there are no specifics for grounding and bonding conductors size, point of connection, etc., as there are for services and other systems.
The proposal provides grounding requirements where neither system is a "separately derived" system. Single point bonding and grounding is specified to minimize undesirable current paths. The requirements are based on the largest capacity system. Generator kVA for example, could be smaller than transformer kVA where used to augment a transformer derived system for temporary peak power loads or to supply limited critical loads during service outages. I did not address largest system consideration where an alternate power source has a direct connection to a service-supplied conductor as the service kVA capacity is usually greater than the alternate standby power source.
PANEL ACTION: Reject.
PANEL STATEMENT: The systems the submitter is discussing are already in the present code. Refer to the definition of "Separately Derived System" in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #CP504)

5- 162a - (250-52): Accept
SUBMITTER: CMP 5
RECOMMENDATION: Replace the text of the 1999 NEC Section 250-52 with the following:
250-52 <u>Grounding Electrodes.</u>
<u>(a) Electrodes Permitted for Grounding.</u>
<u>(1)</u> ~~(a)~~ Metal Underground Water Pipe. A metal underground water pipe in direct contact with the earth for 10 ft (3.05 m) or more (including any metal well casing effectively bonded to the pipe) and electrically continuous (or made electrically continuous by bonding around insulating joints or sections or insulating pipe) to the points of connection of the grounding electrode conductor and the bonding conductors. Interior metal water piping located more than 5 ft (1.52 m) from the point of entrance to the building shall not be used as a part of the grounding electrode system or as a conductor to interconnect electrodes that are part of the grounding electrode system.
Exception: In industrial and commercial buildings where conditions of maintenance and supervision ensure that only qualified persons will service the installation and the entire length

other than short sections passing perpendicular through walls, floors or ceilings of the interior metal water pipe that is being used for the conductor is exposed.

(2) ((b) Metal Frame of the Building or Structure. The metal frame of the building or structure, where effectively grounded.

(3) (c) Concrete-Encased Electrode. An electrode encased by at least 2 in. (50.8 mm) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 20 ft (6.1 m) of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than _-in. (12.7-mm) diameter, or consisting of at least 20 ft (6.1 m) of bare copper conductor not smaller than ~~No. 4~~ 4 AWG. Reinforcing bars shall be permitted to be bonded together by the usual steel tie wires or other effective means.

(4) ~~(d)~~ Ground Ring. A ground ring encircling the building or structure, in direct contact with the earth consisting of at least 20 ft (6.1 m) of bare copper conductor not smaller than No. 2 2 AWG.

(5) ~~(c)~~ Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than 8 ft (2.44 m) in length, and shall consist of the following materials. ~~and shall be installed in the following manner.~~

a ~~1.~~ Electrodes of pipe or conduit shall not be smaller than _ in. trade size and, where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

b ~~2.~~ Electrodes of rods of iron or steel shall be at least 5/8 in. (15.87 mm) in diameter. Stainless steel rods less than 5/8 in. (15.87 mm) in diameter, nonferrous rods, or their equivalent shall be listed and shall not be less than _ in. (12.7 mm) in diameter.

(6) ~~(d)~~ Plate Electrodes. Each plate electrode shall expose not less than 2 ft2 (0.186 m2) of surface to exterior soil. Electrodes of iron or steel plates shall be at least _ in. (6.35 mm) in thickness. Electrodes of nonferrous metal shall be at least 0.06 in. (1.52 mm) in thickness.

7 ~~(b)~~ Other Local Metal Underground Systems or Structures. Other local metal underground systems or structures such as piping systems and underground tanks.

(b) Electrodes not Permitted for Grounding.

The following shall not be used as grounding electrodes:

(1) ~~(a)~~ Metal Underground Gas Piping System. ~~A metal underground gas piping system shall not be used as a grounding electrode.~~

(2) ~~(e)~~ Aluminum Electrodes. ~~Aluminum electrodes shall not be permitted~~.

SUBSTANTIATION: This is one of three companion proposals to rearrange the 1999 NEC Sections 250-50 and 250-52 to add clarity to these sections and to make their application more user friendly. The new section is made up of parts of the 1999 NEC Section 250-50 and Section 250-52 to provide a definition or description of each of the acceptable grounding electrodes and identify each of the electrodes that are not acceptable for grounding. All modified text, except as shown in Section 250-52(a)(1) exception, are editorial changes that were made for clarity. The accepted text from Proposal 5-147 was added into 250-52(a)(1) exception of this proposal to provide a clear understanding of how the proposed section will read based on panel actions affecting these sections in the 1999 NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: (1) The words "or structures" should be incorporated into the exception after the word building. See my comment on Proposal 5-146. These revisions should also be made to Section 250-30(a)(3) Exception to be consistent. (2) Editorially correct the subdivision lettering and numbering. Some are not struckthrough. This is based on a review of the paper copy. (3) Insert the inch pound fractional values where they are missing. (4) "No. 2" should be struckthrough in (a)(4).

(Log #1884)

5- 163 - (250-52): Accept in Principle
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Revise to read as follows:
Where none of the required electrodes specified in Section 250-50 is available, one or more of the made electrodes...
SUBSTANTIATION: The purpose of this proposal is to make it clear to people who skim the code that required electrodes are required.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposal 5-134a meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3912)

5- 164 - (250-52): Accept in Principle
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise this section as follows:

250.52. Grounding Electrode System Installation.

(a) Grounding Electrode System. If available on the premises at each building or structure served, each item in Section 250.50(a)(1) to (6) shall be bonded together to form the grounding electrode system. Where none of the electrodes specified in Section 250.50(a)(1) through 250.50(a)(3) is available, one or more of the electrodes specified in 250.50(a)(4) through 250.50(a)(7) shall be used.

(b) Made Electrodes. Where practicable, made electrodes as defined in Section 250.50(a)(4) through 250.50(a)(7) shall be embedded below permanent moisture level. Made electrodes shall be free from nonconductive coatings such as paint or enamel.

(c) Electrode Spacing. Where more than one electrode is used, each electrode of one grounding system (including that used for air terminals) shall not be less than 6 ft (1.83 m) from any other electrode of another grounding system. Two or more grounding electrodes that are effectively bonded together shall be considered a single grounding electrode system.

(d) Electrode Bonding Jumper. The bonding jumper(s) used to connect grounding electrodes together to form the grounding electrode system shall be installed in accordance with Sections 250.64(a), (b), and (e), shall be sized in accordance with Section 250.66 including the exceptions, and shall be connected in the manner specified in Section 250.70.

(e) Grounding Electrode Conductor Connection. A grounding electrode conductor shall be e permitted to be run to any convenient grounding electrode available in the grounding electrode system or to one or more grounding electrode(s) individually. It shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it. The grounding electrode conductor shall be unspliced or spliced by means of irreversible compression-type connectors listed for the purpose or by the exothermic welding process.

FPN: See Sections 547.8 and 547.9 for special grounding and bonding requirements for agricultural buildings.

(f) Metal Underground Water Pipe. When used as a grounding electrode, metal underground water pipe shall meet the following requirements.

(1) Continuity. Continuity of the grounding path or the bonding connection to interior piping shall not rely on water meters or filtering devices and similar equipment.

(2) Supplemental Electrode Required. A metal underground water pipe shall be supplemented by an additional electrode of a type specified in Sections 250.50(a)(2) through 250.50(a)(7). Where the supplemental electrode is a made electrode of the rod, pipe, or plate type, it shall comply with Section 250.56. The supplemental electrode shall be permitted to be bonded to the grounding electrode conductor, the grounded service-entrance conductor, the nonflexible grounded service raceway, or any grounded service enclosure.

Exception: The supplemental electrode shall be permitted to be bonded to the interior metal water piping at any convenient point as covered in Section 250.50(a)(1), Exception.

(3) Supplemental Electrode Bonding Connection Size. Where the supplemental electrode is a made electrode as in Section 250.50(a)(5) or (6), that portion of the bonding jumper that is the sole connection to the supplemental grounding electrode shall not be required to be larger than No. 6 copper wire or No. 4 aluminum wire.

(g) Grounding Ring. The grounding ring shall be buried at a depth below the earth's surface of not less than 2 1/2 ft (762 mm).

(h) Rod and Pipe Electrodes. The electrode shall be installed such that at lest 8 ft (2.44 m) of length is in contact with the soil. It shall be driven to a depth of not less than 8 ft (2.44 m) except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or shall be buried in a trench that is at least 2 1/2 ft (762 mm) deep.

The upper end of the electrode shall be flush with or below ground level unless that aboveground end and the grounding electrode conductor attachment are protected against physical damage as specified in Section 250.10.

(i) Plate Electrodes. Plate electrodes shall be installed not less than 2 1/2 ft (762 mm) below the surface of the earth.

SUBSTANTIATION: The present code mixes the definitions of what is a grounding electrode with many installation requirements. Also the separation of electrodes between Section 250-50 and 250-52 is confusing indicating a preference that may not really exist. By separating what the electrodes are in Section 250-50 as done in another proposal, and all the installation requirements in 250-52 as proposed here will clarify what is an electrode and what are all the installation requirements needed to form a grounding electrode system.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposals 5-134a and 5-171a meet the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: The Panel has chosen to reorganize portions of 250-50 into a new Section 250-53, an action with which I can concur notwithstanding the changes in Proposals 5-103 and 5-156. These Panel Proposals are 5-134a, 5-162, and 5-171a.

However, if Proposals 5-134a, 5-162 and 5-171a do not pass, this Proposal must be considered on its own merits. This submission (5-164) omits a number of words that materially affect the requirements for a ground ring and omit the prohibition of aluminum electrodes, with no technical substantiation given that would justify such material changes.

Specifically, in this proposal, Section 250-52(d) omitted the words "consisting of at least 20 ft (6.1 m) of bare copper conductor not smaller than No. 2". Omission of the required minimum length will materially affect resistance to ground, without any technical justification for this change.

Further, this proposal omits currently numbered Section 250-52(e). Aluminum Electrodes, without any substantiation. Aluminum is not suitable for burial in earth as an electrode, is not corrosion-resistant, and for that reason has not been allowed as an electrode.

My vote to accept Proposals 5-103 and 5-156 are not intended to be negated by the vote on this proposal.

See also comments regarding Proposals 5-103 and 5-156.

(Log #3313)

5- 165 - (250-52(a)): Reject
SUBMITTER: Kenneth E. Isman, Nat'l Fire Sprinkler Assn.
RECOMMENDATION: Revise Section 250-52(a) to read as follows:

(a) Metal Underground Gas Piping and Water Based Fire Protection Piping Systems. ~~A m~~Metal underground gas piping systems and water based fire protection piping systems shall not be used as a grounding electrode.

SUBSTANTIATION: Use of the fire sprinkler system piping, or other fire protection system piping, from grounding is bad practice and dangerous design. Removal of valves from the system for maintenance and repair such as alarm valves and check valves close to the point of entrance into the building is common enough to cause problems. Sprinkler fitters touching the pipe under these conditions could be electrocuted.

Some electrical contractors are assuming that the fire protection system piping continues to be metallic, even underground. This is no longer a valid assumption as there are a number of nonmetallic pipe and tube products now listed for underground service.

Another concern of the fire sprinkler industry with respect to this issue is the enhanced corrosion that may effect pipe, sprinklers and other attached components due to stray currents.

The NFPA Automatic Sprinkler committee agreed with the concept of this proposal while putting together the 1996 edition of NFPA 13, but thought that the issue was not within the scope of that document. They believed that the issue should be addressed by the NEC. See Proposal 13-27 of the Annual 1996 ROP for more details.

In addition, Section 8-3.5 of NFPA 24 agrees with this proposal. Failure to accept this proposal in some form allows a conflict between two different NFPA documents to continue.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the following statement applies:

"The intentional bonding of all the utilities in a building creates an equipotential ground plane that minimizes the voltage differential between the different systems under both normal and abnormal operating conditions. The result is an environment safer from the hazards of electrocution and fire. {excerpt from January/February, 2000, NFPA Journal, Grounding, Bonding and Sprinklers by John Caloggero}"
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3363)

5- 166 - (250-52(a), FPN (New)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add a new fine print note as follows:

FPN: See 250-104(b) for Metal Gas Piping Bonding Requirements.

SUBSTANTIATION: Many individuals do not completely understand the difference between not being allowed "to connect a wire" to an underground gas pipe and yet being required "to connect a wire" for bonding aboveground piping. Providing this "pointer" will help users in locating the requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 5-229 which eliminated Section 250-104(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #533)

5- 167 - (250-52(c)): Reject
SUBMITTER: John M. Vargo, City of Lorain, OH
RECOMMENDATION: Change the word "shall" to "may" in shall be driven at an oblique angle and shall be buried in a trench.
SUBSTANTIATION: You have a choice where rock bottom is encountered so the word may should be used instead of shall.
PANEL ACTION: Reject.
PANEL STATEMENT: The word "may" is vague and unenforceable. See the NEC Style Manual Table 3.2.1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1933)

5- 168 - (250-52(c)(1)): Reject
SUBMITTER: Warren Kohm, Briner Electric
RECOMMENDATION: Revise as follows:

250-52. Made and Other Electrodes.

(c) Rod and Pipe Electrodes.

(1) Electrodes of pipe or conduit shall not be smaller than 3/4 in. trade size and, where of iron or steel, shall have ~~the outer surface~~ all surfaces galvanized or otherwise metal-coated for corrosion protection.

SUBSTANTIATION: Section 250-52 currently requires that the outer surface of a pipe electrode be protected from corrosion. This could be interpreted as meaning that the inside of the pipe does not require corrosion protection. By changing "outer surface" to "all surfaces" this would clarify the intent of this section.
PANEL ACTION: Reject.
PANEL STATEMENT: No substantiation has been provided to indicate a problem.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #378)

5- 169 - (250-52(c)(3)): Reject
SUBMITTER: Joseph J. Chickey, Middle Atlantic Inspections Inc./Rep. Local 375 IBEW Allentown, PA
RECOMMENDATION: Revise as follows:
The electrode shall be installed such that at least eight ft (2.44 m) of length is in contact with the soil. It shall be driven to a depth of not less than eight ft (2.44 m), except that where rock bottom is encountered the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or shall be buried in a trench at least 2 1/2 ft (762 mm) deep. The upper end of the electrode shall be flush with or below ground level, and shall be protected with an orange colored plastic or rubber safety cap.
Delete ~~Unless the above ground end and the grounding electrode conductor attachment are protected against physical damage as specified in Section 250-10.~~
SUBSTANTIATION: A ground rod extending above the ground level can be a dangerous tripping hazard, and can cause a serious injury if fallen on.
On new construction, the proper grade level is not always available, and the electrician usually will have to guess. This also creates a problem for the inspector, who may have to guess. Even on existing ground rod installations, the ground level may change through the years, due to erosion, exposing the ground rod several inches above the ground.
In my opinion, an orange safety cap on the upper end of the ground rod would provide easy identification of the ground rod, and protect people and property such as lawn mowers, and other lawn equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The concerns of the submitter are already covered by safe work practices and work rules such as OSHA.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2765)

5- 170 - (250-52(c)(3)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Change "8 ft" to "7 ft, 9 in." in lines one and two.
SUBSTANTIATION: I will lay odds, that there are probably 98 percent of the rods in the world that are driven to leave about 3 inches above the ground for connectors.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation to address reducing the depth requirement of a ground rod.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3651)

5- 171 - (250-52(c)(3)): Reject
SUBMITTER: Mahlon Davenport, Rep. Commonwealth Code Inspection Service Inc.
RECOMMENDATION: Revise text to read as follows:
"The upper end of the electrode shall be flush with or below final grade level, and located outside the structure, unless the aboveground...".
SUBSTANTIATION: Final grade may not be established when placed.
Outside the structure is usually damper and not likely to be covered with concrete.
PANEL ACTION: Reject.
PANEL STATEMENT: As long as ground rods are in the earth, they are permitted to be inside or outside the structure. There is no technical substantiation to disallow ground rods inside a structure. The term final grade does not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #CP505)

5- 171a - (250-53): Accept
SUBMITTER: CMP 5
RECOMMENDATION: Add a new Section 250-53 to read as follows:
250-53. Grounding Electrode System Installation.
FPN: See Sections 547-8 and 547-9 for special grounding and bonding requirements for agricultural buildings.
(a) Rod, Pipe and Plate Electrodes. Where practicable, rod, pipe and plate ~~made~~ electrodes shall be embedded below permanent moisture level. Rod, pipe and plate ~~made~~ electrodes shall be free from nonconductive coatings such as paint or enamel.
(b) Electrode Spacing. Where more than one electrode is used, each electrode of one grounding system (including that used for air terminals) shall not be less than 6 ft (1.83 m) from any other electrode of another grounding system. Two or more grounding electrodes that are effectively bonded together shall be considered a single grounding electrode system.
(c) Bonding Jumper. The bonding jumper(s) used to connect the grounding electrodes together to form the grounding electrode system shall be installed in accordance with Sections 250-64(a), (b), and (e), shall be sized in accordance with Section 250-66, and shall be connected in the manner specified in Section 250-70.
(d) Grounding Electrode Conductor.
(1) Connection. ~~An unspliced~~ grounding electrode conductor shall be permitted to be run to any convenient grounding electrode available in the grounding electrode system or to one or more grounding electrode(s) individually.
(2) Sizing. It shall be sized for the largest grounding electrode conductor required among all the electrodes connected to it.
(3) Splicing. The grounding electrode conductor shall be unspliced or spliced by means of irreversible compression-type connectors listed for the purpose or by the exothermic welding process.
(e) Metal Underground Water Pipe. When used as a grounding electrode, metal underground water pipe shall meet the following requirements.
(1) Continuity. Continuity of the grounding path or the bonding connection to interior piping shall not rely on water meters or filtering devices and similar equipment.
(2) Supplemental Electrode Required. A metal underground water pipe shall be supplemented by an additional electrode of a type specified in ~~Sections 250-50 or 250-52~~Section 250-52(a)(2) through (a)(7). Where the supplemental electrode is a ~~made electrode of the~~ rod, pipe, or plate type, it shall comply with Section 250-56. The supplemental electrode shall be permitted to be bonded to the grounding electrode conductor, the grounded service-entrance conductor, the nonflexible grounded service raceway, or any grounded service enclosure.
Exception: The supplemental electrode shall be permitted to be bonded to the interior metal water piping at any convenient point as covered in Section ~~250-50~~ 250-52(a)(1), Exception.
(f) Supplemental Electrode Bonding Connection Size. Where the supplemental electrode is a rod, pipe or plate ~~made~~ electrode ~~as in Section 250-52(c) or (d),~~ that portion of the bonding jumper that is the sole connection to the supplemental grounding electrode shall not be required to be larger than No. 6 copper wire or No. 4 aluminum wire.
(g) Ground Ring. The ground ring shall be buried at a depth below the earth's surface of not less than 2 1/2 ft (762 mm).
(h) Rod and Pipe Electrodes. The electrode shall be installed

such that at least 8 ft (2.44 m) of length is in contact with the soil. It shall be driven to a depth of not less than 8 ft (2.44 m) except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or shall be buried in a trench that is at least 2 1/2 ft (762 mm) deep. The upper end of the electrode shall be flush with or below ground level unless the aboveground end and the grounding electrode conductor attachment are protected against physical damage as specified in Section 250-10.

(i) Plate Electrode. Plate electrodes shall be installed not less than 2 1/2 ft (762 mm) below the surface of the earth.

SUBSTANTIATION: This is one of three companion proposals to rearrange the 1999 NEC Sections 250-50 and 250-52 to add clarity to these sections and to make the application more user friendly. The new section is made up of parts of the 1999 NEC Section 250-50 and Section 250-52 to establish the requirements for installing the electrodes to form a grounding electrode system. The references within the text were revised to correlate with the correct references in the new section. Editorial changes were made as shown for clarity.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

COMMENT ON AFFIRMATIVE:

BRENDER: The Panel has chosen to reorganize portions of 250-50 and 250-52 into a new Section 250-53, an action with which I can concur with certain editorial changes. Agreement with this proposal is contingent on adoption of Proposals 5-162a and 5-134a.

My vote to accept Proposals 5-103 and 5-156 are not intended to be negated by the vote on this proposal.

See also comments regarding Proposal 5-103 and 5-156.

(Log #752)

5- 172 - (250-54): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Supplemental Grounding Electrodes. Supplemental grounding electrodes shall be permitted to be connected to the equipment grounding conductors specified in Section 250-118 and shall not be required to comply with the electrode bonding requirements of Section 250-50 or the resistance requirements of Section 250-56, but the earth shall not be used as the sole equipment grounding conductor.

SUBSTANTIATION: Section 250-50 literally covers the electrode of this section if it is available on the premises (each item (a) through (d) and any made electrodes). It appears the intent is not to require GEC, bonding, and resistance rules, although not specifically excluded.

PANEL ACTION: Accept.

Editorially, change supplemental to supplementary in two places to match existing Code text.

PANEL STATEMENT:

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

BRENDER: This proposal is similar to Proposal 5-149. The proposal does not add clarity. The substantiation submitted does not justify this change, and present Code language, especially under 250-54, already addresses the submitter's concerns.

(Log #CP506)

5- 172a - (250-56, 250-60, and 250-66(c)): Accept

SUBMITTER: CMP 5

RECOMMENDATION: Remove the word "made" as pertaining to electrodes in the following sections and editorially edit for clarity as indicated below:

250-56 Title to "Resistance of ~~Made~~ Rod, Pipe and Plate Electrodes

250-60. Use of Air Terminals

Air terminal conductors and driven pipes, rods, or ~~other made~~ plate electrodes used for grounding air terminals shall not be used in lieu of the ~~made~~ grounding electrodes required by Section ~~250-52~~ 250-50 for grounding wiring systems and equipment. This provision shall not prohibit the required bonding together of grounding electrodes of different systems

250-66(a) Connections to ~~Made~~ Rod, Pipe or Plate Electrodes. Where the grounding electrode conductor is connected to ~~made~~ rod, pipe or plate electrodes as permitted in Section ~~250-52(c) or (d)~~250-52(a)(5) or 250-52(a)(6), that portion of the conductor that is the sole connection to the grounding electrode shall not be required to be larger than No. 6 copper wire or No. 4 aluminum wire.

250-166(c) Connected to ~~Made~~ Rod, Pipe or Plate Electrodes. Where connected to ~~made~~ rod, pipe or plate electrodes as in Section ~~250-52(c) or (d)~~250-52(a)(5) or 250-52(a)(6), that portion of the grounding electrode conductor that is the sole connection to the grounding electrode shall not be required to be larger than No. 6 copper wire or No. 4 aluminum wire.

If the 2002 NEC is printed with Appendix E, then make the additional changes also:

In Appendix E1 subpart C, replace the word "made" with "Rod, Pipe and Plate" in two locations.

In Appendix E2 subpart H, replace the word "made" with "Rod, Pipe and Plate" in two locations.

SUBSTANTIATION: To provide correlation with the changes to Sections 250-50 and 250-52 in the 1999 NEC, the word "made" become undefined. The revised text in this proposal provides corrected terms. The references within the text were revised to correlate with the correct references in the new section. Editorial changes were made as shown for clarity.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1790)

5- 173 - (250-56): Accept

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: Revise first sentence to read as follows:

"A single electrode consisting of a rod, pipe, or plate that does not have a resistance to ground of 25 ohms or less shall be augmented by one additional electrode of any of the types specified by Sections 250-50(b), (c), or (d) or Section 250-52."

SUBSTANTIATION: This change is intended to break the circular reference that currently exists between Sections 250-50, 52, and 56. The current language requires the water pipe to be supplemented by another electrode. If the other electrode is a rod, pipe, or plate with a resistance over 25 ohms to ground, it must be supplemented, but may be supplemented by the water pipe. However, the electrode that supplements a water pipe should be capable of functioning as the sole electrode in the event that the metal underground water piping is replaced with plastic or otherwise lost.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

COMMENT ON AFFIRMATIVE:

DOBROWSKY: The section references are incorrect based on the action on Proposal 5-162a. Change "Section 250-50(b), (c), or (d) or Section 250-52" to "250-52(a)(2) through (a)(7)".

(Log #3830)

5- 174 - (250-56): Reject

SUBMITTER: Nicholas Williams, Riviera Electric

RECOMMENDATION: Revise text to read as follows:

"Resistance of Made Electrodes. Two or more electrodes consisting of rod, pipe, or plate shall be any of the specified in Sections 250.50 or 250.52. The rod pipe or plate electrodes are installed to meet the requirements of this section. They shall not be less than 6 ft (1.83 m) apart.

SUBSTANTIATION: Resistance of made electrodes - a single electrode consisting of a rod, pipe, or plate that does not have a resistance to ground of 25 ohms or less shall be augmented by one additional electrode of any of the types specified in Section 250-50 or 250-52.
PANEL ACTION: Reject.
PANEL STATEMENT: The code now allows a single rod, pipe or plate electrode as long as the resistance is 25 ohms or less. This change requires two electrodes without technical substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #753)

5- 175 - (250-64(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add to first paragraph:
Grounding electrode conductors shall not be installed in a raceway, auxiliary gutter, or cable tray containing other conductors, except a grounding electrode conductor may pass through the space perpendicular to the long dimension of auxiliary gutters or wireways.
SUBSTANTIATION: This is an alternative to my other proposal for this section. It would resolve potential problems associated with comingling a GEC with other conductors. Since separate installation is the general practice even though not required, this is not a hardship proposal. It would lessen the possibility of mis, flashover, and damage to equipment due to lightning surges or contact with other system wiring.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no substantiation that "co-mingling" a grounding electrode conductor with other conductors presents a hazard.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #754)

5- 176 - (250-64(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add after first paragraph:
Where an insulated grounding electrode conductor is installed in a raceway, auxiliary gutter, or cable tray containing other conductors it shall have a continuous outer finish that is either green or green with one or more yellow stripes, except that a grounding electrode conductor that is larger than No. 6 shall be permitted to be identified at the time of installation by one of the following:
a. Stripping not less than 4 in. (101.6 mm) of the insulation or encircling the insulation with a durable and permanent distinct green marking at each termination, and at each junction point except conduit bodies that do not contain splices or unused hubs.
b. Encircling the insulation with a durable and permanent distinct green marking at intervals not exceeding 6 ft (1.83 m) with not less than one such marking, where installed in a wireway, auxiliary gutter, or cable tray.
SUBSTANTIATION: There is no code requirement for identification of a grounding electrode conductor and probably no need where installed as an open conductor or in a dedicated conduit or tubing and readily recognized, as is the case for most installations by common practice. However, there is no prohibition against installation in a raceway, gutter, or cable tray with other conductors. Where installed with other conductors and accessible at pull and junction points in tubular raceways, wireways, gutters, or cable trays, and not identified, a voltage/continuity test cannot readily distinguish it from a grounded circuit conductor or an equipment grounding conductor. Since such installation is not the norm, an electrician may not even consider that it is a grounding electrode conductor. There are many conditions where installation with other conductors may be a viable option.
See Proposal 5-20 in the 1998 ROP for substantiation for marking to encircle the insulation.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no code requirement for identification of a grounding electrode conductor. No problem has been cited to warrant a change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1401)

5- 177 - (250-64(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add new wording to read as follows:
Underground installations shall be installed to meet the minimum cover requirements of Table 300-5, except where the conductor rises for termination or transition to above-ground installation.
SUBSTANTIATION: It may be perceived that Table 300-5 includes or does not include grounding electrode conductors since they are not circuit conductors. While burial depth may not relate to safety from shock, it does relate to physical damage potential. If Table 300-5 is intended to apply, the proposal would clarify this.
PANEL ACTION: Reject.
PANEL STATEMENT: CMP 5 concluded, and confirmed from discussions with CMP-3, that the reference to Table 300-5 was not intended to apply to this application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1791)

5- 178 - (250-64(c), Exception): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Revise the Exception to read as follows:
"Busbars used as grounding electrode conductors shall be permitted to have splices."
SUBSTANTIATION: Although the wording of this exception was improved in the 1999 NEC, the present wording of the exception is still somewhat misleading and has been interpreted by many persons and in some texts as permitting busbars to be used to make splices in other types of conductors. This proposal will clarify that it's only the busbars that can be spliced.
PANEL ACTION: Reject.
PANEL STATEMENT: The title of this section is "Grounding Electrode Installation." The exception to 250-64(c) already permits busbars to have splices.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3890)

5- 179 - (250-64(e)): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise this section and add the appropriate portions of text from Section 250-92(a)(3) as follows:
(e) Enclosures for Grounding Electrode and Grounding Conductors. Metal enclosures for grounding electrode and grounding conductors shall be electrically continuous from the point of attachment to cabinets or equipment to the grounding electrode, and shall be securely fastened to the ground clamp or fitting. Metal enclosures for the grounding electrode conductor or grounding conductor such as raceways, boxes, and enclosures that are not physically continuous from cabinet or equipment to the grounding electrode shall be made electrically continuous by bonding each end to the grounding electrode conductor or grounding conductor.
Where a raceway is used as protection for a grounding conductor, the installation shall comply with the requirements of the appropriate raceway article.

SUBSTANTIATION: This proposal intends to move the sentence on installation requirements for protecting the grounding electrode conductor from Section 250-92(a)(3) to Section 250-64 where the remainder of the requirements are found. This should improve the organization of Article 250 and the user-friendliness without changing any requirements.
In addition, the phrase "and grounding" is added as the grounding electrode conductor at services and separately derived systems is called the "grounding conductor" at additional buildings or structures that are supplied from a common service.
A coordinating proposal to delete the sentence from Section 250-92(a)(3) has been made.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-123.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #291)

5- 180 - (Table 250-66): Accept
SUBMITTER: Richard Smercina, Duke Mfg. Co./Rep. Int'l Assn. of Electrical Inspectors
RECOMMENDATION: First entry under aluminum or copper clad aluminum now reads 1/2 or smaller. Should read 1/0 or smaller.
SUBSTANTIATION: None.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #616)

5- 181 - (Table 250-66): Accept
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Under "Aluminum or Copper Clad Aluminum," Change 1/2 or smaller to 1/0 or smaller.
SUBSTANTIATION: Typographical error.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #755)

5- 182 - (Table 250-66): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise as follows:
Size of Largest Ungrounded Service-Entrance Conductor or Equivalent Area for Parallel Conductors.
(remainder unchanged).
SUBSTANTIATION: Editorial. Due to harmonic currents, grounded neutral conductors may be the largest conductor. Proposal provides correlation with Section 250-24(a)(1).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1055)

5- 183 - (Table 250-66): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Table 250-66 as follows.
(Table shown below)
SUBSTANTIATION: The numbers 2 through 4/0 in the table have no units associated with them. Conductors smaller than 250 kcmil are identified as AWG.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America.
The change from "1/2" to "1/0" is a correction.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1820)

5- 184 - (Table 250-66): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, In
RECOMMENDATION: Revise the title as follows:
"Grounded Conductors, Grounding Electrode Conductors, and Bonding Jumpers for Alternating Current Systems".
SUBSTANTIATION: This table should be properly titled, because it is referenced when determining minimum sizes of the GC, GEC, and MBJ. This will make the NEC more user friendly so it can be applied properly.
PANEL ACTION: Reject.
PANEL STATEMENT: This table primarily refers to grounding electrode conductors. Some other conductors may need to be sized according to this table, but renaming this table may lead to confusion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2058)

5- 185 - (Table 250-66): Accept
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: In Table 250-66 change the first line in the table to read as follows:

2 or smaller	1/0 or smaller	8	6

SUBSTANTIATION: This is a typo error in the 1999 NEC which should be corrected.
See also previous Codes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

Table 250-66. Grounding Electrode Conductor for Alternating-Current Systems

Size of Largest Service-Entrance Conductor or Equivalent Area for Parallel Conductors[1] (AWG/kcmil)		Size of Grounding Electrode Conductor (AWG/kcmil)	
Copper	Aluminum or Copper-Clad Aluminum	Copper	Aluminum or Copper-Clad Aluminum[2]
2 or smaller	~~1/2~~ 1/0 or smaller	8	6
1 or 1/0	2/0 or 3/0	6	4
2/0 or 3/0	4/0 or 250 ~~kcmil~~	4	2
Over 3/0 through 350 ~~kcmil~~	Over 250 ~~kcmil~~ through 500 ~~kcmil~~	2	1/0
Over 350 ~~kcmil~~ through 600 ~~kcmil~~	Over 500 ~~kcmil~~ through 900 ~~kcmil~~	1/0	3/0
Over 600 ~~kcmil~~ through 1100 ~~kcmil~~	Over 900 ~~kcmil~~ through 1750 ~~kcmil~~	2/0	4/0
Over 1100 ~~kcmil~~	Over 1750 ~~kcmil~~	3/0	250 ~~kcmil~~

(Log #2200)

5- 186 - (Table 250-66): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:

Copper	Aluminum or Copper-Clad Aluminum	Copper	Aluminum or Copper-Clad Aluminum
2 or smaller	1/0~~1/2~~ or smaller	8	6

SUBSTANTIATION: This is an editorial change. I believe it is a typographical error. It should be the same as the 1996 NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3654)

5- 187 - (Table 250-66): Accept
SUBMITTER: Steven R. Musial, II, Pittsburgh, PA
RECOMMENDATION: Revise Table to read:

copper	Aluminum or copper-clad Aluminum
2 or smaller	~~1/2~~ 1/0 or smaller

SUBSTANTIATION: The size "1/2 or smaller" is a blatant typographical error. It is obvious that it should read "1/0 or smaller".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4356)

5- 188 - (Table 250-66 Note): Reject
SUBMITTER: Marty Kumm, Board of Electricity, State of Minnesota
RECOMMENDATION: Revise text to read as follows:
Notes:
~~1. Where multiple sets of service-entrance conductors are used as permitted in Section 230-40, Exception No. 2, the equivalent size of the largest service-entrance conductor shall be determined by the largest sum of the areas of the corresponding conductors of each set.~~
~~2.~~ 1. Where there are no service-entrance conductors, the grounding electrode conductor size shall be determined by the equivalent size of the largest service-entrance conductor required for the load to be served.
SUBSTANTIATION: It would be just as safe to allow a separate electrode conductor run from each service disconnect based on the size of the service entrance conductors to that disconnect. We do not require anything different than other exceptions to Section 230-40, why should Exception No. 2 be treated any differently?
PANEL ACTION: Reject.
PANEL STATEMENT: The existing language in Note 1 permits the concept proposed by the submitter. Where one or more of the sets consist of parallel conductors, then the equivalent sum of the conductor areas for a set will determine the appropriate grounding electrode conductor size for that set.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2059)

5- 189 - (Table 250-66 Note 1 and 2): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Move Notes 1 and 2 into positive text as follows:
(a) Multiple sets of service-entrance conductors. Where multiple sets of service-entrance conductors are used as permitted in Section 230-40, Exception No. 2, the equivalent size of the largest service-entrance conductor shall be determined by the largest sum of the areas of the corresponding conductors of each set.
(b) No service-entrance conductors. Where there are no service-entrance conductors, the grounding electrode conductor size shall be determined by the equivalent size of the largest service-entrance conductor required for the load to be served.
Remaining notes to remain as is with subscripts.
Renumber the existing paragraphs (a) through (c) to (c) through (e).
Change the GENERAL paragraph of 250-66 as follows:
250-66. Size of Alternating-Current Grounding Electrode Conductors. The size if the grounding electrode conductor of a grounded or ungrounded ac system shall not be less than given in Table 250-66, ~~except~~ or as permitted in (a) through ~~(c)~~ (e).
SUBSTANTIATION: This will move the mandatory text of the NOTES into positive language as required by the NEC style manual.
Also make the NEC more user friendly.
No intent changes were intended.
PANEL ACTION: Reject.
PANEL STATEMENT: Notes to this table are mandatory text and in positive language already. The panel concludes that the notes are located in accordance with Section 2.3 of the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: The Panel is technically correct that Notes are mandatory. I wonder how many users of the Code recognize that Notes are mandatory and FPNs are not. Moving the notes into positive text in the body of the section will emphasize the fact that they are mandatory without actually changing any of the rules. I believe that this proposal is in the direction of making the Code more user friendly by removing any doubt as to whether notes are mandatory or not.

(Log #4186)

5- 190 - (250-66(d)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add a new subsection (d) as follows:
(d) Connections to Well Casings. Where connected to a metal well casing as provided in the exception to the first paragraph of Section 250-50, that portion of a grounding electrode conductor that is the sole connection to the well casing shall not be smaller than No. 4 copper wire. That portion of an existing grounding electrode conductor that is the sole connection to a metal well casing shall not be required to be larger than No. 4.
SUBSTANTIATION: This is a companion proposal to a proposal that adds a mandatory exception to Section 250-50, first paragraph, requiring the use of metallic well casings as grounding electrodes (where available during new construction) if the only alternative would be a made electrode. It sets a minimum size of No. 4, which is commonly available and the appropriate size for a 200A service. It is larger than required for smaller services, but considering the potential distances involved that is a reasonable tradeoff. On the other hand, if the service is ever increased above 200A, the second sentence will preclude the necessity of reopening the trench. Experience shows that the overwhelming majority of existing grounding electrode conductors that are now running to well casings are No. 4, so this language should minimize problems with existing services if and when they are increased.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation for not increasing the size of the grounding electrode conductor if the service increases above 200 amperes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #756)

5- 191 - (250-68): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Grounding Electrode Conductor and Bonding Jumper Connection to Grounding Electrodes.
(a) Accessibility. The connection of a grounding electrode conductor or bonding jumper to a grounding electrode shall be accessible.

Exception: No change.
(b) Effective Grounding Path. The connection of a grounding electrode conductor or bonding jumper shall be made in a manner that will ensure a permanent and effective grounding path.
(remainder unchanged).
SUBSTANTIATION: Editorial. A bonding jumper connection warrants the same requirements as a grounding electrode conductor as it may serve the same function. For example a supplementary electrode of Section 250-50(a)(2) may in effect become the grounding electrode conductor upon loss of a metal underground water pipe as an electrode.
PANEL ACTION: Accept in Principle.
Revise to read as follows:
"250-68. Grounding Electrode Conductor and Bonding Jumper Connection to Grounding Electrodes.
(a) Accessibility. The connection of a grounding electrode conductor or bonding jumper to a grounding electrode shall be accessible".
Exception: No change.
"(b) Effective Grounding Path. The connection of a grounding electrode conductor or bonding jumper to a grounding electrode shall be made in a manner that will ensure a permanent and effective grounding path."
(remainder unchanged).
PANEL STATEMENT: The connections of the bonding jumper that connects all the grounding electrodes together are required to be accessible unless they are the type referred to in the exception. The proposal adds clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: The term "bonding jumper" should also be inserted after "grounding electrode conductor" in Section 250-66(a) to provide sizing correlation for bonding jumpers connected to electrodes as revised in new Section 250-53.

(Log #757)

5- 192 - (250-70): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Grounding and Bonding Conductor Connection to Electrodes.
The grounding or bonding conductor shall be connected to the grounding electrode by exothermic welding, listed lugs, listed pressure connectors, listed clamps, or other listed means. Connections depending on solder shall not be used. Ground clamps shall be listed for the material of the grounding electrode and, where used on pipe, rod, or other buried electrode, shall also be listed for direct soil burial or concrete embedment. Not more than one conductor shall be connected to the grounding electrode by a single clamp or fitting unless the clamp or fitting is listed for multiple conductors. One of the following methods shall be used.
(1) No change.
~~(2) A pipe fitting, pipe plug, or other approved device screwed into a pipe or pipe fitting~~
(3) No change
(4) No change.
SUBSTANTIATION: Bonding conductors indicated in Sections 250-50; 250-50(a); 250-68 and other sections which require or permit bonding connections to electrodes should be included. Section 250-102(b) applies this section for a specific type (equipment bonding jumpers), which should apply for other type bonding jumpers also. Listing should be required for concrete-embedded clamps also which UL covers.
I for one, have not seen a pipe plug connection to an electrode. A pipe plug, tee, or other fitting is normally a component of a pipe electrode, not a listed connecting device. Present wording does not allow pipe fittings which are welded or soldered.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation to delete item No. 2. The panel does not agree with the submitter that an approved connecting device is necessarily a listed device. See Article 100 for the definition for approved. The proposed additional wording would add confusion. There is a common listing for both direct burial and concrete embedment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2255)

5- 193 - (250-80 Exception No. 1): Reject
SUBMITTER: Paul F. Furman, Rep. IBEW Local 697
RECOMMENDATION: Revise text as follows:
A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 in. (457 mm) and/or is not accessible to any part of the elbow shall not be required to be grounded.
SUBSTANTIATION: If the elbow is isolated from contact by 18 inches of ground, then an elbow that is not accessible should also be applied to the exception for not grounding. As stated in Section 250-80, Exception No. 1.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception is limited to underground installations. Using the term "accessible" (as defined in Article 100) could cause confusion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2874)

5- 194 - (250-81): Reject
SUBMITTER: Sean Werth, Front Range Electric
RECOMMENDATION: Add new text to paragraph four to read as follows:
When a new service is placed on an existing home, the cold water grounding conductor shall be allowed to be attached to the nearest 3/4 in. water pipe.
SUBSTANTIATION: When a home has a finished basement with a drywalled ceiling, it is often impossible to get within 5 ft of the main water line without creating substantial damage to the ceiling.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal references a code section that does not exist in the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1528)

5- 195 - (250-84(a)): Reject
SUBMITTER: Michael C. Reid, Lawrenceville, GA
RECOMMENDATION: Revise to read as follows:
The sheath or armor of a continuous underground metal-sheathed service cable system that is metallically connected to the underground system shall not be ~~required to be~~ grounded at the building. The sheath or armor shall ~~be permitted to~~ be insulated from the interior conduit or piping.
SUBSTANTIATION: 1. Delete wording.
2. To ensure a clear understanding that service cable system shall not be grounded at the building.
PANEL ACTION: Reject.
PANEL STATEMENT: Under the specific conditions stated, in Section 250-84(a), the sheath or armor is permitted but not required to be grounded at the building. The substantiation indicates a requirement that is not intended by the panel.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2254)

5- 196 - (250-86 Exception No. 3): Reject
SUBMITTER: Paul F. Furman, Rep. IBEW Local 697
RECOMMENDATION: Revise text as follows:
A metal elbow that is installed in an underground installation of rigid nonmetallic conduit and is isolated from possible contact by a minimum cover of 18 in. (457 mm) and/or is not accessible to any part of the elbow shall not be required to be grounded.

SUBSTANTIATION: If the elbow is isolated from contact by 18 inches of ground, then an elbow that is not accessible should also be applied to the exception for not grounding as stated in Section 250-86, Exception No. 3.
PANEL ACTION: Reject.
PANEL STATEMENT: See action and statement on Proposal 5-193.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #592)

5- 197 - (250-91(b)(8)): Reject
SUBMITTER: Gary Wonderly, Britton, MI
RECOMMENDATION: Revise 250-91(b)(8) to read as follows:
(8) ~~The metallic sheath or~~ the combined metallic sheath and grounding conductors of Type MC cable;
SUBSTANTIATION: As is stated in Section 334-23: The armor of interlocking Type MC cable is not recognized by UL as the sole means of providing an equipment grounding circuit but may be used to supplement the internal grounding conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: There are types of MC cable other than interlocking types. The proposal references a section that does not exist in the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #758)

5- 198 - (250-92(a)(1)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(1) The service raceways, cable trays, cablebus framework, auxiliary gutters, or cable armor or sheath except as permitted in Section 250-84.
SUBSTANTIATION: Editorial. Auxiliary gutters which enclose service conductors are not presently included since they are not considered raceways.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3889)

5- 199 - (250-92(a)(3)): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Delete the last sentence of this section as follows:
3. Any metallic raceway or armor enclosing a grounding electrode conductor as specified in Section 250.64(b). ~~Bonding shall apply at each end and to all intervening raceways, boxes, and enclosures between the service equipment and the grounding electrode.~~
SUBSTANTIATION: The concept contained in the sentence from this section that is proposed to be deleted has been added to Section 250-64(e) in a comparison proposal. This will improve the organization of Article 250 and make it more user-friendly.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal deletes the bonding requirement for intervening enclosures without substantiation. The panel concludes that this proposal does not make the Code more user friendly.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3887)

5- 200 - (250-92(b)): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Delete the second full paragraph as indicated below:
(b) Bonding to Other Systems. An accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided at the service by at least one of the following means.
1. Exposed nonflexible metallic service raceways
2. Exposed grounding electrode conductor
3. Approved means for the external connection of a copper or other corrosion-resistant bonding or grounding conductor to the service raceway or equipment
~~For the purposes of providing an accessible means for intersystem bonding, the disconnecting means at a separate building or structure as permitted in Section 250-32 and the disconnecting means at a mobile home as permitted in Section 550-23(a) shall be considered the service equipment.~~
SUBSTANTIATION: This text needs to be deleted to coordinate with requirements being added to Section 250-32 in another proposal for external intersystem bonding means for more than one building or structure supplied by a common service.
Deleting this text will also remove the confusing reference to the disconnecting means at a separate building or manufactured home being "service equipment" when in actuality, the supply conductors are no doubt feeders and not service conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-118.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #302)

5- 201 - (250-92(b), FPN No. 1): Reject
SUBMITTER: Vincent Metallo, Sr., Baltimore County, MD
RECOMMENDATION: Delete the following text:
~~FPN No. 1: A No. 6 copper conductor with one end bonded to the service raceway or equipment and with 6 in. (152 m) or more of the other end made accessible on the outside wall is an example of the approved means covered in (b)(3).~~
SUBSTANTIATION: A No. 6 copper conductor with one end connected to the neutral (grounded) bar and the other end open laying in the earth next to, in most cases, the grounded meter can be dangerous. An open main neutral, loose connection on a main neutral, lightning strikes, ground faults on the line and load side and even normal return currents set up by a parallel path. This conductor cannot be defined as a bonding jumper as the open end bonds nothing and is not a grounded electrode conductor because it is not hooked to an electrode. Connection to this grounded wire is not enforceable by 90-2(b)(4).
PANEL ACTION: Reject.
PANEL STATEMENT: The fine print note is a useful example of intersystem bonding. The bonding conductor would be at the same potential as nearby grounded metal parts. There is no substantiation that has shown that this has been a hazard.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1189)

5- 202 - (250-94(2)): Reject
SUBMITTER: Kenneth Higashi, City and County of Honolulu, H
RECOMMENDATION: Revise text to read:
(2) Couplings and connectors that are attached to the metal raceways and metal-clad cables by screws, clamps, or compression connecting devices.
SUBSTANTIATION: These are connectors that attached the metal raceways and metal-clad cables to an enclosure by clips which are a questionable bonding means. These connectors don't have any means for bonding.
PANEL ACTION: Reject.

PANEL STATEMENT: There is no technical substantiation provided to support this change. The panel is unclear as to the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4382)

5- 203 - (250-94(3)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add text to read as follows:
"For the purpose of this section threadless couplings and connectors shall be considered to be those that do not use threads as a direct means of connecting the wiring method to the fitting."
SUBSTANTIATION: The use of the term threadless is confusing. Many connectors and couplings have threaded set screws or threaded "compression glands" but are not typically considered threaded. If the term threadless is taken literally then only fittings that do not have any treaded features would be considered threadless.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the term threadless couplings and connectors is clearly understood.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #759)

5- 204 - (250-94(4)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(4) Other approved methods or devices, such as bonding jumpers, and bonding-type locknuts, bushings, and wedges.
SUBSTANTIATION: Editorial. Bonding jumpers for cable tray, and cablebus framework, wireways, auxiliary gutters, and interposed nonmetallic or flexible metal raceways do not appear to be expressly covered, nor bonding wedges.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is not editorial. Wedges are presently allowed under "other approved devices." Bonding jumpers are presently allowed in this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1402)

5- 205 - (250-97, Exceptions (a) and (d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Delete: ~~(a) Threaded couplings and connectors for cables with metal sheaths.~~
Revise: (d) ~~(Listed Fittings.~~ Fitting listed as suitable for the purpose.
SUBSTANTIATION: Editorial. "Couplings" are generally associated with raceways. I don't believe I have seen couplings for metal sheath cable. There are in-line splicing devices for Type MI cable but these are not designated as couplings. Wording appears to permit "snap-in" type connectors which may not be approved for over 250 volt circuits, and which conflicts with (c) which requires a locknut connection. Listed fittings in (d) would cover snap-in cable connectors if they are listed for such use.
While "listed fittings" is inferred to mean suitable for over 250 volts it literally includes fittings which are merely listed. Section 250-118 differentiates flexible metal conduit that is "listed" and listed for the purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal is not editorial. Listed fittings are acceptable. Section 300-15(a) specifies "fittings and connectors shall be used only with the specific wiring methods for which they are designed and listed." There is no technical substantiation to remove item (a) of the exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4383)

5- 206 - (250-97, Exception (a)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add text to read as follows:
"For the purpose of this section threadless couplings and connectors shall be considered to be those that do not use threads as a direct means of connecting the wiring method to the fitting."
SUBSTANTIATION: The use of the term threadless is confusing. Many connectors and couplings have threaded set screws or threaded "compression glands" but are not typically considered threaded. If the term threadless is taken literally then only fittings that do not have any treaded features would be considered threadless.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that the term threadless couplings and connectors is clearly understood.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3888)

5- 207 - (250-97, Exception (d)): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Delete Section 250-97 Exception (d).
SUBSTANTIATION: This part of the exception is confusing and does not seem to be needed for proper application of the section or other exceptions. Many, many fittings are listed that are not suitable for connecting raceways or cables to enclosures or for bonding raceways or fittings where necessary such as insulating bushings.
PANEL ACTION: Reject.
PANEL STATEMENT: Listed fittings are acceptable. Section 300-15(a) specifies "fittings and connectors shall be used only with the specific wiring methods for which they are designed and listed."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2382)

5- 208 - (250-100): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Add the following after the existing text:
"Such bonding shall be provided for all intervening raceways, fittings, boxes, and other conductor enclosures between the classified location and the point of grounding for the service equipment, or point of grounding of a separately derived system.
Exception: the specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), if the branch-circuit overcurrent protection is located on the load side of the disconnecting means."
SUBSTANTIATION: This section should be consistent with Sections 501-16(a), 502-16(a), and 503-16(a), from which the proposed change is taken. A Code user who relies on this section in its present form does not have complete information.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements for special occupancies are covered in Chapter 5. The panel concludes that repeating the requirement here is unnecessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1165)

5- 209 - (250-102(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
"Size-Equipment Bonding Jumper on Supply Side of Service Overcurrent Device(s). The bonding jumper shall not be smaller than the sizes shown in Table 250-66 for grounding electrode conductors. Where the service-entrance or service-lateral phase conductors are larger than 1100 kcmil copper or 1750 kcmil aluminum, the bonding jumper shall have an area not less than 12 1/2 percent of the area of the largest phase conductor except that, where the phase conductor and the bonding jumper are of different materials (copper or aluminum), the minimum size of the bonding jumper shall be based on the assumed use of phase conductors of the same material as the bonding jumper and with an ampacity ~~equivalent to~~ not less than that of the installed phase conductors. Where the service-entrance or service-lateral conductors are paralleled in two or more raceways or cables, the equipment bonding jumper, where routed with the raceways or cables, shall be run in parallel. The size of the bonding jumper for each raceway or cable shall be based on the size of the service-entrance or service-lateral conductors in each raceway or cable.
A single common continuous equipment bonding jumper shall be permitted to bond two or more raceways or cables where the bonding jumper is sized in accordance with the total kcmil area of the largest phase conductor."
SUBSTANTIATION: Edit. Since the definition of Service encompasses service drops, service-entrance conductors, service lateral conductors and service equipment, a bonding jumper on the supply side could be indicating a location ahead of the service point, where the "service" begins. Subsection (c) specifies a specific component of a service (overcurrent devices).
This section does not appear to address equipment bonding jumper size for service-laterals.
Present wording may infer each raceway or cable requires an individual bonding jumper, especially in view of Subsection (d) which specifically addresses a common jumper for load side bonding. Lack of specificity in this section suggests it does not apply to supply side bonding. The proposal would clarify this.
The word "equivalent" may be perceived as requiring an ampacity which is the same; ampacities of copper and aluminum conductors may not have "same" values and "not less than" removes any such perception without changing intent.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is not editorial and does not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2332)

5- 210 - (250-102(c)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Revise section title to the following:
250-102(c) Size-Equipment Bonding Jumper on Supply Side of Service and on the Secondary Side of Separately Derived Systems.
SUBSTANTIATION: It is not clear as to what the size the equipment bonding jumper installed on the secondary side of a separately derived system with no over current device is to be. It has been argued that conductors on the secondary side of a transformer are feeders and thus the conductor is an equipment ground and must be sized per Table 250-122. The other argument is that the conductors do not have short circuit and ground fault protection at the point they receive their supply, thus this conductor must be sized in the same manner as the bonding jumper for the transformer and 250-66.
It would seem more appropriate for the equipment bond be sized to Table 250-66. This conductor when used to ground the exposed metal housings of the equipment (instead of the using the grounded conductor per 250-142) must carry the same current as the bonding jumper. In a majority of cases this would result in a smaller conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: The present title accurately reflects the contents and the intent of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #760)

5- 211 - (250-102(d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Size-Equipment Bonding Jumper on Load Side of Service. The equipment bonding jumper on the load side of the service overcurrent devices shall be sized, as a minimum, in accordance with the sizes listed in Table 250-122, but shall not be required to be larger than the largest ungrounded circuit conductor ~~supplying the equipment~~ in that portion of the circuit where the bonding is provided, and shall not be smaller than No. 14.
(remainder unchanged).
SUBSTANTIATION: Editorial. There is no code prohibition of one conductor of a circuit being "oversize" and where overcurrent devices are rated higher than conductor ampacities such as for motors, welders, etc., the bonding jumper should be commensurate with the largest conductor. Grounded conductors should be excluded as they are literally included as a circuit conductor, and may be smaller than ungrounded conductors, or in some cases larger, such as a common neutral for feeders or to compensate for harmonic currents.
Common wisdom seems to be that bonding jumpers run with tap conductors do not require a size larger than the tap conductors, however, in a literal sense a feeder supplying tap conductors is also supplying the equipment. The proposal is an attempt to clarify bonding jumper size for such tap conductors or other portions of circuit conductors where the size is reduced. (See my proposal for Section 250-122(a)).
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal is not editorial. The proposal does not provide clarification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2906)

5- 212 - (250-102(e)): Accept
SUBMITTER: Mark R. Hilbert, Wolfeboro, NH
RECOMMENDATION: Add a new sentence after the current second sentence. This sentence would read:
"An equipment bonding jumper longer than six ft shall be permitted at utility pole locations for the purposes of bonding or grounding of isolated sections of metal raceways or elbows installed in a run of rigid nonmetallic conduit."
SUBSTANTIATION: In many locations service lateral conduits are not owned by the utility company at the time of installation and are subject to the rules of the National Electrical Code as well as policies of the serving utility. Often these isolated sections of metal raceways are left ungrounded or not bonded. In many cases the serving utility mandates a metal elbow and/or a ten foot section of metal raceway at the pole. The serving utility then installs the bell end of a section of nonmetallic raceway over the end of the metallic raceway left by the electrician. Therefore, there is no practical way for an internal bonding jumper to exit the lateral conduit. Acceptance of this proposal would allow the electrician to bond the isolated section of raceway or elbow, that is not 18 in. below grade, with a proper size conductor and leave a coil to be run up the pole and attached to the grounded conductor at the top of the pole by the utility company. This would assure that isolated sections of metal raceways or metal elbows are bonded to the grounded conductor resulting in a safer and more compliant installation.
PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 5

EXPLANATION OF NEGATIVE:
JOHNSTON: The installation covered in the proposal is under the scope of the electric utility in 90-2(b)(5). Bonding requirements for isolated sections of metal raceways containing service conductors or other conductors is already covered in Section 250-92 for installations that fall within the scope of the NEC.
MELLO: This requirement really belongs to the utility and that is not covered under the NEC. Therefore, this proposal should be rejected. There is no method to ensure this proposed bonding wire is ever connected as the inspection would be beyond the NEC and the electrical inspector. This would add a burden on the installers that is unnecessary. As for feeders where the pole is not supplying the service, the provisons of Section 250-86 already would require the exposed metal raceway to be bonded by an approved means and this would be inspected by the electrical inspector to the NEC.
RAPPAPORT: I am in agreement that it is desirable to provide a means of grounding isolated sections of metal raceways. I am concerned as to how this would be accomplished. I would not want to see a ground rod driven near the raceway for the purpose of grounding. This proposal is too broad in scope.
TOOMER: This is the responsibility of the utility company. The possibility of the coil of wire being present when the utility is ready to connect service conductors is unlikely. The liability and responsibility being placed upon the contractor is too great without their ability to control the scheduling of the utility.
WHITE: This proposal should be rejected. This proposal would regulate and impose requirements upon the serving utility. The NEC does not control the installation requirements of the serving utility. The inclusion or acceptance of this proposal will not resolve the submitter's concern, but will create conflict in the field. The submitter's concern must be addressed by the appropriate entity that regulates the utility practices and the NESC installation requirements not via the NEC. Ultimately, it remains an issue for the utility, to either connect or not connect the bonding jumper.
COMMENT ON AFFIRMATIVE:
DOBROWSKY: The word "utility" should be deleted in the proposed sentence. The same situation could occur at poles other than those owned by a utility.

(Log #761)

5- 213 - (250-104): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete present wording and substitute:
Bonding of Metal Piping Systems and Exposed Structural Steel to Alternating Current Systems.
(a) Metal Piping. The interior metal piping system(s) shall be bonded in accordance with (1) through (5) below. The bonding jumper(s) shall be installed in accordance with Section 250-64(a), (b), (c) and (e). The points of attachment of the bonding jumpers shall be accessible.
FPN: Bonding all metal ducts within the building or structure will provide additional safety.
(1) Services. Where service equipment is located at the building or structure served, the interior metal piping system(s) shall be bonded to the metal service equipment enclosure, the grounded nonflexible service raceway or, if the grounding electrode conductor is sized in accordance with Table 250-66, to the grounding electrode or the grounding electrode conductor. The bonding jumper(s) shall be sized in accordance with Table 250-66.
(2) Buildings of Multiple Occupancy. In buildings of multiple occupancy where a service is installed at the building and the electrical supply to an occupancy consists of a branch circuit(s) or feeder(s), the interior metal piping system(s) of each occupancy shall be bonded in accordance with (a) above, or to the metal disconnecting means for that occupancy, or to the equipment grounding conductor run with the supply conductors. The bonding jumper(s) shall be sized in accordance with Table 250-66 based on the size of the largest ungrounded supply circuit conductor.
(3) One or More Buildings or Structures Supplied from a Remote Service Equipment. Where one or more buildings or structures is supplied by a branch circuit(s) or feeder(s) from a remote service equipment, the interior metal piping system(s) of each building or structure shall be bonded as specified in (2) above.
(4) Separately Derived Systems. Where there is a permanently installed separately derived system at the building or structure served, that requires a grounding electrode conductor connection to a grounding electrode, the interior metal piping system(s) shall be bonded to the same point on the separately derived system where the system grounding electrode conductor is connected or, if the grounding electrode conductor is sized in accordance with Table 250-66, to the grounding electrode or grounding electrode conductor. The bonding jumper(s) shall be sized in accordance with Table 250-66.
Exception for (a)(1), (2), and (4): In industrial or commercial buildings or structures the bonding jumper(s) specified in (1), (2), and (4) above shall not be required where the interior metal piping system(s) is a metallically continuous extension of a metal underground water piping system used as a grounding electrode for the service(s) or separately derived system(s), if the entire length of the metal piping system(s) is exposed and conditions of maintenance and supervision ensure that only qualified persons will service the installation(s).
(5) Metal Gas Piping. The point of connection of the bonding jumper to a metal gas piping system shall be on the supply side of any equipment shutoff valves.
(b) Structural Steel. Exposed structural steel that is interconnected to form a building or structure frame that is not intentionally grounded, and may become energized, shall be bonded in accordance with requirements for interior metal piping systems prescribed in (a) above, as applicable.
SUBSTANTIATION: Alternating-current systems is added to the heading since Section 250-160 indicates this section applies to dc systems unless specifically intended for ac systems. There is no specific intent indicated for all the requirements, some of which may be suitable for dc but not all. For example, bonding of metal piping and structural steel to a grounded dc service conductor would be in most instances, a violation of Section 250-164. If the panel feels specific similar bonding requirements are needed for dc systems, I'm sure they can be produced.
All metal piping systems, whether for water or other fluids, gas, steam, air, etc. are likely to be electrically interconnected by contact with metal building framing, piping connections at equipment such as water heaters, boilers, and other equipment to which more than one piping system is connected, and by interconnection provided by equipment grounding conductors for equipment connected to piping systems such as electric valves, motors, etc. Any such piping systems can become part of a fault current return path. The conductivity of any piping system may equal or exceed that of water piping due to type of material, size, type of joints, etc., but (a)(2), (3) and (c) permit different bonding jumper sizes. An equipment grounding conductor may be more prone to failure since it doesn't have to be without splice or a minimum No. 8 in raceway or armor.
The proposal in effect, requires a minimum No. 8 copper or No. 6 aluminum regardless of the supply system, whether service, feeder, or branch circuit or the rating of the supply circuit. The bonding jumpers sized per Table 250-122 are inconsistent with sizes for Table 250-66, and (c) permits Table 250-122 for bonding to a service. Some branch circuit and feeder supply conductors may have ampacity and fault current values that equal or exceed some services.
An equipment grounding conductor run with tap conductor to equipment that may energize piping could be smaller than the sizes given in Table 250-122.
Section 250-64(c) should be included in (a) to ensure greater reliability of unspliced conductors. The omission allows separate discontinuous bonding jumpers from the first pipe bonding connection to other piping systems, which if connected at different points on the piping allows the piping to become part of the bonding path. Where the equipping grounding conductor is used for bonding and run between electrical equipment connected to different piping systems the possibility for loss of bonding is increased.
Present (a)(1) permits the bonding jumper (minimum No. 8 per Table 250-166) to be bonded to the grounded service conductor. If the ungrounded service conductors are No. 14 as permitted by Sections 230-42(b) and 230-79(a) the minimum No. 8 bonding conductor size is negated, since Section 230-42(c) would allow a grounded service conductor to be No. 14. The same applies to present (d). "Where of sufficient size" is replaced with reference to Table 250-66 since the intent may not be clear to many code users. Smaller sizes permitted for made electrodes may be deemed "sufficient".
The present (a)(2) appears to be an expedient accommodation to avoid requirements to bond isolated piping to the service and infers such individual bonding is not required if the piping is not metallically isolated from the other occupancies. Does it also infer that a metallically continuous piping to all occupancies does

not have to be bonded even if supplied by a nonmetallic underground system? Even if a metallically continuous piping system is bonded at the service but run through different occupancies, the transient nature of some occupancies and alterations due to different occupant needs do not assure a metallically continuous system. "Disconnecting means" is proposed in lieu of "panelboards" in (a)(2) since a disconnect is generally required but not a panelboard. In (a)(3) "disconnecting means" is used.

In (a)(4) separately derived systems are distinguished from portable sources or those covered by Section 250-30(a)(2) Exception.

The present (b) is inadequate as there are no specifics re: sizes, installation, or accessible points of attachment.

For (d) the reference to proposed (a) covers the requirements and avoids duplication, in addition to providing for bonding where the supply is other than a service.

The fine print note for (a) is revised from the present fine print note to include metal ducts for dust, fibers, fumes, etc. which would also provide additional safety, since they may be as conductive as ducts for air.

The exception is proposed since it appears bonding the interior metal water piping is required even where the grounding electrode conductors are connected to the first 5 ft of a metal underground piping system used as a grounding electrode.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not add clarity. The substantiation does not identify a problem. Additionally, see panel action and statement on Proposal 5-229. The panel does not agree with the proposed focus on AC systems only. The panel affirms that this section could apply to both AC and DC systems. Refer to Section 250-160.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1510)

5- 214 - (250-104): Reject

SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text as follows:

250-104. Bonding of Piping Systems and Exposed Structural Steel.

(a) Metal Water Piping. The interior metal water piping system shall be bonded as required in (1), (2), (3), or (4) of this section. The bonding jumper shall be installed in accordance with Section 250-64(a), (b), and (e). The points of attachment of the bonding jumper(s) shall be accessible.

(1) General. The interior metal water piping system shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-66 except as permitted in (2) and (3).

(2) Buildings of Multiple Occupancy. In buildings of multiple occupancy, where the interior metal water piping system for the individual occupancies is metallically isolated from all other occupancies by use of nonmetallic water piping, the interior metal water piping system for each occupancy shall be permitted to be bonded to the equipment grounding terminal of the panelboard or switchboard enclosure (other than service equipment) supplying that occupancy. The bonding jumper shall be sized in accordance with Table 250-122.

(3) Multiple Buildings or Structures Supplied from a Common Service. The interior metal water piping system shall be bonded to the building or structure disconnecting means enclosure where located at the building or structure, or to the equipment grounding conductor run with the supply conductors, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Section 250-122 based on the rating or setting of the largest overcurrent device protecting the feeder(s) or branch circuit(s) that supply the building.

(4) Separately Derived Systems. The grounded conductor of the separately derived system shall be bonded to the nearest available point of the interior metal water piping system in the area served by the separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. The bonding jumper shall be sized in accordance with Table 250-66.

x(b) Metal Gas Piping. Each aboveground portion of a gas piping system upstream from the equipment shutoff valve shall be electrically continuous and bonded to the grounding electrode system. <u>The size of the bonding conductor shall be based on Table 250-122 for the largest branch circuit that may energize the gas piping system. Where there is no equipment likely to energize the gas piping system, the bonding conductor size shall be based on Table 250-66.</u>

(c) Other Metal Piping. Interior metal piping that may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-122 using the rating of the circuit that may energize the piping.

The equipment grounding conductor for the circuit that may energize the piping shall be permitted to serve as the bonding means.

FPN: Bonding all piping and metal air ducts within the premises will provide additional safety.

(d) Structural Steel. Exposed interior structural steel that is interconnected to form a steel building frame and is not intentionally grounded and may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-66 and installed in accordance with Sections 250-64(a), (b), and (e). The points of attachment of the bonding jumpers shall be accessible.

SUBSTANTIATION: The present Code rule is unenforceable. The additional language gives guidance on bonding conductor size for gas piping under both conditions of being likely to be energized and where not likely to be energized.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 5-229.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1876)

5- 215 - (250-104(a)): Reject

SUBMITTER: Jamie McNamara, City of Saint Paul, MN

RECOMMENDATION: Revise as follows:

The interior metal water piping system shall be bonded as required in (1), (2), (3), ~~or~~ <u>and</u> (4).

SUBSTANTIATION: To change code to require interior metal water piping to be bonded possibly more than once example by service and by separately derived system.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed change would require bonding for systems that may not exist. The present code text is clear.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #2376)

5- 216 - (250-104(a)): Reject

SUBMITTER: Rodney Parker, GTE North/Rep. Network Design

RECOMMENDATION: Revise text to read as follows:

(a) Metal Water Piping. The interior metal water piping system <u>that may become energized</u> shall be bonded as required in (1), (2), (3), or (4) of this section. The bonding jumper shall be installed in accordance with Section 250-64(a), (b), and (c). The points of attachment of the bonding jumper(s) shall be accessible.

SUBSTANTIATION: During recent litigation against the company, the plaintiff and their experts consistently informed the jury that the interior water piping system must be continuous before this section applies.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal is not consistent with the substantiation. The panel is unclear as to the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4287)

5- 217 - (250-104(a)): Accept in Part
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text as follows:
250-104. Bonding of Piping Systems and Exposed Structural Steel.
(a) Metal Water Piping. Where the metal water pipe is not used as a grounding electrode. The interior metal water piping systems shall be bonded as required in (1), (2), (3), or (4) of this section. The bonding jumper shall be installed in accordance with Section 250.64(a), (b), and (e). The points of attachment of the bonding jumper(s) shall be accessible.
(1) General. The interior metal water piping system shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250.66 except as permitted in (2) and (3).
(2) Buildings of Multiple Occupancy. In buildings of multiple occupancy, where the interior metal water piping system for the individual occupancies is metallically isolated from all other occupancies by use of nonmetallic water piping, the interior metal water piping system for each occupancy shall be permitted to be bonded to the equipment grounding terminal of the panelboard or switchboard enclosure (other than service equipment) supplying that occupancy. The bonding jumper shall be sized in accordance with Table 250.122.
(3) Multiple Buildings or Structures Supplied from a Common Service. The interior metal water piping system shall be bonded to the building or structure disconnecting means enclosure where located at the building or structure, or to the equipment grounding conductor run with the supply conductors, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Section 250.66 ~~250-122~~ based on the ~~rating or setting of the largest overcurrent device protecting the feeder(s) or branch circuit(s) size~~ of the feeder or branch circuit conductors that supply the building. The bonding jumper shall not be required to be larger than the largest ungrounded feeder or branch circuit conductor supplying the building.
SUBSTANTIATION: (1) This section has been interpreted by some jurisdictions to require an additional bonding jumper to the interior metal water piping even when it is being used as the grounding electrode per Section 250-50 or Section 250-30. The bonding should only be necessary when there is not an existing connection to the water pipe for the service or a separately derived system.
(2) In a second building supplied from a common service, the purpose of the interior metal water pipe bonding is the same as in the first building at the service. To be consistent, Section 250-66 should be used for both locations. Since there is the possibility of a smaller feeder or branch circuit to the second building, by not requiring the bonding conductor to be larger than the largest ungrounded feeder or branch circuit conductor meets the intent of the present rule to not require a larger conductor than necessary.
PANEL ACTION: Accept in Part.
Revise the text in 250-104(a)(3) as follows:
(3) Multiple Buildings or Structures Supplied from a Common Service. The ~~interior~~ metal water piping system(s) installed in or attached to a building or structure shall be bonded to the building or structure disconnecting means enclosure where located at the building or structure, or to the equipment grounding conductor run with the supply conductors, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Section 250.66 ~~250-122~~ based on the ~~rating or setting of the largest overcurrent device protecting the feeder(s) or branch circuit(s)~~ size of the feeder or branch circuit conductors that supply the building. The bonding jumper shall not be required to be larger than the largest ungrounded feeder or branch circuit conductor supplying the building.
PANEL STATEMENT: The panel does not agree with the proposed first sentence in 250-104(a) because it does not add clarity. The panel accepts all other proposed changes to Section 250-104(a)(3). Additional changes from Proposal 5-221 were included here.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: No substantiation has been provided to increase the size of the bonding jumper. A conductor (equipment grounding or grounded) sized according to Section 250-122 that is run to the building or structure is the ultimate connection point of the bonding jumper. The additional last sentence is not helpful in many situations because the equipment grounding conductor is usually considerably smaller (based on Table 250-122) than the ungrounded branch circuit or feeder conductors.

(Log #400)

5- 218 - (250-104(a), Exception (New)): Reject
SUBMITTER: Steve Canaday, Dept. of Labor and Industries, WA
RECOMMENDATION: Add an exception to 250-104(a) to read as follows:
Exception: Where the water piping system entering a one or two family dwelling is nonmetallic or is less than 10 ft of metallic piping in contact with earth, the size of bonding jumper may be sized from Table 250-122.
SUBSTANTIATION: Due to the ever-increasing use of underground nonmetallic piping systems entering one and two family dwellings, the need to bond as per Table 250-66 is relieved and does not provide a path to interrupt the current of the fault. This exception to permit the bonding of interior metal water from Table 250-122, based on the largest circuit likely to energize the piping system, should interrupt the circuit safely.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel intends to reference Table 250-66 since there is nothing to prohibit the nonmetallic system from being replaced with a metallic system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1914)

5- 219 - (250-104(a)(1)): Accept
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) General. ~~The interior~~ Metal water piping system(s) installed in or attached to a building or structure shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Table 250-66 except as permitted in (2) and (3).
SUBSTANTIATION: The existing wording in Section 250-104 (a)(1) can be taken literally to mean only one interior metal water piping system is required to be bonded as required in this section. By changing the word system to system(s), it is clear that all water piping systems fall under the same requirement. By changing the first sentence to state Metal water piping systems installed in or attached to a building or structure will provide the additional clarification needed to address situations such as where water piping is installed on a wall on the exterior of a building or on the roof, which is also the exterior of a building. This change will eliminate any question about whether or not the bonding requirement applies to water piping systems installed as stated in this substantiation. It also will increase safety for workers or service personnel that may be exposed to an accidentally energized portion of an exterior metal water piping system, which may not have been bonded due to literal interpretation. By changing the word bonding jumper to bonding jumper(s) in the second sentence, it is clear that all bonding jumpers shall be installed as stated in this section.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: In general I support the concept of bonding water piping systems to the "equipment grounding system". I am concerned about the interpretations of what constitutes a water piping system(s) and about extending the requirement to all exterior piping.

(Log #1915)

5- 220 - (250-104(a)(2)): Accept
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(2) Buildings of Multiple Occupancy. In buildings of multiple occupancy, where the ~~interior~~ metal water piping system(s) installed in or attached to a building or structure, for the individual occupancies is metallically isolated form all other occcupancies by use of nonmetallic water piping, the ~~interior~~ metal water piping system(s) for each occupancy shall be permitted to bonded to the equipment grounding terminal of the panelboard or switchboard enclosure (other than service equipment) supplying that occupancy. The bonding jumper shall be sized in accordance with Table 250-122.
SUBSTANTIATION: The existing wording in Section 250-104 (a)(2) can be taken literally to mean only one interior metal water piping system is required to be bonded as required in this section. By changing the words system to system(s), it is clear that all water piping systems fall under the same requirement. By changing the first sentence to state Metal water piping system(s) installed in or attached to a building or structure will provide the additional clarification needed to address situations such as where water piping is installed on a wall on the exterior of a building or on the roof, which is also the exterior of a building. This change will eliminate any question about whether or not the bonding requirement applies to water piping systems installed as stated in this substantiation. It also will increase safety for workers or service personnel that may be exposed to an accidentally energized portion of an exterior metal water piping system, which may not have been bonded due to literal interpretation. By changing the words bonding jumper to bonding jumper(s) in the second sentence, it is clear that all bonding jumpers shall be installed as stated in this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: See my Comment on Affirmative on Proposal 5-219.

(Log #1916)

5- 221 - (250-104(a)(3)): Accept in Principle
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(3) Multiple Buildings or Structures Supplied from a Common Service. The ~~interior~~ metal water piping system(s) installed in or attached to a building or structure shall be bonded to the building or structure disconnecting means enclosure where located at the building or structure, or to the equipment grounding conductor run with the supply conductors, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Section 250-122 based on the rating or setting of the largest overcurrent device protecting the feeder(s) or branch circuit(s) that supply the building.
SUBSTANTIATION: The existing wording in Section 250-104 (a)(3) can be taken literally to mean only one interior metal water piping system is required to be bonded as required in this section. By changing the words system to systems(s), it is clear that all water piping systems fall under the same requirement. By changing the first sentence to state Metal water piping system(s) installed in or attached to the building or structure will provide the additional clarification needed to address situations such as where water piping is installed on a wall on the exterior of a building or on the roof, which is also the exterior of a building. This change will eliminate any question about whether or not the bonding requirement applies to water piping systems installed as stated in this substantiation. It also will increase safety for workers or service personnel that may be exposed to an accidentally energized portion of an exterior metal water piping system, which may not have bonded due to literal interpretation. By changing the words bonding jumper to bonding jumper(s) in the second sentence, it is clear that all bonding jumpers shall be installed as stated in this section.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-217.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: See my Comment on Affirmative on Proposal 5-219.

(Log #1917)

5- 222 - (250-104(a)(4)): Accept in Principle
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(4) Separately Derived Systems. The grounded conductor(s) of ~~the~~ separately derived system(s) shall be bonded to the nearest available point of the interior metal water piping system(s) in the area served by the separately derived system(s). This connection shall be made at the same point on the separately derived system(s) where the grounding electrode conductor is connected. The bonding jumper(s) shall be sized in accordance with Table 250-66.
SUBSTANTIATION: The existing wording in Section 250-104 (a) (4) should be revised as proposed because actually more than one separately derived system operating at different voltage levels could serve the same area served as the water piping system(s). Also Section 250-104 (a) (4) can be taken literally to mean only one interior metal water piping system is required to be bonded as required in this section. By changing the word system to system(s), it is clear that all water piping systems fall under the same requirement. It also will increase safety for workers or service personnel who may be exposed to and accidentally energized portion of an interior or exterior metal water piping system, which may not have been bonded due to literal interpretation. By changing the word bonding jumper to bonding jumper(s) in the third sentence, it should clarify that all bonding jumper(s) shall be sized as stated in this section.
PANEL ACTION: Accept in Principle.
Revise text in Section 250-104(a)(4) to read as follows:
(4) Separately Derived Systems. The grounded conductor of ~~the~~each separately derived system shall be bonded to the nearest available point of the interior metal water piping system(s) in the area served by ~~the~~ eachseparately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. ~~The~~Eachbonding jumper shall be sized in accordance with Table 250-66.
PANEL STATEMENT: The text was revised for clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2108)

5- 223 - (250-104(a)(4), Exception (New)): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add a new Exception to read as follows:
"A bonding jumper shall not be required where the metal frame of a building or structure is used as the grounding electrode for the separately derived system and the interior metal water piping in the area served by the separately derived system, is attached to or supported from the metal frame by conductive means."

SUBSTANTIATION: In the 1996 NEC bonding was required only when the separately derived system was grounded using a made electrode. Transformers have been commonly installed throughout industrial and commercial occupancies for many years without this additional bonding requirement with no evidence of problem. No substantiation was provided to add this requirement. It can also be interpreted that metal sprinkler piping is also required to be bonded to the grounded conductor of the separately derived system since it is interior metal water piping.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that the mere metallic support of a pipe to a structure is adequate to accomplish bonding as defined in Article 100. See also Section 250-8.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: This proposal should be accepted.
Scenario No. 1. Building 1 (a metal-framed building) is supplied by a 120/240 volt single phase service. The service is grounded to a metal underground water pipe and the effectively grounded metal building frame. There are several feeder supplied 120/240-volt panelboards located throughout the building. No additional bonding is required at each feeder supplied panelboard or in the areas served by them.
Scenario No. 2. Building 2 (a metal-framed building) is supplied by a 240 volt 3-phase, 4-wire, delta service. The service is grounded to a metal underground water pipe and the effectively grounded metal building frame. There are several 120/240-volt transformer supplied panelboards located throughout the building. The transformer secondaries are grounded to the effectively grounded metal frame of the building. In this scenario each transformer must also be bonded to the nearest point of the interior water piping system(s). This requirement appears to apply even though the water piping and metal building frame are bonded together through the service grounding electrode conductor. If the Authority Having Jurisdiction considers the metal sprinkler piping to be "interior water piping" it would have to be bonded also. These bonding jumpers may need to be of considerable length to reach the piping systems. Any utilization equipment that is connected to water piping (a source of potential energization) is required to have an equipment grounding conductor run with the circuit conductors.
The concept of bonding grounded secondary conductors (of separately derived systems) to "local" interior metal water piping was added to the 1996 NEC. I confirmed (with the 1996 NEC CMP 5 Chair) that this was only necessary and required if electrodes <u>other than</u> a metal underground water pipe or the metal frame of a building or structure were used.
The proposed exception could be revised and improved as follows:
Exception: A separate bonding jumper shall not be required where the effectively grounded metal frame of a building or structure, used as the grounding electrode for separate systems, is bonded to the interior metal water piping.

(Log #1676)

5- 224 - (250-104(b)): Reject
SUBMITTER: Terry L. Carlson, Nebraska State Electrical Board
RECOMMENDATION: Revise text.
Add the following new sentence to the end of the current text in (b) to read as follows:
(b) Where the metal gas piping system is electrically continuous with the equipment, the equipment grounding conductor connected to the equipment and sized in accordance with Table 250-122 shall be considered as the required bonding connection.
SUBSTANTIATION: Gas piping connected to and electrically continuous with the equipment is bonded by the equipment grounding conductor connected to the equipment. The equipment the gas piping is connected to is the most likely source that will energize the piping system. Therefore, the equipment grounding conductor sized with Table 250-122 and bonded to the equipment does effectively bond the gas piping system.
There is no need to install a redundant bonding jumper to the piping system unless the gas piping system contains a nonmetallic union between the piping system and the equipment. In such a case a bonding jumper must be installed between the equipment the gas piping is connected to and the supply side of the nonmetallic union with a bonding jumper sized in accordance with 250-122.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1783)

5- 225 - (250-104(b)): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Delete the superscript x and revise the rule to read as follows:
"Metal Gas Piping. Each aboveground portion of a gas piping system upstream from the equipment shutoff valve shall be bonded to the grounding electrode system. The bonding conductor shall be sized in accordance with Table 250-122 using the rating of the circuit which may energize the piping. Where the circuit that may energize the piping cannot be identified, the bonding conductor shall be a minimum of No. 8 copper or No. 6 aluminum or copper clad aluminum."
SUBSTANTIATION: 1. The current rule was extracted from a standard that addresses the installation of the gas piping. The NEC has no jurisdiction over such installations and electrical personnel cannot be responsible for the electrical continuity of such systems any more than they can be responsible for the continuity of a water, waste, drain, process, or sprinkler piping system.
2. The current rule provides no information as to how the bonding conductor is to be sized. Based on the panel actions for the 1999 NEC, the apparent intent of the panel was to maintain the sizing requirements from similar requirements of previous codes. Since gas piping was previously covered as "other metal piping," and no substantiation was given for any other sizing requirement, the same sizing requirement should be retained. However, since the TCC removed any sizing information from this rule based on the fact that the equipment or circuit that might energize the piping may not be readily identifiable, a minimum size is proposed that corresponds to the minimum size bonding jumper used for equipotential bonding in other rules of the code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2023)

5- 226 - (250-104(b)): Reject
SUBMITTER: Ronald P. O'Riley, Innovative Education, Inc.
RECOMMENDATION: Add at end of existing text:
"<u>The equipment bonding jumper shall be sized in accordance with Table 250-66. The above ground portion of the gas piping system shall be isolated from the below ground portion of the gas piping system.</u>"
SUBSTANTIATION: There is a need to indicate how this conductor is sized. If the above ground portion of the gas piping is not isolated from the underground portion, and is bonded to the grounding electrode, it becomes part of the grounding electrode system in violation of 250-52(a).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2443)

5- 227 - (250-104(b)): Reject
SUBMITTER: Michael J. Timpanaro, Silver Springs, FL
RECOMMENDATION: Add text to read:
"Electrodes used. The bonding jumper shall be sized in accordance with Table 250-122 using the rating of the circuit that may energize the piping."
SUBSTANTIATION: It is necessary to provide the size of the bonding jumper required. Since metal gas piping is not used as a grounding electrode, it would be proper to size the bonding conductor by Table 250-122 using the rating of the circuit that may energize the piping.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2562)

5- 228 - (250-104(b)): Reject
SUBMITTER: John W. Hall, Electrical Seminars
RECOMMENDATION: Clarify and explain bonding of gas line bonding, where, how, size like you have the water pipe grounding electrode.
Don't leave it up to the local authority having jurisdiction to decide.
SUBSTANTIATION: Whether it is a safe practice to bond gas line to ground electrode rod, intentionally connecting the lightning strike to a gas line before going to ground.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no specific recommendation made by the submitter in the proposal. Section 4.3.3(c) of the Regulations Governing Committee Projects requires proposals to include proposed text, including the wording to be added, revised (and/or) revise, or deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2755)

5- 229 - (250-104(b)): Accept
SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.
RECOMMENDATION: Deleted text:
~~Metal gas piping each aboveground portion of a gas piping system upstream from the equipment shutoff valve shall be electrically continuous and bonded to the grounding electrode system.~~
SUBSTANTIATION: Gas pipe system being bonded to service equipment does pose risk to building occupants. Without the ability to ensure low resistance connections, gas piping poses the risk of high resistance faults occurring during fault conditions. This in turn igniting the gas.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel does not agree with the submitter's substantiation. The panel concludes that 250-104(c) adequately covers this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2837)

5- 230 - (250-104(b)): Reject
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Add new last sentence:
"x(b) Metal Gas Piping. Each aboveground portion of a gas piping system upstream from the equipment shutoff valve shall be electrically continuous and bonded to the grounding electrode system. The bonding jumper shall be sized in accordance with Table 250-122.
SUBSTANTIATION: This will provide guidance for sizing of the equipment bonding conductor to metallic gas piping systems.
Continues a practice used in 1996 and earlier Editions of the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2858)

5- 231 - (250-104(b)): Accept
SUBMITTER: Bill F. Neitzel, Madison, WI
RECOMMENDATION: Delete this subsection:
~~(b) Metal Gas Piping. Each aboveground portion of a gas piping system upstream from the equipment shutoff valve shall be electrically continuous and bonded to the grounding electrode system.~~
SUBSTANTIATION: NEC 250-52(a) does not allow underground metal gas piping to be used as a grounding electrode. Section 250-104(b) appears to conflict with 250-52(a). Section 250-104(c) requires gas piping to be electrically bonded by the equipment grounding conductor serving the appliance. This piping would serve as the hazard to personnel if a fault should occur. Requiring the upstream side of the gas valves to be bonded to the grounding electrode system raises questions of size and location.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel does not agree with the submitter's substantiation. The panel concludes that 250-104(c) adequately covers this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3028)

5- 278 - (250-104(b)): Reject
SUBMITTER: Richard P. Owen, City of St. Paul, MN
RECOMMENDATION: Add text as follows:
(b) Metal Gas Piping. Each aboveground portion of a gas piping system upstream from the equipment shutoff valve shall be electrically continuous and bonded to the grounding electrode system. This bonding conductor shall be sized in accordance with Table 250-66.
SUBSTANTIATION: The sizing of the bonding conductor was not specified in the 1999 NEC, and led to confusion and arguments on the job. Since a gas pipe could be connected to several different pieces of equipment in a large building, rather than attempting to determine the largest feeder or circuit to use Table 250-122, I think enforcement would be easier and less confusing to use Table 250-66. Since the bonding conductor can usually be fairly short between the GEC system and some portion of the gas piping, the cost to the consumer should be fairly negligible.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3130)

5- 232 - (250-104(b)): Reject
SUBMITTER: Robert R. Sallaz, City of Munroe Falls, OH
RECOMMENDATION: Revise text as follows:
(b) Metal Gas Piping. Each aboveground portion of a gas piping system ~~upstream from the~~ on the line side of the equipment shutoff valve shall be electrically continuous and bonded to the grounding electrode system.

SUBSTANTIATION: "Upstream" is a nautical term not defined in Article 100 or applicable to electrical construction.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3796)

5- 233 - (250-104(b)): Reject
SUBMITTER: John I. Williamson, Minnesota Board of Electricity
RECOMMENDATION: Modify the wording in this section as follows:
"Metal Gas Piping. Each aboveground portion of a gas piping system upstream from the equipment shutoff valve shall be electrically continuous and shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250.66 and installed in accordance with Sections 250.64(a), (b), and (e). The points of attachment of the bonding jumpers shall be accessible."
SUBSTANTIATION: The wording in the 1999 NEC is incomplete. There is no language that specifies how to size or install the bonding jumper.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3810)

5- 234 - (250-104(b)): Reject
SUBMITTER: Douglas Hansen, Codecheck
RECOMMENDATION: Add the following sentence at the end of 250.104(b):
"Bonding conductors shall be sized per table 250.122 for the largest overcurrent device of the conductor capable of energizing the piping."
SUBSTANTIATION: Energized gas piping has caused at least 2 fatalities in our area. Bonding of gas piping reduces shock hazards. The 1999 code requires bonding beyond simply that supplied by the equipment grounding conductor of the equipment that may energize the piping. Since a separate conductor is now required, the code should provide guidelines for sizing that conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4187)

5- 235 - (250-104(b)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Insert the word "fuel" ahead of "gas" in both the title and the rule. Add the following sentence at the end:
"The bonding conductor shall be sized in accordance with Table 250-66."
SUBSTANTIATION: It goes without saying that this new provision in the NEC cries out for clarification with respect to the sizing of the bonding conductor required, and this proposal does just that. Although this is extracted material, NFPA 54 says that this conductor has to be installed per NEC rules, and the NEC Committee does have the authority to set a minimum size. The TCC objection to the panel action during the last comment period has been widely misunderstood. The objection isn't to setting a size; it is to making a technical change in a NFPA 54 requirement. NFPA 54 requires the connection upstream of the equipment shutoff valve. The panel action in the comment period attempted to extend the rules in Section 250-104(c) to this connection. A Section 250-104(c) connection usually occurs through the equipment grounding conductor connection to equipment, and that, in turn, usually occurs on the downstream side of the equipment shutoff valve in the case of gas equipment. The TCC reversed the panel action because it introduced a technical conflict with NFPA 54.

In fact, both connections need to be made. Section 250-104(b) is an entirely separate rule, and it addresses fuel gas piping systems uniquely because they have a fundamental difference from most other piping systems in that they contain highly flammable material. Both sides of the equipment shutoff valve need to be bonded to the same ultimate grounding reference. Only in that way can we be sure that opening the service union won't draw an ignition-capable arc.

With it thus understood that there will be an independent connection to the gas piping system, the remaining question is how to size the connection. Table 250-66 is the only logical choice. It corresponds to requirements for similarly extensive piping systems and structures [water piping, Section 250-104(a) and structural steel §250-104(d)]. It's practical in that one conductor can be run to both systems. Furthermore, even if you want to run a conductor based on Table 250-122, anything smaller than No. 6 ends up in a raceway anyhow. The Table 250-66 approach is technically consistent and practical for field installers.

The word "fuel" needs to be added because although the context within NFPA 54 is clear, it isn't at all clear outside that document. There are many other gas piping systems that only require a Section 250-104(c) bond.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4424)

5- 236 - (250-104(b)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add text to read as follows:
"The bonding jumper shall not be smaller than No. 8 copper or No. 6 aluminum and shall be installed according to 250.64(a), (b), and (e)."
SUBSTANTIATION: A simple size requirements is necessary for bonding gas piping.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2914)

5- 237 - (250-104(b)(1) (New)): Reject
SUBMITTER: Donald A. Ganiere, Ottawa, IL
RECOMMENDATION: Add text as follows:
(b) Metal Gas Piping. Each aboveground portion of a gas piping system upstream from the equipment shutoff valve shall be electrically continuous and bonded to the grounding electrode system.
(1) The bonding jumper shall be sized in accordance with Table 250-122 using the rating of the circuit that may energize the piping. The equipment grounding conductor for the circuit that may energize the piping shall be permitted to serve as the bonding means.
SUBSTANTIATION: Current code wording gives no guidance as to the size of the bonding conductor for gas piping systems. Some inspectors are requiring a full size conductor base of the size of the service and Table 250-66, others are requiring a smaller conductor sized by Table 250-122 and the size of the circuit that may energize the gas piping system. This proposal will clear up the confusion in the field.
PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 5-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1918)

5- 238 - (250-104(c)): Accept
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:

(c) Other Metal Piping Systems. ~~Interior~~ Metal piping system(s) installed in or attached to a building or structure that may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with Table 250-122 using the rating of the circuit that may energize the piping system(s).

The equipment grounding conductor for the circuit that may energize the piping shall be permitted to serve as the bonding means.

SUBSTANTIATION: The existing wording in Section 250-104 (c) can be taken literally to mean only one interior metal piping system is required to be bonded as required in this section. By changing the word system to systems(s), it is clear that all interior metal piping systems fall under the same requirement. By changing the first sentence to state Metal piping system(s) installed in or attached to a building or structure will provide the additional clarification needed to address situations such as where other metal piping systems are installed on a wall on the exterior of a building or on the roof, which is also the exterior of a building. This change will eliminate any question about whether or not the bonding requirement applies to other metal piping systems installed as stated in this substantiation. It also will increase safety for workers or service personnel who may be exposed to an accidentally energized portion of an interior or exterior metal piping system, which may not have been bonded due to literal interpretation. By changing the words bonding jumper to bonding jumper(s) in the last sentence of the second paragraph it should clarify it is clear that all bonding jumpers shall be sized as stated in this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
COMMENT ON AFFIRMATIVE:
DOBROWSKY: See my Comment on Affirmative on Proposal 5-219.

(Log #1047)

5- 239 - (250-104(d)): Reject
SUBMITTER: Arthur Buxbaum, City of San Diego, CA
RECOMMENDATION: Revise text to read:

(d) Structural Steel. Exposed interior structural steel that is interconnected to form a steel building frame or structure and is not intentionally grounded and may become energized shall ~~be bonded~~ have all metal surfaces within 30 in. (732 mm) bonded together and, to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-66 and installed in accordance with Sections 250-64(a), (b), and (e). The points of attachment of the bonding jumpers shall be accessible.

SUBSTANTIATION: In the course of two fatal accident investigations, it would appear that if this new wording and intent was in place, the fatalities might not have occurred. The issue appears when electrical power or lighting is installed and/or mounted on metal structures. When other metal surfaces such as benches, tables and the like, are within reach, the problem may become fatal. These separated metal units each then present a different potential to ground if a voltage is accidentally applied to the metal. This difference in potential allows an electrical flow of power to occur. A person in contact with the different objects is then subjected to an electrical current flow through their body, their body acting as a conductor between these separated parts, this can be damaging and/or fatal depending on circumstances at the time of the incident. In the two fatalities such was the case. The change of wording to bond the various metal parts together now places all the reachable parts at the same (equal) potential and a flow of current is then limited to the amounts of resistive values between the parts and/or a person.

The rule of electrical flow is an equation with the higher resistance causing the lesser flow. Body resistance is generally higher than the bonded parts. The bonding of these parts together results in generally a lesser resistance, generally not enough to be fatal to the average person in contact with them. Incidents involving metal patio covers and other metallic structures would also benefit. While there would still be the slight hazard of a possible electrical shock, it would not be fatal.

I have provided pictures that demonstrate the condition that caused the fatality. Note the current flow melting the base of the legs. Note the proximity of the bench. If these were bonded, the flow through the body would cause a slight shock and not a fatality. This type of structure is in common use throughout the country. This similar condition of separated metallic parts has been known to cause problems in animal shelters. We cannot totally prevent accidents, but we must learn from them.

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: In order to revise the text of this section adequately, the panel encourages the submitter to provide the following information as a comment:

1.) Additional technical details surrounding this reported incident.
2.) The technical basis for the distance of 30 inches and how it should be measured and from what reference point.
3.) What mitigations were implemented as a result of the investigation?
4.) Was the existing installation in compliance with the NEC?
5.) What edition of the NEC was used at the time of installation?
6.) Were there any modifications made to the NEC?

Additionally, the panel can not determine if the proposed text will mitigate the hazard cited in the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: I believe this Proposal should be Accepted in Principle, with certain editorial changes.

The submitter identifies a potential hazard and cites two fatal accidents that can be addressed with this Proposal, although I believe the wording can be improved as follows:

(d) Structural ~~Steel~~ Metal. Exposed interior structural ~~steel~~ metal that is interconnected to form a ~~steel~~ building frame, and any ancillary part located within 30 in. (0.732 m), thereof ~~and~~ that is not intentionally grounded and may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-66 and installed in accordance with Sections 250-64(a), (b) and (e). The points of attachment of the bonding jumpers shall be accessible.

It should be noted that bus shelters of the type the submitter identifies are frequently made of structural aluminum. See also Proposal 5-240.
COMMENT ON AFFIRMATIVE:
JOHNSTON: I concur with the submitter's concern because of the potential of shock hazard that can exist in these situations. However the recommended solution would be difficult to enforce and requiring all metal objects within 30 in. of the steel is impractical. Also many of these types of structures are installed or exist in a dedicated right of way and may not be covered by the NEC. I agree with the Panel in seeking additional information on this subject.

(Log #1919)

5- 240 - (250-104(d)): Accept
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(d) Structural Steel. Exposed ~~interior~~ structural steel that is interconnected to form a steel building frame and is not intentionally grounded and may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper(s), shall be sized in accordance with Table 250-66 and installed in accordance with Sections 250-64(a), (b) and (e). The points of attachment of the bonding jumper(s) shall be accessible.
SUBSTANTIATION: The existing wording in Section 250-104(d) can be taken literally to mean only exposed interior metal structural steel is required to be bonded as required in this section. By eliminating the word interior to it should clarify that all exposed structural steel that is interconnected to form a building frame and is not intentionally grounded, fall under the same requirement. Isolated portions of exposed exterior building steel could become energized and would be a potential shock and fire hazard. By changing the first sentence to state "Exposed structural steel that is interconnected to form a building frame and is not intentionally grounded" will provide the additional clarification needed to address situations such as where structural steel is installed on the exterior of a building. Often times isolated sections of building steel are interconnected to form a frame that makes up a portion of the building but is not necessarily common to or connected to the larger portion of the structural steel frame. This change will eliminate any question about whether or not the bonding requirement applies to the exposed structural steel frames of buildings or isolated sections of exposed structural steel frames that are likely to become energized installed as stated in this substantiation. It also will increase safety for workers or service personnel who may be exposed to and accidentally energized portion of an isolated exposed structural steel frame of a building, whether interior or exterior, which may not have been bonded due to literal interpretation. By changing the words bonding jumper to bonding jumper(s) in the second sentence, it is clear that all bonding jumpers shall be installed as stated in this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: Expanding this requirement to include exterior structural steel increases the complications in this section. Any conductive object is "capable of", "may", or "can", in theory, become energized. Interior structural steel can usually be bonded to one of the acceptable locations, within a building, without much difficulty. Exterior structural steel may be used for buildings that are not even supplied by an electrical circuit or may not have a service or grounding electrode. How does one determine if it "may" become energized.

(Log #290)

5- 241 - (250-104(e) (New)): Reject
SUBMITTER: Gordon D. Brindley, Marion County Building Dept., FL/Rep. North Florida Division IAEI
RECOMMENDATION: Change heading: Bonding of Piping Systems and ~~exposed structural~~ Steel Framing.
Add a new paragraph (e) to read:
(e) Interior steel framing that is interconnected to form a portion of a building frame and is not intentionally grounded, that may become energized, shall be bonded to the service equipment enclosure, the grounding electrode conductor where of sufficient size, or to one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-122, using the rating of the circuit that may energize the metal framing. The equipment grounding conductor for the largest circuit that may energize the metal framing, shall be permitted to serve as the bonding means.
SUBSTANTIATION: As you are aware, due to the high cost of lumber, especially in states that have of theirs shipped in from out of state, we are having many more residential and commercial structures built, that are using metal stud wall framing, that are not necessarily considered, STRUCTURAL, as listed in paragraph (d) of this article; many of these wall are exposed within the attics, and can become energized by the circuits that are within these metal framed walls.
We have had two recent cases: One was due to a homeowner, installing a large picture frame on a bedroom wall, he used 2 in. metal screws that entered a NM Cable running down the channel of a 2 x 4 metal stud, this energized the frame wall, and his wife received an extreme shock when she opened a metal medicine cabinet that was attached to another part of this wall section.
Second was caused by a tradesman installing the metal end of a towel bar, using a 2 1/4 in. screw, which also entered the electric dryer circuit cable, the homeowner was shocked while touching the washing machine and the towel bar, at the same time.
This can be remedied by simply attaching a bonding jumper from the equipment ground of the largest circuit within this wall section, or by installing one metal box on that circuit, and grounding the metal box.
Very cost effective, especially when you might save a life.
PANEL ACTION: Reject.
PANEL STATEMENT: Where nails or screws are likely to penetrate nonmetallic-sheathed cable or electrical nonmetallic tubing, protection is required by Section 300-4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: The submitter has identified a potential hazard and cites two accidents to support this Proposal. Bonding of the metal interior wall framing can be accomplished with as little as a properly bonded metal outlet box in such a wall section in lieu of nonconductive box. Existing Section 300-4(b)(2) does not adequately address this situation. The proposal enhances safety and should be adopted.

(Log #2458)

5- 242 - (250-104(l)): Reject
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Delete the entire subsection and renumber others as needed.
SUBSTANTIATION: Section 250-104(c) provides adequate coverage for the bonding of gas pipes for safety. The electrical industry is not responsible for electrical continuity of gas pipes.
PANEL ACTION: Reject.
PANEL STATEMENT: The Code section the submitter references does not exist. See panel action on Proposal 5-229 which may meet the submitters concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2838)

5- 243 - (250-106): Reject
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Revise by adding the following to the end of the sentence:
"…unless separated from them by no less than 6 ft (1.83 m)…"The lightning protection system ground terminals shall be bonded to the building or structure grounding electrode system unless separated from them by no less than 6 ft (1.83 m)."
SUBSTANTIATION: The information that a 6 ft (1.83 m) separation may be sufficient is found in FPN No. 2. The style language of Section 90-5(c) makes it non-enforceable.
Presently, the mandatory language style of Section 90-5(a) as it pertains to Section 250-106 main text requires air terminals and building or structure grounding electrode systems to be bonded no matter how far apart they may be. The frequency of a lightning stroke makes long lengths of cross-bonding conductors useless and may contribute to electronic equipment damage. I refer you to the discussion in Chapter 4 of the IEEE 1999-1100 Standard (Emerald Book).
PANEL ACTION: Reject.
PANEL STATEMENT: Section 250-106 refers to bonding the ground terminals of the lightning protection system to the

grounding electrode system. Fine Print Note No. 2 refers to additional bonding as required by NFPA 780, Lightning Protection Code. Therefore the proposed change is not correct.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #762)

5- 244 - (250-112(i)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
~~Power-Limited,~~ Class 2, Class 3, ~~Remote Control and Signaling circuits,~~ and Power-Limited Fire Alarm Circuits. Where not located in a hazardous (classified) location, as covered by Articles 500 through 517, noncurrent-carrying metal parts of equipment and enclosures, supplied by ~~Class 1,~~ Class 2, ~~and~~ Class 3 or by power-limited fire alarm circuits, using nonmetallic wiring methods, shall only be required to be grounded where the system ~~grounding~~ is grounded. required by Part B of this article.
SUBSTANTIATION: This section does not correlate with Section 250-10. "Remote control and signaling" is superfluous, and does not cover Class 2 lighting systems. Class 1 and fire alarm circuits may operate at up to 600 volts with no power limitation; should ungrounded equipment be permitted? Class 1 power-limited systems commonly supply damper motors for HVAC systems; Section 430-142 requires grounding if supplied by metal-enclosed wiring; Section 430-144 requires grounding of controllers for such motors.
Grounding should be required where the system is grounded by choice; the result is the same as where required by the code.
This section is an example of why many code users consider Article 250 to be one of the most confusing.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements for special occupancies are covered in Chapter 5. The panel concludes that repeating the requirement here is unnecessary. The circuits to be grounded are adequately covered in Part B of Article 250. The recommended text does not add to the clarity of this section. There is no substantiation for deleting Class 1 circuits or adding additional conditions for using nonmetallic wiring methods only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1784)

5- 245 - (250-112(i)): Accept
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Revise the end of the sentence to read:
". . . where system grounding is required by Part B or Part H of this article."
SUBSTANTIATION: The reference to DC systems was lost in the rewriting and reorganization of this article. Grounding of DC systems should also be referenced with regard to grounding requirements for Class 1, Class 2, Class 3, and fire alarm systems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2463)

5- 246 - (250-112(i)): Accept in Principle
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Revise as follows:
... required by Part B or Part H of this article.
SUBSTANTIATION: To include DC circuits as required by the 1996 NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel concludes that Proposal 5-245 meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2818)

5- 247 - (250-114): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
RECOMMENDATION: After existing text, "exposed noncurrent-carrying metal parts of cord and plug-connected equipment likely to become energized shall be" ...add: REDUNDANTLY grounded.
(a) Two grounding conductors shall be installed in cord and cord sets with the branch circuit conductors supplying the unfixed equipment.
(b) Component Grounding poles. Cord connectors and attachment plugs shall be provided with two separate wiring sites at the existing grounding pole. Cord female connectors, and male attachment plugs shall be designed so that only the grounding pole can be wired with two conductors.
SUBSTANTIATION: This proposal will correct the design defects in existing line and extension cords that cause thousands of electrocutions and fiery deaths each and every year. Ralph Nader accused the medical profession of accidentally electrocuting 5000 patients a year with electrical equipment and covering up the deaths.
The U.S. National Institute for Occupational Safety and Health estimates 700 Americans are electrocuted on the job each year.
The Consumer Product Safety Commission estimates 600 persons lose their lives each year by electrocution in and around the home. And each year, hundreds of thousands of fires of electrical origin result in many more deaths, as well as billions of dollars of property damage.
Yet, despite these horrific statistics, not a single attempt has ever been made by government agencies, or the National Fire Protection Association, to investigate and correct the design defects in the electrical grounding system responsible for them.
For the past 13 years, I have been trying to convince the National Fire Protection Association that electrocutions, and fatal, destructive, fires, of electrical origin, alluded to by the U.S. Consumer Product Protection Agency, are caused by serious defects in the design of our cord and plug connected grounding system.
Yet, despite my admonitions regarding these life threatening hazards, cord components continue to be sold at hardware stores without any warning tags or instructions; warnings that 4 of 6 ways to wire this product to the white, black, and green cord conductors can cause an electrocution or fiery death.
And, to further compound the chances of fatal wiring errors are the molded extension cords now flooding the market without any color coding whatsoever.
The most insidious nature of the present cord and plug connected grounding system is that a reversal of the white and green wires will operate an appliance properly. They are both grounded conductors.
However, the wiring error will cause current to flow through a hundred feet, or so, of the flexible metal raceways that lace the space inside the walls and ceilings of practically every dwelling, and tenement, in our nation; literally converting rooms into electric ovens.
Massive current from a heater, for example, will cause the lengthy raceway and up to sixteen outlet box connections to overheat enough to cause “unseen”, and undetectable, fire inside walls of dwellings. Tests I’ve made with heater current disclosed flexible raceway temperatures of 150 degrees in open air. The temperatures could be considerably higher inside insulated sealed walls. And, any poorly made, or rusted out, grounding connector may cause arcing sufficient enough to cause immediate ignition.
Tenements, and older dwellings, converted to electricity prior to the adoption of the equipment grounding system are extremely vulnerable to fires inside walls because they lack the approved grounding connectors now in use. There was no need to fasten armored cable securely in those days because the only purpose for armored cable was to protect conductors from damage and to contain, and dissipate, heat. It never occurred to electricians that at some future date the armor would be permitted to carry current.
Since practically every dwelling in our nation uses metal raceways as the equipment grounding conductor it is imperative to prevent massive current, such as from heaters, dryers, and air conditioners, to flow through them for extended periods of time.
Two wire redundancy together with a slight, no cost, change in existing components will prevent a reversal of the white and green conductors from causing deadly fires inside walls, and also correct the many design defects, and cord violations, that cause electrocutions.

If the system I propose is adopted by our nation, a homeowner no longer will be playing 4 bullet "Russian Roulette" with their family because it is impossible to wire the cord and plug grounding system so as to cause an electrocution or fiery death.

However, despite my many proposals during the past 13 years, the National Fire Protection Association still remains unconvinced of the deadly fires that incinerate entire families within seconds, and cause billions of dollars of property damage each year, are "unseen" fires that originate, and rage inside walls.

Therefore, the carnage will continue until, hopefully, new members of the NFPA will see the danger as I do.

We're talking about fires within walls that rage, undetected by occupants, sprinkler systems, or smoke alarms until its too late. "Unseen" fires that superheat the interior of walls until they flashover and consume occupants and their procession within seconds.

Case in point is an article in the January 5, 1994 issue of the Bergen Record that reported a firefighter, (name deleted), was incinerated by a sudden inferno while searching for survivors. His buddy said a "flashover" from superheated walls caused temperatures to rise from 100 degrees to 2000 degrees within seconds. Everything in the room became incinerated within seconds.

Rutherford Fire Chief (name deleted), explained that the interior of walls create a large area where "unseen" fires can develop and build up heat due to lack of ventilation. It makes for the ideal conditions for a flashover.

The January 15, 1995 issue of the Bergen Record reported that a house fire in Burbank, IL killed 6 children and one adult despite working smoke alarms. The report stated a smoke alarm was still blaring when firefighters arrived.

The October 9, 1995 issue of the New York Post reported that 31 year old hero firefighter (name deleted) was incinerated when the room he was standing in suddenly flashed over.

The March 22, 1998 mysterious fire that killed 11 students in Pennsylvania could also have been caused by "unseen", and undetectable, raging fires inside the cabin walls that flashed over and incinerated them within seconds.

And during a two week period of the 1998-9 Christmas season, fast moving fires in the New York Metropolitan area caused 8 deaths, several injuries, and millions of dollars of property damage. Fire officials blamed heaters that ignited combustible material.

I say heater "current" and not heater "heat" is responsible for all fast moving, inferno, type fires.

A fire that demonstrates how wrong the NFPA is concerning the cause of fires is an inferno that killed nine members of a man's family while he was talking to his wife on the phone. He heard his wife scream in agony at the same time the smoke alarm went off. Orange fire officials blamed the tragedy on a heater placed too close to a blanket. And a spokesperson for the National Fire Protection Association also informed an investigative reporter that "most heater related deaths are caused by heaters placed too close to combustible material."

Nothing could be further from the truth. In the first place, I found it impossible to get tissue paper to burn while draped around two types of electric heaters turned on for three hours. Try the experiment and see for yourself.

We are also led to believe that cigarettes, halogen lamps, or candles are also reasons for fast moving fires that caused fatalities and total destruction of property.

This is simply not true. If working smoke alarms are sensitive enough to blare when toasters are used, they most certainly will warn occupants in ample time to escape if a blanket, drape, paper, or chair is on fire inside a room.

Fires that start inside rooms can be easily detected and extinguished by occupants. while serving on the fire brigade in Francis Delafield Hospital, every fire responded to was extinguished and occupants were able to walk away unharmed.

It's the fires that start inside walls that kill and destroy property. But how can a fire start inside a wall? Walls are sealed from floor to ceiling. A fire, originating in a room, would have to rage for a half hour or more before it burnt itself into a wall, during which time smoke alarms and occupants would have detected the fire in ample time to extinguish it or escape.

And people can't smoke, use heaters, play with matches, or toss lit cigarettes inside the walls of dwellings. So it's obvious that the electrical system, prone to overheating, and arcing, is to blame for flashover, fireball, and inferno type fires that kill and destroy property.

And the cause of fires inside the walls are the design defects in line and extension cords together with an ill-conceived grounding system adopted and installed in practically every building in our nation.

According to the original National Electric Code document, devised under the influence of insurance compancies, the grounding conductor should only be copper, copper clad, or aluminum (Article 250-95 in the original code.).

Instead, electrical safety has been severely compromised with exceptions to the original code whereby inappropriate corrosive metal raceways are permitted to be used as the equipment grounding conductor.

The exception also violates the intent of the code that mandates all conductors must terminate in splice boxes to contain any heat or sparking from poorly made connections.

Because practically all buildings in our nation use the metal raceways as the grounding conductor, it behooves NEMA and the NFPA to prevent wiring errors from causing massive current to cause them to overheat and cause raging fires inside the walls.

No family should become incinerated because a plug is inadvertently wired with reversed green and white conductors. Or die because a replacement plug was not properly installed on one of the violation extension cords now flooding the market with similarly colored conductors. The white, green, and black conductors are now all black, all yellow, all gray or all brown.

My proposal provides a standard that will make all line and extension cords fire-proof, and also electrocution-proof, by eliminating or ameliorating the potentially hazardous defects in their design. And even though all conductors are similarly colored.

The standard requires no physical changes except to provide a no cost second wiring site only at the ground pole of cord components.

The extra conductor in all cords is the only cost, a small price to pay to eliminate the following design defects:

1ST DESIGN DEFECT: This defect defies conventional wisdom and practice. Instead of the redundancy resorted to by every other federal agency whenever lives are at stake, the protective equipment grounding conductor used on practically all electrical devices has been reduced up to 66%.

This increases the chances of shock or electrocution from loss of grounding or injury due to line drop shock. My proposal, will prevent loss of grounding and voltage drop.

2ND DESIGN DEFECT: This defect results from sizing cord, and cordset, equipment grounding conductors the same as the circuit conductors (3#18, 3#16, 3#14, etc). The equipment grounding conductor must, at all times, assure that it will withstand fault currents for the length of time it takes fuses, or circuit breakers, to clear a fault. A 20 ampere circuit breaker, for example, can cause spike currents that could burn open the equipment grounding conductor, instead of the circuit conductor, leaving the metal exposed parts of an appliance energized.

Two equipment grounding conductors in all cords, regardless of wire size, will assure that the circuit conductors will always burn open first during massive ground faults.

3RD DESIGN DEFECT: This cord design defect permits miswired devices to operate safely until they are plugged into an outlet, or extension cord, with reversed polarity. The drill in figure 1 operates safely when used with a properly wired outlet, or extension cord, even though improperly wired with reversed green and white conductors.

However, the moment the drill is plugged into an outlet, or extension cord, wired with reversed polarity, the case of the drill becomes energized with a full 120 volt potential, figure 2.

Figure 3 illustrates how my electrocution-proof grounding system will correct this "Russian Roulette" type hazard. The two grounding conductors needed to correct the two previous design defects will make possible a wiring scheme that absolutely prevents miswired cords from causing shock or electrocution regardless of whether, or not, a wall outlet, or extension cord remains wired with reversed polarity.

If all cord components, and device terminals, are designed according to the specification in my proposal, there is no possible way to miswire a cord without at least one of the three grounded conductors (two green and one white) attached to the grounding pole of components and exposed metal parts of electrical devices or extension cords.

Acceptance of my proposal will eliminate the cord design defect that permits wiring errors to shock or electrocute.

4TH DESIGN DEFECT: No provision is provided in existing cords to activate branch circuit ground fault current interrupters when miswiring energizes the exposed metal parts of electrical devices. A ground fault causing current to flow through people cannot trip circuit breakers or blow fuses.

Accepting my proposal will assure that an equipment grounding conductor is ALWAYS attached to the metal exposed parts of electrical devices, despite wiring errors, thereby providing the necessary impedance required to activate branch circuit ground fault current interrupters.

In fact, adoption of my proposal will convert branch circuit ground fault current interrupters into people GFCIs. See how the second grounded conductor in figure 3 prevents shock, or electrocution, by providing the low resistance path required to activate branch circuit ground fault devices.

5TH DESIGN DEFECT: No provision is provided in existing cords to prevent miswiring from causing current to flow through metal raceways. A heater, or extension cord, miswired with reversed green and white conductors, can cause raceway heating, or arcing, at metal raceway connections sufficient enough to cause "unseen" raging fires inside walls.

If my proposal is accepted, the second grounding conductor will shunt any metal raceway current back to the proper circuit conductor.

Figure A illustrates how heater current flows through metal raceways when a line cord, or extension cord, is miswired with reversed green and white conductors.

Figure B illustrates how my proposal will prevent current flow through raceways.

At the New Orleans annual meeting a member ridiculed my A and B figures so I am also submitting figures C and D. They depict, in diagram form, how current flowing through metal raceways can be automatically shunted back to the white circuit conductor.

The second grounding conductor, in conjunction with electrocution-proof and fire-proof cord components, will shunt raceway current to the proper circuit conductor.

Current flowing through raceways, instead of the white conductor, cause the ground poles of all downstream outlets to become energized, a hazard also eliminated by the second ground conductor and the properly designed cord components I propose.

6TH DESIGN DEFECT: Molded cords have similarly colored branch circuit conductors instead of the usual black and white ones, a violation of the National Electrical Code. Without color coding, there is no way to prevent replacement components from being wired with reversed polarity. Even manufacturers are shipping extension cords with reversed polarity. I can corroborate this by producing such an extension cord purchased at a local hardware store.

Figure 2 illustrates how extension cords, or wall outlets, wired with reversed polarity, will cause shock, or electrocution, if used with devices, or another extension cord, inadvertently wired with reversed green and white conductors.

Figure 3 illustrates how a second grounding conductor, together with electrocution-proof components will prevent electrocution from this type of wiring hazard.

Accepting my proposal will permit the SAFE repair of molded cords even if all conductors are colored the same.

7TH DESIGN DEFECT: Providing only one equipment grounding conductor for up to 6 extension outlets. Accepting my proposal will ameliorate this defect.

8th DESIGN DEFECT: Molded cord components cannot be examined or repaired at the strain relief. Accepting my proposal true assurance that the protective equipment grounding conductors will never open prior to the circuit conductors.

9th DESIGN DEFECT: The lack of wiring safeguards. Experienced electricians, including myself, have admitted catching themselves wiring outlets and cords improperly. It is unconscionable to permit a grounding system whereby an electrical worker could be responsible for an electrocution or fiery death.

If four of six ways to wire an attachment plug can cause an electrocution, or fiery death, it becomes imperative that they be designed to at least assure the proper attachment of the equipment grounding conductor.

My proposal will absolutely assure that the grounding pole of cord components will be attached to a grounded conductor regardless of any amount of wiring errors.

It will also assure that the ground poles of cord components are always wired with two green conductors. A green and white, green and black, or black and white conductor attached to the ground pole clamp will be immediately noticed and corrected.

Conclusion: Thousands of our citizens suffer fiery deaths, electrocutions, and serious, shock induced, injuries, because of the above mentioned design defects in all cords.

Design defects that caused an 8 fold increase in electrocutions on construction sites, despite the use of extensive written assured grounding programs by well supervised, and qualified, personnel. Without the assured grounding program, the loss of life and serious injuries would have been considerably higher.

Millions of homeowners, other workers, and patients, exposed to the same defectively designed cords, do not have this mandated assured grounding program and remain unprotected. Therefore, it behooves NEMA and NFPA to adopt my self monitoring electrocution-proof and fire-proof grounding system.

My proposal, if adopted by our nation, will provide true assured grounding for every man, woman, and child, in every area of our nation, without the need for, costly, ineffective, testing programs.

No one should needlessly suffer fiery deaths, shock, or electrocution in order to save the cost of less than two cups of coffee.

Note: Supporting material is available for review at NFPA Headquarters

PANEL ACTION: Reject.

PANEL STATEMENT: The panel has again reviewed the submitter's substantiation and reaffirms its previous statements on this subject . The panel concludes that the substantiation fails to provide convincing evidence that the mentioned fires and associated casualties were the result of miswired extension cords or that the proposed methods of redundant grounding would have prevented these occurrences from taking place.

This proposal would completely eliminate the present method of grounding cord-and-plug connected equipment and would mandate the implementation of an equipment grounding system utilizing two grounding conductors. If adopted this proposal would necessitate the manufacture of special hardware including new 4-conductor cords with redundant grounding conductors, and new plugs and connectors that can terminate these 4-conductor cords.

The panel recognizes that redundancy can enhance the reliability of some systems under some conditions. However, redundancy is not the only effective means of achieving enhanced protection against electric shock. Other effective methods which are now required or permitted, such as ground-fault protection, double insulation, and assured equipment grounding conductor connections have all attributed to a decline in accidental electrocutions in recent years despite the increased use of electrical devices.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #4329)

5- 248 - (250-114(3)b): Accept in Principle

SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services

RECOMMENDATION: Revise text to read as follows:

"kitchen waste disposers after dishwashing machines. This equipment is likely to become energized, and should be included. Kitchen waste disposers were included in the 1996 NEC, Section 250.45(c)."

SUBSTANTIATION: The same potential hazard exists with kitchen waste disposers, therefore this equipment should be grounded.

PANEL ACTION: Accept in Principle.

Revise Section 250-114(3)(b) to read as follows:

"b. Clothes-washing, clothes-drying, dish-washing machines, kitchen waste disposers ; information technology equipment; sump pumps and electrical aquarium equipment."

PANEL STATEMENT: Editorially revised recommendation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

COMMENT ON AFFIRMATIVE:

DOBROWSKY: "Kitchen waste disposers" should also be added to (4)(b) also to be consistent.

(Log #2175)

5- 249 - (250-114(4)): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(e) ~~(g)~~ Portable handlamps
(f) ~~(e)~~ Cord- and plug connected appliances used in damp or wet locations or by persons standing on the ground or on metal floors or working inside of metal tanks or boilers.
(g) ~~(f)~~ Tools likely to be used in wet or conductive locations.
SUBSTANTIATION: Rearranging this list organizes it in the same order as the list in 250-114(3). This is in accordance with the NEC Style Manual 3.3.5 Organization and Numbering, Sections, and Lists. This rearrangement also improves the parallel construction.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4357)

5- 250 - (250-115): Reject
SUBMITTER: Paula Walach, The Gillette Co. of South Boston
RECOMMENDATION: Revise text to read as follows:
(a) Listed bolted clamp of cast bronze or brass or stainless steel.
Omitting malleable iron and also to continue sentence addressing all bolts to be either brass or stainless steel nonferrous type and not aluminum.
SUBSTANTIATION: Working in the trade since 1972, I have yet to see an installation of a grounding electrode conductor to the grounding electrode not subjected to corrosive conditions. This could also be a maintenance point involving other trades such as plumbers pipe fitter, etc. Working as an industrial electrician and working part time as an electrical contractor I've seen too many grounding electrode connection failures caused by bolted malleable iron.
PANEL ACTION: Reject.
PANEL STATEMENT: The referenced section in the recommendation does not exist in the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3241)

5- 251 - (250-118): Reject
SUBMITTER: Edward J. Fox, Jr., Orange County Bldg Div., FL
RECOMMENDATION: 250-118: An equipment grounding conductor shall be provided in all electrical raceway systems to insure electrical continuity and shall have the capacity to conduct safely any fault current likely to be imposed.
SUBSTANTIATION: Metal raceways are approved by the NEC to act as the equipment grounding conductor path, installation practices today cannot assure that all connections are made properly. Therefore, grounding continuity cannot be assured for a grounding path.
Further, underground metal raceways deteriorate over a period of years, and therefore you have lost your grounding continuity.
The above articles provide a higher degree of safety and flexibility for the consumers.
When a coupling or fitting becomes loose, whether it is a poor installation or over a period of time fittings become loose, the grounding path is interrupted and you no longer have a safe grounding path to divert a fault.
With the grounding conductor added you always have a grounding path to divert a fault situation.
Technical merit is that it will protect lives better in a fault situation. There have been cases with old electrical systems where only the conduit is the grounding path and it has deteriorated due to metal conduit and corrosive influences have eaten the metal and you have NO grounding path.
When a person has a claim due to electrical shock, where no grounding path was, insurance, hospital bills, and more, cost will rise.
PANEL ACTION: Reject.
PANEL STATEMENT: Insufficient substantiation has been provided to require an equipment grounding conductor in all metal raceways. Metal raceways listed in Section 250-118 have safely been used as an equipment grounding conductor for many years.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
BRENDER: Copper Development Association recommends and suggests that a separate, continuous, copper equipment grounding conductor always be utilized as the most reliable grounding path, irrespective of the conduit type or material.
Numerous recognized sources have agreed with the submitter's statement that grounding continuity cannot be assured utilizing solely the conduit as the equipment grounding conductor. Indeed, several other proposals within this Code cycle, such as 5-262 and 5-263, highlight the potential hazards associated with the use of the conduit as a ground path without an associated copper grounding conductor.
Adoption of this proposal will enhance safety, and help assure a low impedance continuous grounding path.
RAPPAPORT: The Panel comment has indicated that insufficient substantiation has been provided. In fact, there has been an abundance of substantiation from the previous two Code cycles. In the A95 ROP (for 1996), there were five proposals related to the use of conduit as and equipment grounding conductor. In the A98 ROP (for 1999), the IAEI Central Arizona Chapter cited five specific cases in the Phoenix area and twelve cases cited by Factory Mutual. In addition, a Factory Mutual report was cited that described hazardous conditions associated with discontinuities in metallic conduit under fault conditions. Yet the Panel has consistently chosen to ignore substantiation from the field which it generally looks for.
There has been adequate substantiation for requiring a supplementary equipment-grounding conductor in all conduit. A large majority of the substantiation is directed at EMT. As a minimum, this proposal should be accepted in principal to require a supplementary equipment-grounding conductor in all EMT.
I am confused, however, as to why this proposal was even considered by CMP 5. The Technical Correlating Committee has directed that the responsibility for determining the suitability of raceways as in equipment-grounding conductor rests with CMP 8. (See Panel Statement 5-185 in A98 ROC). If that is the case, Section 250-118 should delete all of the permissible raceways from that section and refer to the applicable sections in Chapter 3. Otherwise, 250-118 will always be one Code cycle behind the requirements set by CMP 8.
TOOMER: The substantiation provided adequately represents true field conditions and depicts actual results. This proposal will provide a degree of safety that does not, at present, exist. The majority of projects designed by engineers require equipment grounding conductors in all raceways.

(Log #3400)

8- 3 - (250-118): Reject
SUBMITTER: Steve Dupas, James Building Co.
RECOMMENDATION: Add new text to Article 250 to read as follows:
"All raceways are to include a grounding conductor sized in accordance with largest conductor in raceway. Grounding conductor shall be bonded to all enclosures and bonded to equipment grounding bar in panelboard, disconnects, etc.".
SUBSTANTIATION: Rigid conduit, electrical metallic tubing, intermediate metallic tubing are approved as a grounding path, when the coupling is broke, rusted into, or vibrated loose - electrical continuity is not present and provides no protection against shock. I have been electrocuted as have several other electricians that I know, due to the continuity not being present due to vibration, rusy, or broken fittings. The state of Oklahoma requires this and in my opinion it is needed in the code.
PANEL ACTION: Reject.
PANEL STATEMENT: There are metal raceways that, where installed and maintained properly, are suitable as equipment grounding conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3708)

5- 252 - (250-118): Reject
SUBMITTER: Scott Steck, Chicago, IL
RECOMMENDATION: None.
SUBSTANTIATION: Please consider requiring all conducting wires be encased in metal tubing. This would make grounding available to all shorted wires. It would also increase safety for personnel.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no specific recommendation made by the submitter in the proposal. Section 4.3.3(c) of the Regulations Governing Committee Projects requires proposals to include proposed text, including the wording to be added, revised (and/or) revise, or deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4288)

5- 253 - (250-118): Reject
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
"The equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following:
1. A copper or other corrosion-resistant conductor. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a busbar of any shape.
2. Rigid metal conduit.
3. Intermediate metal conduit.
4. Electrical metallic tubing.
~~5. Flexible metal conduit where both the conduit and fittings are listed for grounding.~~
~~6.~~ 5. Listed flexible metal conduit ~~that is not listed for grounding,~~ meeting all the following conditions.
a. The conduit is terminated in fittings listed for grounding.
b. The circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.
c. The combined length of flexible metal conduit and flexible metallic tubing and liquidtight flexible metal conduit in the same ground return path does not exceed 6 ft (1.83 m).
d. The conduit is not installed for flexibility.
~~7.~~ 6. Renumber the remaining sections.
SUBSTANTIATION: Flexible metal conduit is only listed for use up to 6 ft in length as an equipment grounding conductor. The UL Standard 1 for listing of flexible metal conduit limits this length. There are no nationally recognized listed flexible metal conduits listed for use in lengths greater than 6 ft. This section is permitting something that does not exist and causes confusion because listed conduit that is marked might be assumed to be acceptable in lengths greater than 6 ft or in larger sizes when that is not the case.
The change to the renumbered 250-118(5) is to clarify that the conduit is listed and there is no such thing in this standard as "listed for grounding". With the elimination of old 250-118(5) this extra phrase becomes unnecessary.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has provided insufficient substantiation to warrant this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4002)

5- 254 - (250-118(11)): Accept
SUBMITTER: James T. Dollard, Jr., IBEW Local Union 98/Rep. IBEW Eastern Code Advisory Group
RECOMMENDATION: Revise text as follows:
250-118(11). The metallic sheath or the combined metallic sheath and grounding conductors of the smooth or corrugated Type MC cable.
SUBSTANTIATION: The vast majority of Type MC cable in use today is of the interlocking metal tape sheath type. The problem is that the metal jacket of the interlocking metal tape sheath type MC cable is not identified/listed as an equipment grounding conductor. We have seen far too many situations that involved the misuse of Type MC cable where isolated grounding type receptacles or patient care areas in hospitals etc. are wired with this type of cable. There are also problems where the interlocking metal tape sheath type MC cable is spliced in metal junction boxes and a ground tail is not taken to the box to effectively ground it. When questioned on the application of the interlocking metal tape sheath type MC cable in several situations that I have personally been involved with the answer is clear as to where the confusion exists. Engineers, contractors, and installers are having fits with the way the present Code text reads. To quote one engineer, "If the jacket of this type cable (interlocking metal tape sheath MC) is not an approved equipment grounding conductor then why is it in 250-118?" In the following conversation he asked "If this type cable requires an equipment grounding conductor as Type NM does then why is Type NM absent from Section 250-118, it also is made with an equipment grounding conductor?" The answer to this question is that Section 250-118(11) is confusing, and is not at all user friendly.
The present text of this section is as follows:
250-118. Types of Equipment Grounding Conductors.
(11) The metallic sheath or the combined metallic sheath and grounding conductors of Type MC cable.
The permissive language of this statement is widely interpreted by code users to mean that the metallic sheath of all types of MC cable as detailed in 334-1 may be used as an equipment grounding conductor or the combined metallic sheath and grounding conductors of Type MC cable.
The product listing is METAL CLAD CABLE (PJAZ) as found in the UL White or Green books. The product listing separates the three types of MC cable when addressing the application of the outer metal jackets as equipment grounding conductors. The listing groups the smooth and corrugated sheaths together and clearly states that the outer metal jacket of these type cables alone or a combination of the jacket and a SUPPLEMENTAL conductor are approved as an equipment grounding conductor. The listing addresses the interlocking metal tape sheath alone and clearly points out that an equipment grounding conductor is REQUIRED to be installed. The listing does not recognize a combination of the REQUIRED equipment grounding conductor and the interlocked metal tape sheath as an equipment grounding conductor.
Section 110-3(b) of the National Electrical Code clearly states that "Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling." There will be those who would argue that the Code addresses this problem and all users of this code should be aware of this requirement. This argument is in direct conflict with the stated purpose of the NEC. "The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity." The misuse of the type of cable assembly is resulting in equipment that is not effectively grounded. The jacket of the interlocking metal tape sheath type MC cable will not provide a low impedance fault return path to limit the voltage to ground and facilitate the operation of the OCPD.
An argument to reject this proposal in my opinion is one in favor of ambiguous language that will mislead users of this Code. The product listing is clear. The jacket of the interlocking metal tape sheath is in no case permitted to be used as a ground fault return path.
We need to revise language in the Code which is clearly not easy to use. I urge the Panel to accept this proposal in the name of safety and to make this section more user friendly, practicable, and enforceable.
Submitted with this proposal is a copy of page 62 of the UL White Book which provides the listing information.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
BRENDER: The product standard for type MC cable already addresses the concerns expressed by the proposal. The product standard for Type MC cable requires that the product be marked to indicate that the armor or the armor and supplemental bare

equipment grounding conductor is an acceptable grounding path where such is the case.

If the proposal is accepted the armor, as part of the combined armor and equipment grounding conductor of the interlocked construction, will no longer be eligible for listing as an equipment grounding path. The present language permits the product to be submitted to listing laboratories for listing and, if so approved, marked accordingly.

Copper Development Association recommends and suggests that a separate, continuous, copper equipment grounding conductor always be utilized as the most reliable grounding path. It is not our intent, by this vote, nor do we believe it is the submitter's intent, to have the interlocking sheath of Type MC, when used in conjunction with a copper grounding conductor, not eligible for listing.

However, the proposed language of the submission would make it appear that the interlocking Type MC cable is not permitted even in combination with the enclosed grounding conductor.

HADEEN: The electrical properties of the metallic sheath on Type MC cable are covered by the product standard. The present text is adequate. Substantiation does not demonstrate that there is widespread confusion on how Type MC is terminated and how it complies with the applicable grounding requirements. Product standards and listing requirements address the identification requirements for the products.

STEINMAN: The implication of the proposed wording would imply that the sheath of smooth tube or corrugated tube must always be suitable as an equipment grounding conductor. This is not always the case. The applicable product standards for type MC cable controls the electrical requirements of the metallic sheath. The present wording accurately reflects the grounding characteristics of the sheath of MC cable.

(Log #264)

5- 253a - (250-118(1)): Accept

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in Mr. Rappaport's Explanation of Negative. This action will be considered by the panel as a public comment.

SUBMITTER: Charles M. Trout, Maron Electric Co.

RECOMMENDATION: Revise Section 250-118(1) to read:

"A copper, aluminum or copper-clad aluminum conductor. This conductor shall be solid or stranded, insulated, covered, or bare; and in the form of a wire or busbar of any shape."

SUBSTANTIATION: As presently written, it appears that only copper conductors may be used as equipment grounding conductors. Sections 250-62 and 250-64 allows aluminum and copper-clad aluminum to be used as grounding electrode conductor material. Section 250-120(b) permits the use of aluminum and copper-clad aluminum to be used as equipment grounding conductors. Table 250-122 permits the use of aluminum and copper-clad aluminum as equipment grounding conductors. These conductor types should be shown in Section 250-118 as permitted types of equipment grounding conductors. If it was the intent of the panel that aluminum and copper-clad aluminum are covered in the terminology "or other corrosion resistant conductor", then they are departing from the customary explanatory language used in other sections and are not helping to make the code user friendly.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

BRENDER: Aluminum is not a corrosion-resistant material; witness its restrictions for use within 18 in. of the ground, in agricultural areas, or in corrosive environments. If the submitter (and the Authority Having Jurisdiction in his area) considers aluminum to be corrosion-resistant, then present Code language covers his situation, and the proposed change is superfluous.

Particularly in industrial environments, where various vapors and moisture may be present, aluminum is a poor choice for grounding conductor. The present Code wording allows the Authority Having Jurisdiction some discretion that would be diminished with this proposal. In discussions with a member of previous Panels, I was informed that the omission of aluminum from Section 250-118(1) by pervious Panels was intentional.

This proposal should have never been rejected.

(Log #1135)

7- 5a - (250-118(11)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.

SUBMITTER: Kenneth Carter, The Control Specialists

RECOMMENDATION: Revise text to read:

"The sheath of smooth metallic- or corrugated metallic- Type MC Cable or the combined metallic sheath and grounding conductors of Type MC Cable".

SUBSTANTIATION: As it is currently written, Section 250-118(11) implies that the metallic sheaths of all types of MC Cable are permitted as equipment grounding conductors. The sheath of type MC cable having an armor of interlocking tape is not permitted as an equipment grounding conductor. This differentiation should be clearly indicated.

PANEL ACTION: Reject.

PANEL STATEMENT: The the proposed wording would imply that the sheath of smooth tube or corrugated tube is always suitable as an equipment grounding conductor. This not always the case. The applicable product standards for Type MC cable controls the electrical requirements of the metallic sheath. The present wording accurately reflects the grounding characteristics of the sheath of Type MC cable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 1

NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

STEWART: The substantiation of the submitter is correct. All types of armour used on MC cable is not suitable for use as an equipment grounding conductor. This change would clarify the point.

The word "continuous" should be added between "or" and "corrugated" to make the proposal completely correct.

COMMENT ON AFFIRMATIVE:

TEMBLADOR: I am voting affirmative to support the Panel Action with a comment. See Mr. Hadeen's coment on Proposal 5-254.

Note: The sequence nos. 8-4 and 8-5 were not used.

(Log #763)

8- 6 - (250-118(14)): Accept

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(14) Other electrically continuous metal raceways <u>and auxiliary gutters</u> listed for grounding.

SUBSTANTIATION: Editorial. Metal auxiliary gutters are not indicated in (1) through (13) nor indicated in (14) since they are not considered raceways. While gutters with dual listing as wireways would be included by (14) where designated by use as gutters, they may be considered as not complying as an equipment grounding conductor. Section 374-9(f) doesn't clarify this, merely refers to Article 250.

PANEL ACTION: Accept.

PANEL STATEMENT: Refer this proposal and action to CMP 5 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #265)

8- 7 - (250-118(2) and (3)): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.

SUBMITTER: Charles M. Trout, Maron Electric Co.

RECOMMENDATION: After the words, (2) "Rigid Metal Conduit" and (3) "Intermediate Metal Conduit" add the words "where an application of a listed grounding continuity liquid or compound has been applied to all threaded portions of the rigid metal raceway."

SUBSTANTIATION: Other than a separate equipment grounding conductor being run with the circuit or feeder conductors, the metallic raceway may be the best equipment grounding conductor we have. There is, however, the problem of corrosion as recognized in Section 300-6 and the problem of couplings and locknuts not being set up tight enough to carry fault currents. This is not a problem of poor installation by our labor forces or poor inspection by code enforcement personnel. This is an inherent problem relating to the extent possible to tighten up threaded parts. Corrosion with the resulting high resistance connection at threaded joints in the raceway system must be minimized to maintain the ground fault path required by Section 250-2(d). It is highly unlikely that installers will bond around threaded portions of steel raceways to gain the results required by 250-2(c). The integrity of the corrosion protection applied by the manufacturer will be compromised at any threaded portion of the raceway system. Sealing threaded connections by the application of a listed grounding continuity liquid or compound will help to ensure that the ground fault path will be properly maintained. We might take a tip from the plumbing or other pipe trades that realize the extent to which threads can be made up and apply sealing compounds or other means to prevent leaks.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not identified that there are any products available that have been evaluated for use with metal raceways and will meet the intent of this proposal. Factory cut threads are protected against corrosion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2056)

8- 8 - (250-118(4)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Delete Item ~~(4) Electrical metallic tubing.~~ from the long list of unlisted types of equipment grounding conductors.
SUBSTANTIATION:
Grounding as provided by the EMT system is inadequate in many cases due to the separation, corrosion, loose fittings, thermal expansion, etc. This is due to inadequate code requirements on specific installation requirements causing EMT to move in such a manner that the fittings, couplings, and connectors loosen over time.
There have been many cases of human injuries due to this problem over time and across the country. In the Phoenix metropolitan area, there have been several cases of electrocution. Recently, an electrocution of an eight year old girl occurred, when the conduit came apart while she was playing on it. Another case was an electrocution of an air conditioning service technician who was taking the cover off of an ac unit with the conduit apart.
Additionally, the City of Phoenix Chief Electrical Inspector at the time, personally investigated many fires and injuries due to EMT conduit raceway failures. One such documented electrocution case occurred when a person attempted to turn on a water hose bib at a residence in Phoenix and was electrocuted. This was due to a shorted-grounded evaporative cooler motor and a broken and separated EMT conduit raceway. The metal water line had a plastic bushing which eliminated the electrical grounding continuity. The human body provided the path to ground. Even though a violation occurred, the missing bonding jumper on the isolation bushing on the water line would have no impact if the EMT raceway system was intact.
The Chief Electrical Inspector also investigated another documented serious injury which resulted in hospitalization. This occurred at the remodeling of a building in downtown Phoenix, Arizona. A power tool failed along with a broken EMT conduit raceway causing serious shock injury and near death.
Another injury was reported by a PE Electrical Engineer who personally investigated the accident. This injury took place at a Mall in Mesa, Arizona when a maintenance man came into contact with a broken EMT conduit raceway and was hurt due to a ground fault to the EMT down stream.
These are the injuries which occurred in the greater Phoenix area only. How many more deaths will it take before we take action?
"Fire investigation records of commercial buildings and military facilities show that metal raceways or cables are identified as the ignition source in a number of fires over recent years. Twelve such instances were identified in a Factory Mutual Technical Report, "A Review of Factory Mutual Technical Reports of Losses of Electrical Origin Involving Metal Conduits," by D.M. Karydas, FMRC J.I. 0N0R3.RU, July, 1986. A Shore Fire Management Report, prepared by the Naval Safety Center covering a period from April, 1982 through April, 1987 shows fires at seven U.S. military buildings were related to metallic raceways or cables. Also, the official NFPA investigation report of the tragic MGM fire indicates an arc between flexible aluminum conduit and EMT was the cause of the fire." Additionally, Factory Mutual conducted various studies on this problem and the summaries of their findings are as follows: "1. It was demonstrated that under ground fault conditions, metal conduit discontinuities release high thermal energy, visually manifested as showers of sparks, that is sufficient to ignite directly flammable gases, or pyrolyzate and melt, or even burn metallic parts (conduit fittings, etc.). 2. It was also demonstrated that under internal high-current arcing conditions, both plastic and metallic conduits suffer external wall rupture and the arcing fault releases high thermal energy to the ambient; molten metallic substance may ignite flammable material in the vicinity or at a distance from the immediate electrical fault area. No sustained fire involving conduit material itself was observed under these conditions." (Refer to 1989 TCR proposal 5-210) The panel's rejection statement on this proposal was not substantiated or answered by the panel. This raises the concern as to the technical intelligence of the panel members in response to the technical concerns that Factory Mutual's report states. The concerns to the public for safety are shown by the panel commented statements such as "Proposal would eliminate all raceways as grounding conductors. This would penalize both the good as well as the mediocre installations of wire / cable in conduit. It fails to take into account that if an equipment grounding conductor is in conduit, as recommended, that similar arcing can occur if the careless installer fails to securely attach each end of the equipment grounding conductor which is not visible after installation." Additionally, the concern of the internal arcing due to the differential impedance between the copper wire within the steel conduit raceway can be eliminated by requiring the equipment grounding conductor to be insulated. Presently over ninety percent of installations uses the insulated equipment grounding conductor. The only people who commented on the proposals are those who have an economic interest for maintaining market share and not for safety interest.
Installation(s) exposed on the surface of the roof have come apart during normal use. Also during the re-roofing of a roof, roof workmen, during the removal and installation of roofing material, have become severely shocked when the workman pick up the EMT raceway during the reroofing process. Roofers quite often move or step on the electrical conduits to install the new roofing. During this process, conduit fittings are being broken, pulled apart, or conductors damaged. Other nonelectrical trades are also called upon to perform on a roof are often not aware of the importance of grounding continuity. These persons do not take the necessary precautions to avoid damaging conduit or separating fittings.
Additionally, conduits exposed to the elements become rusted with a limited amount of ground continuity left and when moved or stepped on, they break quite easily.
Needless additional electrocutions and fires can be eliminated by the following minor change in installation requirements. By having an equipment grounding conductor installed within the raceway, the grounded appliance would have an assured means for ground return, thereby protecting the individual from shock hazard or injury. Since the only way that an appliance can remain energized, is when the conductors contained in the raceway remain continuous.
Interior raceways have the same problem as stated above, however, it has been proven everyday that the raceway system has a high impedance path. This proof is constantly shown by the fact that sensitive electronic equipments do not function correctly. Another line of reasoning involves computer grounding. A more solidly grounded conduit system would be less noisy and would help to encourage safe grounding practices for solid state equipment. Section 250-118(4) implies that this raceway system is adequate for grounding.
Section 250-118 is titled "Types of Equipment Grounding Conductors". Article 100 under definitions defines a

"conductor". Nowhere in the definition of a conductor does it states that a raceway or a raceway which contains conductors is a conductor. Under the definitions, EMT is defined as a raceway. Since 250-118 only implies that a conductor can take other forms, it does not make it mandatory that these conductors are adequate as a equipment grounding conductor. If this was true, then the definition of conductor has to be revised to include any shape, any material, and so on.

Research of the standard relating to EMT shows no substantiated testing to confirm that raceways are adequate as an equipment grounding conductor. EMT Conduits have never been tested by UL or any testing laboratory as an equipment grounding conductor and there are no requirements under UL Standard 797 for resistance testing, for current testing, and for short circuit withstand testing of the conduit. In addition, UL Standard 514B does not require short circuit withstand testing for fittings and connectors. Additionally, Dr. C. Brenner, a PE electrical engineer, states that the technical article "Performance Evaluation of Steel Conduit Enclosed Power Systems" (conducted by Georgia Institute of Technology) does not address the real world conditions of broken, loose, or rusted EMT systems. The testing was done in an ideal condition and does not represent actual field application. The paper does not address the safety/hazard issue that exists when an electrical fault occurs and the metal conduit does not have a low conductivity path and a person contacts the conduit. Additionally, the Georgia Institute of Technology testing project is inadequate and does not addresses the issues of the previously mentioned Factory Mutual testing.

There is no guarantee that couplings, fittings and connectors have low impedance at the connection point. Therefore, it can not be assured that they comply with NEC 250-2(d) without a test of every branch circuit or feeder.

Where the EMT conduit is being used as the sole equipment grounding conductor, the ground path is often broken in normal field applications. As a result, equipment or a portion of the raceway may be energized with no equipment grounding to trip the overcurrent device. By installing an equipment grounding conductor within the raceway will help to ensure an effective equipment grounding means (the grounding path remains intact) and will provide additional safety for personnel and property.

GENERAL STATEMENT TO THE PANEL

How much technical substantiation must we, the public, submit before the panel will take action and require an equipment grounding conductor in a raceway or cable which have uncontrolled impedances as used in a real world field application to conduct ground fault current and where the potential exists for people to get killed or shocked. In the past 10 years, people have submitted many code change proposals to require an equipment grounding conductor and they are constantly rejected by the panels. There has been overwhelming support for this change as documented by the TCRs and with substantiation of specific serious problem areas. The panel statements are always stating workmanship problems or design problems. The NEC is supposed to be an international safety standard. How many lives must be lost before the panel will take action?

Additional information was submitted under ROP (1998) 5-272 and 8-157 including the letters referenced above are available from NFPA.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation does not warrant the deletion of EMT as an equipment grounding conductor from 250-118. The first paragraph of 250-118 specifies one or a combination of the identified types of equipment grounding conductors.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #3394)

5- 255 - (250-118(4)): Reject

SUBMITTER: David Yee, Scottsdale, AZ

RECOMMENDATION: Revised and delete item "~~(4) Electrical metallic tubing~~" from the long list of unlisted types of equipment grounding conductors.

SUBSTANTIATION: A. The title of Section 250-118(4) states "type of equipment grounding conductor".

Conductor is defined in Article 100 as follows:

Bare: A conductor having no covering or electrical insulation whatsoever.

Covered: A conductor encased within material of composition of thickness that is not recognized by this Code as electrical insulation.

Insulated: A conductor encased within material of composition and thickness that is recognized by this Code as electrical insulation.

Since the title references conductors, the code section should only reference conductors. Tubing, conduit, raceways, and other similar material should not be referenced as conductors in this section.

B. Grounding as provided by the EMT system is inadequate in many cases due to the separation, corrosion, loose fittings, thermal expansion, etc. This is due to inadequate code requirements on specific installation requirements causing EMT to move in such a manner that the fittings, couplings, and connectors loosen over time.

There have been many cases of human injuries due to this problem over time and across the country. Refer to my earlier submittal under ROP (1998) 5-272.

Installation(s) exposed on the surface of the roof have come apart during normal use. Also during the reroofing of a roof, roof workmen, during the removal and installation of roofing material, have become severely shocked when the workman pick up the EMT raceway during the reroofing process. Roofers quite often move or step on the electrical conduits to install the new roofing. During this process, conduit fittings are being broken, pulled apart, or conductors damaged. Other nonelectrical trades are also called upon to perform on a roof are often not aware of the importance of grounding continuity. These persons do not take the necessary precautions to avoid damaging conduit or separating fittings. Additionally, conduits exposed to the elements become rusted with a limited amount of ground continuity left and when moved or stepped on, they break quite easily.

Needless additional electrocutions and fires can be eliminated by the following minor change in installation requirements. By having an equipment grounding conductor installed within the raceway, the grounded appliance would have an assured means for ground return, thereby protecting the individual from shock hazard or injury. Since the only way that an appliance can remain energized, is when the conductors contained in the raceway remain continuous.

Interior raceways have the same problem as stated above, however, it has been proven everyday that the raceway system has a high impedance path. This proof is constantly shown by the fact that sensitive electronic equipments do not function correctly. Another line of reasoning involves computer grounding. A more solidly grounded conduit system would be less noisy and would help to encourage safe grounding practices for solid state equipment. Section 250-118(4) implies that this raceway system is adequate for grounding.

Where the EMT conduit is being used as the sole equipment grounding conductor, the ground path is often broken in normal field applications. As a result, equipment or a portion of the raceway may be energized with no equipment grounding to trip the overcurrent device. By installing an equipment grounding conductor within the raceway will help to ensure an effective equipment grounding means (the grounding path remains intact) and will provide additional safety for personnel and property.

Note: Additional information was submitted under ROP (1998) 5-272 and 8-157 including the letters referenced are available from NFPA.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel recognizes the extensive work involved in gathering information related to accidents involving conduits and tubing used as the equipment grounding path. However, it is clear that the incidents reported involved improper installations of the raceway systems or damage to the raceway systems by other trades, in combination with equipment failure. Installation of an internal ground wire is not prohibited. However, field experience has shown that where installed properly, electrical metallic tubing can effectively serve as the grounding path in accordance with Section 250-2(d). Also, in recent years, requirements for listed conduit and tubing fittings have been significantly strengthened. Each raceway/fitting interface is now subjected to the same ground current test as required for grounding and bonding equipment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:
BOKSINER: There are many instances where the NEC requirements are intended to increase the reliability of the grounding path. Such considerations apply to this case. If field experience indicates problems indicated by the submitter then this proposal should be accepted.
COMMENT ON AFFIRMATIVE:
JOHNSTON: I agree with the Panel Action to reject the proposal, but do not totally concur with all of the Panel Statement. Electrical metallic tubing is a proven and effective grounding conductor where installed and maintained correctly. The proposal, as submitted, is too broad in scope, however the submitter identified some situations where it is advisable to have an equipment grounding conductor installed inside the tubing for safety reasons. Damage to EMT on rooftops, resulting in separation of sections of the raceway are real even where the initial installation was done correctly.
RAPPAPORT: When installed properly and maintained so that it remains electrically continuous, EMT provides an adequate means for containing an electromagnetic field within itself as well as providing a low impedance ground fault current return path. I am, however, concerned with the reliability of connections, either during installation or due to daily abuse. It is for this latter reason that a supplementary equipment-grounding conductor should be installed in all EMT. See my Negative Vote and Comment on Proposal 5-251.

(Log #764)

5- 256 - (250-119): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Identification of Equipment Grounding Conductors. Unless otherwise required elsewhere in this Code, equipment grounding conductors shall be permitted to be bare, ~~covered,~~ or insulated. Individually ~~covered or~~ insulated equipment grounding conductors shall have a continuous outer finish that is green or green with one or more yellow stripes except as otherwise permitted in this section.
(a) Conductors Larger than No. 6. An insulated ~~or covered~~ conductor larger than No. 6 ~~copper or aluminum~~ shall be permitted, at the time of installation, to be permanently identified as an equipment grounding conductor ~~at each end and at every point where the conductor is accessible. Identification shall be accomplished~~ by one of the following:
(1) Stripping not less than 4 in. (101.6 mm) of the insulation; ~~or covering from the entire exposed length;~~
(2) ~~Coloring the exposed insulation or covering green.~~ Encircling the insulation with a permanent distinct green marking;
~~(3) Marking the exposed insulation or covering with green tape or green adhesive labels.~~
Identification as permitted in (1) and (2) above shall be provided at each conductor termination, and at each junction point except conduit bodies that do not contain splices or unused hubs. Identification as permitted in (2) above shall be provided at intervals not exceeding 6 ft (1.83 m), with not less than one such marking, where the conductor is installed in a wireway, auxiliary gutter, or cable tray.
(remainder unchanged).
SUBSTANTIATION: Individually covered conductors are not indicated in code tables re: material covering, temperature rating, dimension, ampacity, etc., and do not appear to be a listed product. (See my proposal for Article 100 Conductor - Covered).
The deletion of "copper or aluminum" is editorial since No. 6 covers all material.
In (a) and (a)(1) "accessible" and "entire length" requires a conductor installed as an open aerial conductor per Articles 225, 320, or 321 to be stripped or colored green for the entire length, which for practical purposes rules out an insulated conductor unless it is green.
Stripping the entire exposed length in boxes or other enclosures is somewhat difficult since some insulation is generally visible at the raceway or cable connections. The word "exposed", per definitions, does not seem appropriate. The proposal would negate the need to strip all visible portions of insulation from conductors in switchboards and other equipment and lessen exposure to a grounded surface.
The proposed (2) tracks the requirement of Section 200-6(b) for grounded conductors, the substantiation for which in Proposal 5-20 of the A98 ROP is valid for grounding conductors; it also negates the need for (3). "Permanent green marking" allows for judgement of efficacy of taping, painting, labels, etc.
The proposal would legitimize and permit insulated overhead aerial conductors larger than No. 6 to have insulation other than green and be marked or stripped at terminations and junction points. Present wording requires stripping or marking the entire length since it is accessible. Section 200-6(b) limits required marking of grounded conductors to terminations, which allows a conductor with other than white insulation to be used in overhead aerial spans.
Passing larger than No. 6 insulated grounding conductors through a conduit body without splices or unused hubs does not appear to warrant identification any more than an "accessible" grounding conductor in a cablebus assembly, for which the proposal would only require identification at terminations and junction points.
Present wording which requires stripping or marking of the entire length or every point where the conductor is accessible tends to result in use of bare conductors where used in a wireway, auxiliary gutter, or cable tray.
Since grounding conductors in cables are usually insulated or bare but not individually covered, the proposal has no effect on such conductors.
PANEL ACTION: Accept in Principle in Part.
Revise Section 250-119(a) only to read as follows:
"(a) Conductors Larger than No. 6. An insulated or covered conductor larger than No. 6 copper or aluminum shall be permitted, at the time of installation, to be permanently identified as an equipment grounding conductor at each end and at every point where the conductor is accessible. Identification shall encircle the conductor and shall be accomplished by one of the following:
1. Stripping the insulation or covering from the entire exposed length
2. Coloring the exposed insulation or covering green
3. Marking the exposed insulation or covering with green tape or green adhesive labels."
PANEL STATEMENT: The panel accepts the need to encircle the conductor with coloring or marking. No substantiation has been included to delete covered. The panel does not agree with the requirement to mark conductors at six foot intervals. The remainder of the recommendation is not accepted because it does not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3325)

5- 257 - (250-119(a)): Reject
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Revise as follows:
(a) Conductors larger than No. ~~6~~ 10 copper or aluminum shall be permitted, at the time of installation, to be permanently identified...
SUBSTANTIATION: Difficulty in the ready availability of green (or green w/yellow stripe) insulated conductors. Facilitates installation with on-hand materials.
PANEL ACTION: Reject.
PANEL STATEMENT: The lack of availability by some electrical suppliers is not technical substantiation for a change. Suppliers will stock materials where there is a demand for it.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: This proposal should be accepted. Conductors with green insulation in sizes larger than 6 AWG could also be manufactured and stocked. Conductors in size 10 AWG and smaller are most commonly used for branch circuits and are readily available with colored insulation. If termination marking is acceptable and considered safe for 4 AWG and larger why not in sizes 6 AWG and 8 AWG.

(Log #2748)

5- 258 - (250-119(d) (New)): Reject
SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.
RECOMMENDATION: Add new paragraph (d) to read as follows:
(d) Identification of isolated grounding conductors. Isolated grounding conductors shall be permitted to be identified with the provisions of 250-119(a). Isolated grounding conductors shall be identified and readily different from the conductors of the equipment grounding system.
SUBSTANTIATION: Upon inspection of a job the electrician had installed, both IG and equipment grounding conductors but both were identified the same and indistinguishable. This problem should also be addressed in cable assembly situations.
PANEL ACTION: Reject.
PANEL STATEMENT: The different identification is already permitted in Section 250-119. The panel does not agree that the different conductors should be required to be distinguishable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #765)

5- 259 - (250-120(a)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Raceway, Cable Trays, Auxiliary Gutters, Cablebus, Cable Armor, or Cable Sheaths. Where it consists of a raceway, cable tray, auxiliary gutter, cablebus framework, cable armor or cable sheath, or where it is a wire ~~within a raceway or cable,~~ it shall be installed in accordance with this code using fittings for joints and terminations approved for use with the type ~~raceway or cable~~ of grounding conductor used. All connections, joints, and fittings shall be made tight. ~~using suitable tools.~~
SUBSTANTIATION: The provisions of this section are applicable to auxiliary gutters and cablebus which are not considered raceways. Grounding conductors not within a raceway or cable such as in a gutter or cablebus or as permitted by Sections 250-134(b) Exceptions No. 1 and 2, and Section 250-138(b) should be included. The tool requirement literally does not permit hand-twisted wire connectors.
PANEL ACTION: Accept in Part.
Revise Section 250-120(a) to read as follows:
"a) Raceway, Cable Trays, Cable Armor, Cablebus, or Cable Sheaths. Where it consists of a raceway, cable tray, cable armor, cablebus framework, or cable sheath or where it is a wire within a raceway or cable, it shall be installed in accordance with the applicable provisions in this Code using fittings for joints and terminations approved for use with the type raceway or cable used. All connections, joints, and fittings shall be made tight using suitable tools."
PANEL STATEMENT: The panel concludes that auxiliary gutters do not belong in this section. The additional recommendations do not add clarity to this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2214)

5- 260 - (250-120(b)): Accept in Principle
Note: The Technical Correlating Committee directs that the first sentence of the Proposal be rewritten to comply with the NEC Style Manual to read as follows: "Equipment grounding conductors of bare or insulated aluminum or copper-clad aluminum shall be permitted."
The Technical Correlating Committee understands that the metric values will be the same as accepted in Proposal 5-54. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Revise 250-120(b) as follows:
Equipment grounding conductors of bare or insulated aluminum or copper-clad aluminum are permitted. Where used these conductors shall not come in direct contact with masonry or the earth or where subject to corrosive conditions. Where terminated outside, these conductors shall not be installed within 18 in. (457 mm) of the earth.
SUBSTANTIATION: Rewrite of Article 250 for the 1999 Code can result in a possible interpretation that can prohibit the well recognized use of aluminum and copper-clad aluminum conductors as equipment grounding conductor.
250-64(a) means that aluminum and copper-clad aluminum conductors shall not be used as grounding electrode conductors where in direct contact with masonry or the earth or where subject to corrosive conditions. Equipment grounding conductors are terminated on to the grounding electrodes.
Equipment grounding conductors of bare or insulated aluminum and copper-clad aluminum conductors are part of cable assemblies suitable for direct burial applications or raceway systems and have been used successfully for many years. Their use has been in accordance with the Code. To prohibit their use now, as a result of the rewrite of Article 250 for better organization of the Code requirements in this article, in these wiring methods might as well mean that insulated phase conductors of these materials are prohibited. Rewriting Article 250 was not intended to change the technical requirements for the permitted use of equipment grounding conductors of bare or insulated aluminum and copper-clad aluminum conductors.
Proposed wording recognizes the permitted use while maintaining the intended installation requirement for the proper use of bare or insulated aluminum or copper-clad aluminum as equipment grounding conductors.
PANEL ACTION: Accept in Principle.
Replace 250-120(b) with the following:
"b) Aluminum and Copper-Clad Aluminum Conductors. Equipment grounding conductors of bare or insulated aluminum or copper-clad aluminum are permitted. Bare conductors shall not come in direct contact with masonry or the earth or where subject to corrosive conditions. Aluminum or copper-clad aluminum conductors shall not be terminated within 18 in. (457 mm) of the earth."
PANEL STATEMENT: The panel concludes that this revision meets the submitter's intent and provides clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: There is nothing in the present wording of 250-120(b) that prohibits the use of aluminum if it is used within the restrictions of Section 250-64. The submitter provides no substantiation that there was ever a problem with interpretation of this section. The proposal does not provide clarity. According to one member of the Panel during the last cycle, the wording of this section was considered and deliberated.
Bare aluminum grounding conductors used in direct burial as part of a cable assembly is of undocumented success. One major manufacturer of such assemblies informed me they have no documentation or studies of failure rates of conductor material. The submitter's statement that they have been used successfully for many years is a subjective anecdotal comment, with no substantiation provided.
If aluminum is exposed to moisture, as may occur when a semi-porous jacketing material is used in direct burial, or if an impervious jacket is damaged, as during installation, it will corrode at a relatively fast rate, failing in an open-circuit condition and rendering the ground path ineffective.
This proposal is superfluous, degrades safety and should be rejected.
COMMENT ON AFFIRMATIVE:
DOBROWSKY: A similar issue exists with Section 250-64 that should be corrected also. Only bare conductors and the terminations of covered or insulated conductors should be restricted from corrosive environments or within 18 in. of the earth.
The Panel Action text should be revised to improve clarity and comply with the NEC style manual as follows:
(b) Aluminum and Copper-Clad Aluminum Conductors. Bare, covered, or insulated aluminum or copper-clad aluminum equipment grounding conductors shall be permitted. Bare conductors shall not be located where subject to corrosive conditions or be in direct contact with masonry or the earth. Aluminum or copper-clad aluminum conductors shall not be terminated within 18 in. (450 mm) of the earth.

(Log #4337)

5- 261 - (250-120(b)): Accept in Principle
SUBMITTER: C. David Mercier, Southwire Co.
RECOMMENDATION: Delete:
(b) Aluminum and Copper-Clad Aluminum Conductors. Aluminum and copper-clad aluminum conductors shall be installed in accordance with the restrictions of Section 250-64.
Replace with:
(b) Separate Equipment Grounding Conductors. Where the equipment grounding conductor is a separate equipment grounding conductor as provided for in Sections 250.130(c)(1) and (2) and in Section 250-134(b), Exception No. 2, it shall be installed in accordance with Section 250.64 in regard to restrictions for aluminum and also in regard to protection from physical damage.
SUBSTANTIATION: The 1999 NEC inadvertently, through the rewrite of Article 250, now disallows the use of insulated aluminum conductors used as grounding conductors when in direct contact with the earth based on 250-120(b). This now disallows the use of an insulated aluminum grounding conductor for the feeder to a mobile home, removing a product from the market that has been used successfully for many years.
The 1996 NEC allowed the grounding conductor to be aluminum based on 250-92(c)(2) only disallowing aluminum conductors installed as "a separate equipment grounding conductor as provided in the Exception for Sections 250-50(a) and (b) and in Section 250-57(b), Exception No. 2". The panel statement for Proposal 5-257 in the 1995 NEC Committee Report on Proposals states that "Section 250-92(c)(2) only covers a separate equipment grounding conductor as provided for in the exception to Sections 250-50(a) and (b). It does not pertain to the equipment grounding conductor that is contained in type USE service entrance cable."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 5-260.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BRENDER: See my Explanation of Negative Vote on Proposal 5-260.
COMMENT ON AFFIRMATIVE:
DOBROWSKY: See my Comment on Affirmative on Proposal 5-260.

(Log #3618)

5- 262 - (250-120(d) (New)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Add a new Section 250-120(d) to read as follows:
(d) Roofs. All raceways installed on roofs with a slope of 4 in. per 12 in. or less shall contain an equipment grounding conductor sized per Table 250-122 and installed with the circuit conductors.
Exception No. 1: Systems which are used with low voltage and communication type systems unless required elsewhere in the Code.
Exception No. 2: As permitted by Section 250-86.
SUBSTANTIATION: When a building needs to have its roof redone permits are not required and no inspections are performed. The roofers too often have no regard for the integrity of the conduit system installed on the roof. The conduit is just moved out of the way as they reroof. Even if they move the conduit back to its original position the conduit has separated from the couplings and connectors. Lengths of conduit are no longer grounded and the conductors are subject to physical damage. Without an approved equipment grounding system personnel are exposed to the possibility of electrical shock.
PANEL ACTION: Reject.
PANEL STATEMENT: The code can not regulate the dismantling of electrical systems or foresee all future renovations. There is lack of technical substantiation for this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BRENDER: This submitter, as well as the submitter of Proposal 5-263, have identified a safety hazard that is easily and cheaply rectified. This proposal should be accepted in the interests of safety. Numerous recognized sources have agreed with the submitter's intent that grounding continuity cannot be assured utilizing solely the conduit as the equipment grounding conductor. Indeed, several other proposals within this Code cycle, such as 5-251 and 5-263, highlight the potential hazards associated with the use of the conduit as a ground path without an associated copper grounding conductor. Adoption of this proposal will enhance safety and should be adopted.
JOHNSTON: This proposal should be accepted. Damage to raceways on roofs is not an uncommon occurrence. In addition to the types of incidents cited in the substantiation to the proposal, raceways installed on roofs are often damaged by maintenance personnel or workers of other trades, when performing their tasks. When these workers step on or move the raceways, the electrical and mechanical continuity of the raceways at the connectors and couplings is affected and can leave portion(s) of the raceway system isolated creating potential hazards.
MELLO: This proposal should be accepted. This submitter and several before have provided substantial field evidence of a problem. Code-Making Panel 8 has determined that metal raceways are suitable as equipment grounding conductors with the provision that they are applied correctly and installed correctly. The evidence shows that while the initial installaton may comply with the Code, the long term conditions are such that on rooftops, the raceway does not remain suitable as an equipment grounding conductor. I cannot agree, as proposed elsewhere, to make a blanket requirement to install a separate equipment grounding conductor in all metal raceways. In this limited application on rooftops, some action is needed. The panel statement that there is inadequate technical substantiation is incorrect.
RAPPAPORT: There has been substantial documentation relating to the inadequacy of EMT as an equipment-grounding conductor due to mechanical separation, corrosion, and loose fittings. All of these can and do occur on rooftops. It is time that we recognize that all installations are not performed ideally, that all connections are not made secure, and that traffic on rooftops can and does separate EMT sections. This proposal is necessary for safe roof top installations.
It is interesting to note that CMP 8 has passed this same proposal. In view of the direction given by the Technical Correlating Committee that responsibility for determining the suitability of raceways as an equipment-grounding conductor rests with CMP 8, voting on this proposal is inconsequential. See my Negative Vote and Comment on Proposal 5-251.
TOOMER: This problem does not exist in the electrical industry. If this proposal is accepted, it would help ensure the electrical continuity of the fault and ground path. Although the code does not regulate the dismantling of electrical systems, by accepting this proposal it will result in future personnel safety.

(Log #4302)

5- 263 - (250-120(d) (New)): Reject
SUBMITTER: Glenn Soles, Clark County Building Dept./Rep. So. Nevada Electrical Code Committee
RECOMMENDATION: Add a new Section 250-120(d) to read as follows:
(d) Roofs. All raceways installed on roofs with a slope of 4 in. per 12 in. or less shall contain an equipment grounding conductor sized per Table 250-122 and installed with the circuit conductors.
Exception No. 1: Systems which are used with low voltage and communication type systems unless required elsewhere in the Code.
Exception No. 2: As permitted by Section 250.86.
SUBSTANTIATION: When a building needs to have their roof redone permits are not required and no inspections are performed. The roofers too often have no regard for the integrity of the conduit system installed on the roof. The conduit is just moved out of the way as they reroof. Even if they move the conduit back to its original position the conduit has separated from the couplings and connectors. Lengths of conduit are no longer grounded and the conductors are subject to physical damage. Without an approved equipment grounding system personnel are exposed to the possibility of electrical shock.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-262.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
BRENDER: This submitter, as well as the submitter of Proposal 5-262, have identified a safety hazard that is easily and cheaply rectified. As a building official in Clark County, he has undoubtedly encountered the types of damage to the integrity of conduit systems on roofs he alludes to. Further, owing to the exposure to outdoor conditions, corrosion of EMT or other conduits or joints cannot be precluded.
Numerous recognized sources have agreed with the submitter's intent that grounding continuity cannot be assured utilizing solely the conduit as the equipment grounding conductor. Indeed, several other proposals within this Code cycle, such as 5-251 and 5-263, highlight the potential hazards associated with the use of the conduit as a ground path without an associated copper grounding conductor. Adoption of this proposal will enhance safety and should be adopted.
JOHNSTON: See my Explanation of Negative Vote on Proposal 5-262.
MELLO: See my Explanation of Negative Vote on Proposal 5-262.
RAPPAPORT: See my Explanation of Negative Vote on Proposal 5-262.

(Log #1750)

5- 264 - (250-122): Accept
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise to read as follows:
250-122 (b) Increased in size *Adjustment for Voltage Drop.* **Where ungrounded conductors are increased** *adjusted* **in size** *to compensate for voltage drop*, **equipment grounding conductors, where installed, shall be increased in size** *adjusted* **proportionately according to circular mil area of the ungrounded conductors.**
SUBSTANTIATION: The current text is limited to voltage drop only and is subject to abuse and misinterpretation (e.g. it was done per the plans, not for voltage drop). The manufacturers directions often call for conductor to be increased in size, with no explanation for why the ungrounded conductors size is increased, with no corresponding requirement for the equipment grounding conductor to be increased.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TOOMER: The submitter did not provide sufficient substantiation.

(Log #2057)

5- 265 - (Table 250-122): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Move the first note at the end of Table 250-122 to the General (a) statement.
to read as follows.
(a) General. Copper, aluminum, or copper-clad aluminum equipment grounding conductors of the wire type shall not be smaller than shown in Table 259-122, but shall not be required to be larger than the circuit conductors supplying the equipment. Where a raceway or a cable armor or sheath is used as the equipment grounding conductor, as provided in Sections 250-118 and 250-134(a), it shall comply with Section 250-2(d).
Where necessary to comply with Section 250-2(d), the equipment grounding conductor shall be sized larger than Table 250-122.
SUBSTANTIATION: The Note at the end of Table 250-122 is a mandatory requirement and should be moved into the General text of 250-122.
PANEL ACTION: Reject.
PANEL STATEMENT: The note to the table is mandatory text and is enforcable already. See reference 2.3 of the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
RAPPAPORT: The Panel is technically correct that Notes are mandatory. I wonder how many users of the Code recognize that Notes are mandatory and FPNs are not. Moving the notes into positive text in the body of the section will emphasize the fact that they are mandatory without actually changing any of the rules. I believe that this proposal is in the direction of making the Code more user friendly by removing any doubt as to whether notes are mandatory or not.

(Log #2239)

5- 266 - (Table 250-122): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Revise Table 250-122 as follows.

Table 250-122. Minimum Size Equipment Grounding Conductors for Grounding Raceway and Equipment

Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc., Not Exceeding (Amperes)	Size (AWG or kcmil)	
	Copper	Aluminum or Copper-Clad Aluminum*
15	14	12
20	12	10
30	10	8
40	10	8
60	10	8
100	8	6
200	6	4
300	4	2
400	3	1
500	2	1/0
600	1	2/0
800	1/0	3/0
1000	2/0	4/0
1200	3/0	250
1600	4/0	~~350~~ 300
2000	250	400
2500	350	~~600~~ 500
3000	400	600
4000	500	~~800~~ 750
5000	700	~~1200~~ 1100
6000	800	~~1200~~ 1300

Note: Where necessary to comply with Section 250-2(d), the equipment grounding conductor shall be sized larger than this table.
***See installation restrictions in Section 250-120.**

SUBSTANTIATION:
Objective of this proposal is to examine the requirement for equipment grounding conductor size for overcurrent devices with rating or setting of 1600 Ampere and higher. Except for a few sizes, this table exhibits a relationship between the sizes of copper and aluminum conductors that is similar to the relationship that exists in Table 310-16. The proposed change is needed to make the entire Table 250-122 to exhibit a relationship between the sizes of copper and aluminum conductors that is similar to the relationship that exists in Table 310-16. Also, the acceptance of this recommendation will facilitate harmonization of requirements in the National Electrical Code (NEC) and Canadian Electrical Code (CEC) for this requirement.

References:

1. **Proposals by Mr. E. C. Soares for Table 250-95 as recorded on pages 69 – 72 of the "Preprint" of the proposed amendments for the 1965 NEC.**
2. **Pages 168 – 173 of Soares' Grounding Electrical Distribution Systems for Safety, 1966.**
3. **Table 250-95 of the 1965 NEC.**
4. **Table 250-95 of the 1968 NEC.**
5. **Pages 217 – 221, Soares' Grounding Electrical Distribution Systems for Safety, 1966.**
6. **Table 16 of the 1998 CEC.**

See Appendix 1 for copies of the above items.

It is not the intent of the submitter to challenge the work done by Mr. Soares, in particular, and many other experts on grounding.

This proposal is based on the following statement found on page 218 of item 5 referenced above. (I believe that same statement exist in the original work published by Mr. Soares in 1966, item 1 referenced above.)

"While Tables XVI and XVII list only copper conductors an aluminum conductor having a conductance equivalent to a given copper conductor will also have an approximately equal short–time current–carrying capacity. This is true because, for equivalent dc conductance, the temperature coefficients, specific heats and densities of copper and aluminum, respectively, are such as to cause their respective melting points to be reached in approximately the same length of time."

Table 16 of the CEC and Table 250-122 of the NEC deals with the same subject. Comparison of the two suggests that the requirements are very similar in these two tables. However, some differences do exist for the equipment grounding conductor size for devices rated at 1600 ampere and larger.

Analysis similar to Table XVI shown on page 220 of item 4 above is performed on the revised table 250-122 shown above in the recommendation. See Appendix II for the results.

Should these three details fail to support the proposed recommendation, then the CMP 5 should consider following alternates:

1. Increases the minimum size of the equipment grounding conductor where required to maintain the relationship.

OC Rating (Ampere)	Size of Copper EGC (AWG or kcmil)	Size of Aluminum or Copper-Clad Aluminum EGC (AWG or kcmil)
1600	~~4/0~~ 250	~~350~~ 400
2000	250	400
2500	~~350~~ 400	600
3000	400	600
4000	~~500~~ 600	~~800~~ 900
5000	~~700~~ 750	1200
6000	800	~~1200~~ 1300

2. Use the proportional increase rule of 1965 NEC to establish the size of the copper conductor for OC devices rated above 1200 Ampere and then establish the nearest matching (or larger) size of the aluminum or copper-clad aluminum conductor from Table 310-16:

OC Rating (Ampere)	Size of Copper EGC (Table 250-122) (AWG or kcmil)	Circularmils	Size of Copper EGC (Circularmils) Proportionally Increased using 1200 Ampere as a reference	Size of Copper EGC (Nearest larger size to match with the proportionally increased size) (AWG or kcmil)	Nearest matching (or larger) size of Aluminum or Copper-Clad Aluminum from Table 310-16 (AWG or kcmil)
1200	3/0	167800	3/0	3/0	250
1600	4/0	211600	223733	250	400
2000	250	250000	279667	300	500
2500	350	350000	349583	350	500
3000	400	400000	419500	500	750
4000	500	500000	559333	600	900
5000	700	700000	699167	700	1200
6000	800	800000	839000	900	1500

(Example: Required Circularmils for 1600 Ampere OC Device = (167800 x 1600/ 1200) = 223733)

Note: Supporting material available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no empirical data to support the submitters assumptions of the short time current carrying capacity of the conductors. Table 310-16 refers to steady state ampacity, where as Table 250-122 is based on fault current. This points out the thermal characteristic differences.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HADEEN: The submitter's substantiation includes the required technical information to support the change. See Appendix 1, Item 5 (Pages 218 and 219 from Soares' Grounding Electrical Distribution System for Safety, 1966); and Appendix 2, Pages 1 and 2 provided with the substantiation.
STEINMAN: The submitter's substantiation includes the required technical information to support the change. See Appendix I, Item 5 (pages 218 and 219 from Soares' Grounding Electrical Distribution System for Safety, 1996) and Appendix 2, pages 1 and 2 that were provided with the submitter's substantiation.

(Log #766)

5- 267 - (250-122(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) General. Copper, aluminum, or copper-clad aluminum equipment grounding conductors of the wire type shall not be smaller than shown in Table 250-122, but shall not be required to be larger than the largest ungrounded associated circuit conductor (including tap conductors) supplying the equipment, if of the same material or adjusted in size in accordance with the equivalent size columns of Table 250-122 if of different material. ~~Where a raceway or cable armor or sheath is used as the equipment.~~ Equipment grounding conductors, as provided in Section 250-118 ~~and 250-134(a)~~ it shall comply with Section 250-2(d).
SUBSTANTIATION: "Largest" and "ungrounded" should be specified, as all ungrounded conductors of a circuit may not be the same size. A grounded conductor is a circuit conductor and a neutral may be larger than the ungrounded conductors where to compensate for harmonic currents. "Associated" is intended to define that portion of a circuit directly related to grounding conductor size, such as the tap conductor portion. While circuit conductors includes tap conductors it also includes feeder conductors. My impression is that the intent is to limit an equipment grounding conductor in general, to the tap conductor size, but this is not explicitly indicated. Section 90-4 gives responsibility for interpretation of "circuit conductors" to the authority having jurisdiction.
A somewhat plausible interpretaton based on Section 250-2(d) and the FPN for Table 250-12, to require a feeder sized equipment grounding conductor could be made for a (worst case type) tap conductor installation as follows:
No. 12 conductors are tapped to an outside feeder that has overcurrent protection rated 500 amperes, with a 2/0 copper equipment grounding conductor, in accordance with Section 240-21(b)(5). A limited ground fault current of approximately 225-amperes on the tap would likely be seen as an overload by the feeder overcurrent device instead of a ground fault, especially if the feeder is lightly loaded, and time/trip characteristics could preclude instantaneous opening. The fault current could fuse (melt open) the tap supply conductors or the No. 12 grounding conductor. If the EGC fuses first, equipment potential can rise to line voltage and remain energized due to loss of ground. While a 2/0 EGC for the tap conductors would not necessarily cause the feeder overcurrent device to open, it would limit the above ground potential of the equipment and allow fusing of the No. 12 tap conductor, which would likely remove the faulted connection.
Grounding conductors of Section 250-118 other than raceways or cable armor should also be included in the reference to Section 250-2(d) which is not so limited. Reference to Section 250-134(a) is superfluous as that section refers to Section 250-118.
Proposal is intended as clarification of intent.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation to delete the reference to raceways, cable armor or sheaths used as equipment grounding conductors. The proposed text does not add any clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1155)

5- 268 - (250-122(b) Exception No. 1 (New)): Reject
SUBMITTER: Charles N. Landey, Wisconsin Dept. of Transportation
RECOMMENDATION: Add a new Exception to read:
Exception No. 1: Conductors connecting street light poles with individual grounding electrodes at each pole base.
SUBSTANTIATION: To lower costs. The proposed language will be a superior system to the traditional street lighting specification of grounding the "white" wire and omitting the "green" wire.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no substantiation provided for the exception. Additional grounding electrodes do not remove the need for equipment grounding conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #767)

5- 269 - (250-122(e), (f)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(e) Flexible Cord and Fixture Wire. Equipment grounding conductors that are part of flexible cords or used with fixture wires in accordance with section 240-4 shall be copper, not smaller than No. 18 and not smaller than the largest flexible cord conductors or fixture wire. ~~circuit conductors.~~
(f) Conductors in Parallel. Where conductors are run in parallel in multiple raceways or cables as permitted in Section 310-4, the equipment grounding conductors, where used, shall be run in parallel in each raceway or cable. One of the following methods shall be used to ~~ensure~~ determine the minimum size of the equipment grounding conductors. ~~are protected.~~
SUBSTANTIATION: Editorial. No smaller than No. 18 copper does not explicitly require copper. While the cord and fixture wires will normally be copper if intended to be mandatory it should be explicit. (A No. 12 aluminum could be used with fixture conductors). "Circuit" conductors in (a) evidently refers to feeder or branch circuit conductors. Proposal clarifies that branch-circuit conductors are not intended. While flexible cords covered in Section 240-4 will normally have the same size conductors, individual fixture wire could be various sizes and the grounding conductors should relate to the largest sized used.
"Protected" implies overcurrent protection. The code doesn't require overcurrent protection for grounding conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is not editorial. The substantiation is insufficient for the changes proposed. The proposed text does not add clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2820)

5- 270 - (250-122(e)): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
RECOMMENDATION: After existing text add:
(1) Flexible cords, and cordsets, shall be redundantly grounded with two conductors whenever the equipment grounding conductor is sized smaller than shown in table 250-122.
SUBSTANTIATION: Ralph Nader accused the medical profession of accidentally electrocuting 5000 patients a year with electrical equipment and covering up the deaths.
Frank Mayhew, in a micro-shock overview, stated that 1200 patients are electrocuted each year with currents as little as 20 microamperes.

The U.S. National Institute for Occupational Safety and Health estimates 700 Americans are electrocuted on the job each year.

OSHA also reported 109 deaths in one year on construction sites, and many serious injuries due to shocks as little as 3 milliamperes.

The Consumer Product Safety Commission estimates 600 persons lose their lives each year by electrocution in and around the home.

Yet despite thousands of electric shocks that cause injuries, and electrocutions, each and every year, the grounding system still remains without the redundancy every other responsible engineer resorts to whenever lives are at stake.

For the past thirteen years I have urged the members of the NFPA to adopt a cord and plug grounding system that provides the necessary two conductor redundancy required to correct the design defects in cords that cause micro and machro shock.

Instead of redundancy, and despite the above horrific statistics, the members of the NFPA are content to continue protecting our men, women, and children with equipment grounding conductors sized up to 66 percent less than required by table 250-122.

The original code document, developed under the influence of insurance companies, distinctly states the equipment grounding conductors shall be sized according to table 250-122. This means a No. 12 equipment grounding conductor shall be used in all cord and cordsets when used on a 20 ampere circuit.

Therefore, it is irresponsible to permit a No. 18, 7 ampacity conductor grounding conductor to be used on a 20 ampere branch circuit. And especially branch circuits protected by circuit breakers instead of fuses.

And we're talking about cords subjected to much use and abuse, not conductors that are protected inside walls.

If we must reduce the size of the grounding conductor No. 18 then install a second No. 18 conductor to prevent the loss of grounding responsible for electrocutions, and line drop responsible for the milliampere shocks that cause serious injuries.

The same two conductors, together with electrocution-proof components will make our grounding system electrocution-proof and fire-proof. See substantiation I submitted for Section 250-114.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 5-247.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #1707)

5- 271 - (250-122(f)(1) and (2)): Reject

SUBMITTER: Kenneth W. Birringer, University of Michigan

RECOMMENDATION: Revise text as follows:

(1) Each parallel equipment grounding conductor <u>where not in combination with other types of equipment grounding conductors listed in Section 250-118</u> shall be sized on the basis of the ampere rating of the overcurrent device protecting the circuit conductors in the raceway or cable in accordance with Table 250-122.

(2) <u>Where in combination with other types of equipment grounding conductors, each parallel equipment grounding conductor shall be permitted to be sized in accordance with Table 250-122 on the basis of the ampere rating of the overcurrent device divided by the number of sets of parallel conductors.</u>

(3) (Former Paragraph No. 2)

SUBSTANTIATION: Where conductors are run in parallel in multiple raceways and the raceways are approved as equipment grounding conductors, any equipment grounding conductors within the raceways are extra and not required. Therefore, sizing them on the basis of the full ampere rating of the overcurrent device protecting the circuit conductors in accordance with Table 250-122 is unnecessarily costly and discourages the use of supplemental equipment grounding conductors within the raceways.

PANEL ACTION: Reject.

PANEL STATEMENT: The installation of a wire type grounding conductor in a raceway that otherwise qualifies as an equipment grounding conductor is optional. The panel intends that all required and optional installations shall be completed in accordance with the NEC.

There is no substantiation that equal and effective minimum safety is still maintained. The main rule is referring to equipment grounding conductors installed in parallel and does not intend to offer relief when installed in metallic wiring methods specified in Section 250-118. In the proposed changes to (2), no substantiation provided as to the adequate capacity to clear a fault based on the use of the equation provided in the new language.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #3132)

5- 272 - (250-122(f)(1), Exception (New)): Reject

SUBMITTER: W. E. "Buck" Black, WE Black

RECOMMENDATION: It is suggested that the following exception be added, following 250-122(f)(1):

"Exception: When enlarging an existing feeder circuit by adding one or more parallel runs, all new equipment ground cables shall be sized according to 250-122(f)(1). The existing equipment ground conductors can remain as originally sized if the sum of the cross sections of all ground conductors both old and new is at least 200 percent of the single ground conductor required per Table 250-122. If new ground cables are sized larger than required by Table 250-122, only the cross section shown in the table will be allowed for the 200 percent cross section calculation."

SUBSTANTIATION: Section 250-122(f)(1) places overly conservative restraints on equipment grounding conductors when upgrading large paralleled conductor feeders installed in conduit. The required upsizing of the equipment grounding conductors often results in a replacement of the phase conductors and occasional abandonment of existing conduit due to exceeding the 40 percent fill rule. The requirement for a full size ground conductor in every conduit is belt and suspenders conservative and fails to take into account the dual grounding effectiveness of any individual grounding conductor in a large multiple paralleled run.

The physics behind the safe sizing of equipment grounding conductors is based on two factors:

a) Sufficiently low impedance to develop large fault current flow

b) Sufficient I^2T capability to conduct the fault current without overheating or melting.

The sizing of the equipment grounding conductor in Table 250-122 is based on the use of a single equipment ground conductor. That is, one ground conductor of the indicated size should safely conduct fault current of sufficient magnitude and duration for the circuit overcurrent device to operate. Should the ground conductor be severed or burned in two, all equipment grounding will be lost. If the equipment ground conductor were to come into electrical contact with a phase conductor at mid span in a conduit, fault current would flow from the point of contact back toward the source of the feeder and no flow would occur toward the load. All fault current flow will be through a single cross section of the particular ground cable. With loss of this single ground, the load will lose all grounding and no longer be safe to touch.

Now consider a load served by paralleled conductors, installed in conduit with an equipment ground in each conduit. Just for purposes of tangible example, assume that three paralleled runs constitute this feeder. If a single ground cable is now severed or burned in two, equipment grounding will not be lost since two cables continue to maintain ground. If an equipment ground conductor were to come into electrical contact with a phase conductor at mid span in one conduit, fault current will flow from the point of contact back toward the source of the feeder <u>as well as toward the grounded load.</u> The point of contact is effectively grounded by two cross sections of ground cable at any mid conduit fault in a paralleled feeder circuit. This dual effectiveness was never taken into account when 250-122(f)(1) was drawn up. It was instead based on the conservative Table 250-122, which is predicated on the use of only one equipment ground cable.

The requirement for a full sized ground in every conduit of a paralleled run poses no hardship on new work; it is only when upsizing an existing run that relief should be considered.

The 200 percent requirement will assure that sufficient size and quantity of ground cables are installed such that complete loss or burnout of any one cable will still leave at least 100 percent of the required grounding cross section. This requirement will assure the two-way fault drain (toward the source as well as the grounded equipment) previously described.

PANEL ACTION: Reject.
PANEL STATEMENT: The Code is not retroactive. It is the panel's intent that if an existing feeder is enlarged, it becomes a new feeder. There is no assurance that a fault will only occur in the midspan of the original raceway or cable. An enlarged feeder circuit shall comply with the latest edition of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1751)

5- 273 - (250-122(g)): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Added new text to read as follows:
(g) Transformers and converters. Where the current that may be imposed on an equipment grounding conductor is supplied through a transformer, converter or the like that changes the voltage. The size of the equipment grounding conductor on the secondary side ahead of any secondary side overcurrent protection device, shall have its minimum size determined by multiplying the secondary equipment grounding conductors overcurrent protection device rating ahead of equipment by the secondary to primary voltage ratio.
SUBSTANTIATION: When the current must pass through a transformer, converter, VFD, UPS or the like that changes the voltage the current also changes and the equipment grounding conductor should be adjusted in size to compensate for this change in current. An example is a 45 kva transformer 480 primary 120/208 secondary with 60 amps overcurrent protection on primary wired with three # 6 and one # 10 equipment grounding conductor, the secondary appears to be acceptable to wire with four 1/0 and one # 10 equipment grounding conductor to a 150 amp overcurrent device. The 60 amp overcurrent protection device on primary is protecting the # 10 on the secondary during a ground fault, but the current on the secondary is 480 / 208 = 2.3 times as much current as is on the primary, a #10 equipment grounding conductor is good for 60 amps times 2.3 equals 138 amps minimum equipment grounding conductor on the secondary or a # 6 pertaining to table 250-122 for 138 amps . Or the current on the primary is (208 / 480 = .433...) .4333 of the secondary. The equipment grounding conductor should be a # 6 good for 200 amps times .4333 = maximum primary overcurrent protection device rating of 86.66 amps.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: No substantiation for the proposed additional requirements which are already addressed in Article 250. Equipment grounding conductor sizing for both primary and secondary circuits of transformers or converters are already required to be sized appropriately by other sections of Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MELLO: The Panel Statement is not correct. The conductor that provides "bonding" between the separately derived source (transformer, generator or convertor), and the enclosure with the first disconnecting means is not defined. Some believe this conductor is an equipment grounding conductor with size based on Table 250-122 but there is not overcurrent device ahead to size so this conductor has the proper withstand capacity for the secondary ground fault current. Others believe this conductor is a bonding conductor and should be sized similar to a bonding conductor on the line side of a service. This argument has more credibility because the derived phase conductors can be used and reference to Section 250-103(c) so adequate withstand is provided. This proposal attempts to resolve the issue by defining the conductor as an equipment grounding conductor but specifically requires the size to be increased from that determined from the primary overcurrent device proportionately by the ratio of the current values between the primary and the secondary.

(Log #768)

5- 274 - (250-130(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Nongrounding Receptacle Replacement or Branch Circuit Extensions. The equipment grounding conductor of a grounding-type receptacle or a branch circuit extension, or for short sections of metal raceways or enclosures used to provide support or protection of cable assemblies shall be permitted to be connected to any of the following:.
(Remainder unchanged).
SUBSTANTIATION: While these short sections are not required to be grounded, if grounding is desired the provision of Exception No. 1 for Section 250-134(b) doesn't apply since this section doesn't relate to short sections not involved with grounding of receptacles or extensions. Likewise, Section 250-132 doesn't appear to cover short sections for support or protection but rather appears to cover extensions or additions for wiring systems that do not provide an equipment ground.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation is insufficient for the changes proposed. The proposed text does not add clarity. The proposed text is not appropriate for the Section 250-130(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #769)

5- 275 - (250-132): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Short Sections of Raceways. Isolated sections of metal raceway or cable armor ~~where required~~ to be grounded, shall be grounded in accordance with Section 250-134.
SUBSTANTIATION: Under circumstances where grounding is not required, but done by choice, code rules should be mandated for safety. Otherwise the lack of requirements for size, type identification connections, and manner of installation could result in potential hazard. Optional grounding should meet minimum standards.
PANEL ACTION: Accept in Principle.
Revise to read as follows:
"250-132. Short Sections of Raceway.
If isolated sections of metal raceway or cable armor are grounded, they shall be grounded in accordance with Section 250-134."
PANEL STATEMENT: The panel concludes this action meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
TOOMER: The intent of the code, as written, meets the intent of the submitter.

(Log #2306)

5- 276 - (250-134(b)): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.
RECOMMENDATION: Revise text to read as follows:
"By an equipment grounding conductor contained within the same raceway, cable, cord, or if direct buried, in the same trench.
(FPN) The equipment grounding conductor must be kept in close proximity to the phase conductors to keep the impedance as low as possible. For further information see IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems, ANSI/IEEE Standard 142-1991."
SUBSTANTIATION: The existing terminology "... or otherwise run with the circuit conductors" is too vague. The present wording of this Section has been interpreted to permit the installation of a large duct bank with only one equipment grounding conductor for the entire duct bank thus eliminating the need to install separate equipment grounding conductors in each PVC conduit. This installation was understood to be

acceptable based on the premise that this was "otherwise run with the circuit conductors". The impedance could get too great between the circuit conductors and the equipment grounding conductor and could possibly prevent proper operation of the overcurrent protection device when installed in this manner. Adding this clarification would align this section with Section 300-3(b).
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed language does not improve clarity or cover all applications. Section 250-122(f) addresses the situation as described by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3899)

5- 277 - (250-140): Reject
SUBMITTER: Douglas Hansen, Codecheck
RECOMMENDATION: Delete item 3 in the list of conditions allowing the frames of appliances to connect to the grounded conductor.
SUBSTANTIATION: This section contradicts Section 338-3(b) and is commonly used to justify uses of other wiring methods (such as nonmetallic sheathed cable) in the same application (using a bare grounded conductor to ground the frame of appliances). There is no longer any need for this item to be included in the code.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 250-140 is applicable to existing range and dryer circuits and item (3) should remain as this was allowable in previous editions of the Code. It allows existing wiring in this manner to remain unchanged if it exists in a manner specified in item (3) of the section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3429)

5- 279 - (250-142(b)): Reject
SUBMITTER: Tom Baker, TB Training
RECOMMENDATION: Revise text to read as follows:
"(b) Load-Side Equipment. Except as permitted in Sections 250-30(a)(1) and 250-32(b), a grounded circuit conductor shall not be used for grounding noncurrent-carrying metal parts of equipment on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means or the overcurrent devices for a separately derived system not having a main disconnecting means.
Exception No. 1: The frames of ranges, wall-mounted ovens, counter-mounted cooking units, and clothes dryers under the conditions permitted for existing installations by Section 250-140 shall be permitted to be grounded by a grounded circuit conductor.
Exception No. 2: It shall be permissible to ground meter sockets ~~enclosures~~ by connection to the grounded circuit conductor on the load-side of the service disconnect if:
(a) No service ground-fault protection is installed, and
(b) All meter sockets ~~enclosures~~ are located near the service disconnecting means, and...".
SUBSTANTIATION: For the 1999 NEC, the title of Article 373 and Scope in 373-1 was changed to Cabinets, Cutout Boxes, and Meter Socket Enclosures, adding Meter Sockets.
Article 250-142(b) Load-Side Equipment, Exception No. 2(b) refers to meter enclosures.
The term meter socket is used 6 times in the 1999 NEC. The term meter enclosure is used twice in Article 250.
The terms in Article 250 should be consistent with other sections of the NEC. This proposal is to change meter enclosures to meter sockets.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "meter enclosures" includes more than just meter sockets.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #4188)

5- 280 - (250-142(b) Exception No. 4): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Insert an additional Exception No. 4 as follows:
Exception No. 4: A grounded neutral conductor derived from the supply system shall be connected to the pressure vessel containing the electrodes of an electrode-type boiler operating over 600 volts in accordance with Section 490-72(e)(1). All exposed noncurrent-carrying metal parts of the boiler and exposed grounded structures or equipment shall be bonded to the pressure vessel or to the derived neutral conductor, in accordance with Section 490-74.
SUBSTANTIATION: This is, in effect, former Section 250-61(b) Exception No. 4 in the 1996 NEC. It has been editorially modified to use a complete sentence structure in accordance with current style manual requirements. CMP 5 removed this exception in the 1999 cycle because Section 90-3 accomplished the same ends; its subject matter fell into Chapter 7 and therefore modified this section anyway. The panel lost track of the fact that CMP 13 relocated these requirements into Chapter 4, as part of the new Article 490. The result is a new direct conflict in the NEC that needs appropriate correlation.
PANEL ACTION: Accept in Principle.
Add a new Exception No. 4 to Section 250-142(b) to read as follows:
"Exception No. 4. Electrode-type boilers operating at over 600 volts shall be grounded as required in Sections 490-72(e)(1) and 490-74."
PANEL STATEMENT: The panel concludes that this action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #636)

5- 281 - (250-146): Reject
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Relocate Section 250-146 without change to proposed new Article 420 as Section 420-9.
420-10~~250-146.~~ Connecting Receptacle Grounding Terminal to Box. An equipment bonding jumper shall be used to connect the grounding terminal of a grounding-type receptacle to a grounded box unless grounded as in (a) through (d).
(a) Surface Mounted Box. Where the box is mounted on or at the surface, direct metal-to-metal contact between the device yoke and the box shall be permitted to ground the receptacle to the box. This provision shall not apply to cover-mounted receptacles unless the box and cover combination are listed as providing satisfactory ground continuity between the box and the receptacle.
(b) Contact Devices or Yokes. Contact devices or yokes designed and listed for the purpose shall be permitted in conjunction with the supporting screws to establish the grounding circuit between the device yoke and flush-type boxes.
(c) Floor Boxes. Floor boxes designed for and listed as providing satisfactory ground continuity between the box and the device shall be permitted.
(d) Isolated Receptacles. Where required for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, a receptacle in which the grounding terminal is purposely insulated from the receptacle mounting means shall be permitted. The receptacle grounding terminal shall be grounded by an insulated equipment grounding conductor run with the circuit conductors. This grounding conductor shall be permitted to pass through one or more panelboards without connection to the panel board grounding terminal as permitted in Section 384-20, Exception, so as to terminate within the same building or structure directly at an equipment grounding conductor terminal of the applicable derived system or service.
FPN: Use of an isolated equipment grounding conductor does not relieve the requirement for grounding the raceway system and outlet box.
SUBSTANTIATION: This is a general installation requirement. It is more in line with the scope of proposed Article 420 than the scope of Article 210. Over many code cycles the general installation and construction requirements for receptacles, attachment plugs and cord connectors have been adopted in various sections of the Code. The intent of this proposal is to locate the general installation requirements for receptacles and

cord connectors to the new Article 420. New Article 420 covers requirements for installation, mounting, grounding and non-interchangeability. This proposal brings the related requirements into a single article thereby making it easier for the code user to locate them.

The Task Group recognizes that by moving this requirement, the application is expanded from receptacles mounted adjacent to wet bars to a general requirement wherever receptacles are mounted in work surfaces or countertops. The task group believes a safety hazard exists wherever receptacles are mounted face up because foreign materials are likely to enter the receptacle and come in contact with current carrying parts.

The proposal was developed by a Task Group of CMP 18 appointed by the chairman to consider separating 1999 NEC Article 410 into two articles, one covering fixtures and the other covering receptacles, attachment plugs and cord connectors. This Task Group was appointed in response to Proposal 18-55 for the revision of the 1996 NEC.

PANEL ACTION: Reject.

PANEL STATEMENT: If the proposed Article 420 is accepted and inserted into the 2002 NEC, then this new article should refer to Section 250-146 for grounding requirements. There are requirements in Section 250-146 that properly belong in Article 250 and not in Article 420. Premises wiring grounding is a comprehensive system that incorporates equipment and installation grounding requirements. Separating the rules will make it more difficult for the user to understand and implement all the requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #3011)

5- 282 - (250-146(a)): Accept

SUBMITTER: Robert H. Keis, Dover, DE

RECOMMENDATION: Delete the words "or at" in the first sentence. Sentence would then read as follows:

Where the box is mounted on ~~or at~~ the surface, direct metal to metal contact between the device yoke and box shall be permitted..." (balance of paragraph to remain as is).

SUBSTANTIATION: Mr. Hartwell's argument in the original proposal for the 1999 edition is incorrect concerning the contact between an old-work box and the device. He stated also, "There is no dispute that some installation practices result in questionable continuity. That is why we have electrical inspections (at least for now, and that is the premise of the entire code)." When "old work" boxes are installed in walls of any type, the box support fittings seat against the finish wall. The screw hole is recessed behind this box support. In order for the wall plate to properly seat against the wall surface the "plaster ears" must be removed from the receptacle. This is the point where Mr. Hartwell states the contact surface is the same with old and new work. This is not so. The only contact surface is at the screw itself, which is a very small part of the device.

Now the real problem. Apparently Mr. Hartwell and the panel both believe that everything that is installed is going to be inspected. Let's be real. Some areas don't have electrical inspection. Some building codes don't require inspection or permits until a certain financial point is reached. Some areas require inspection, if a permit is obtained, but the electrician, homeowner or whoever says, I can do this and no one will know. Even without inspection the jobs usually are put in by code, but many, many times I have installed old work boxes as Mr. Hartwell described and then went back later and found that the walls have been covered with many things, such as paneling, wallpaper, in the kitchen and bathrooms the walls have been covered with ceramic tile. What happens to the metal to metal contact now? It would really be naive to think that someone is going to install bonding jumpers at this point in time. This can happen days or months after the box was cut into the wall. There could even be a new owner. Do you really believe that whoever installed the paneling or the ceramic tile is going to call the electric inspector to look at work that has nothing to do with electricity, except to possibly set up an electrocution or fire hazard? This is a very serious electrical hazard just waiting to kill someone.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #4010)

5- 283 - (250-146(a)): Accept in Principle

SUBMITTER: Christopher Pharo, Rep. IBEW

RECOMMENDATION: This proposal is delete the wording "or at".

"Section 250.146(a) Surface Mounted Box. Where the box is mounted on ~~or at~~ the surface, direct metal to metal contact between the...".

SUBSTANTIATION: A box installed during the rough in phase of a project is sometimes not flush with the GWB. The boxes must be installed perfectly, usually with a factory made mounting bracket, in order to be totally flush. However, if multiple ganged receptacles are required, then the installer must adapt to the field conditions. This is usually done by directly fastening the box to the stud with self-tapping screws. Most installers would rather "err" in keeping the box behind the surface of the GWB rather than risk having the box extend out beyond the surface of the GWB. Another problem would be the use of 5/8 in. GWB. Tile rings come in either 1/2 in. or 3/4 in. not 5/8 in. This is close enough on some jobs but what people seem to forget is that the threaded 6/32 in. bolt in conjunction with the direct metal to metal contact between the yoke of the receptacle and the box itself is a "green wire".

It can be argued that the electrician should not rely on the box as the ground in these instances. I agree, but how in the world can an inspector be asked to pass any future project without dismantling every receptacle in question to make sure that if it does not conform, then it must have a green pigtail to the box. In today's competitive world it seems unfair to place this burden on the inspectors whom already have their work cut out for them. Simply by deleting these two words, "or at", this code section can be enforced quickly and fairly.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel concludes that Proposal 5-282 meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #415)

5- 284 - (250-146(e) (New)): Reject

SUBMITTER: William L. Porubek, Dept. of Labor and Industries, WA

RECOMMENDATION: Add a new 250-146(e) to read:

Cover Mounted Devices. Receptacles, switches and any other current carrying devices mounted in raised or removable metal covers shall be grounded by an equipment bonding jumper to provide grounding continuity to the cover when removed from the box.

SUBSTANTIATION: The problem exists that metal covers become isolated when removed from the box and could cause a shock hazard to an individual coming in contact with it.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel concludes that Section 250-146(a) adequately addresses cover mounted receptacles under normal conditions. Switch requirements are not appropriate for Section 250-146.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #770)

5- 285 - (250-148): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Continuity and Attachment of Equipment Grounding and Bonding Conductors to Boxes. Where more than one wire type equipment grounding or bonding conductors enters a box or other enclosure all such conductors shall be spliced or joined within the box or other enclosure or to the metal box or enclosure with devices suitable for the use. Connections depending solely on solder shall not be used. Splices shall be made in accordance with Section 110-14(b) except that insulation shall not be required. The arrangement of grounding or bonding connections shall be such that the disconnection or removal of a receptacle fixture, or other device fed from the box will not interfere with or interrupt the grounding or bonding continuity.

Exception: No change.
(a) Metal Boxes. A connection shall be made between the one or more equipment grounding or bonding conductors and a metal box by means of a grounding screw that shall be used for no other purpose or a listed grounding device.
SUBSTANTIATION: Bonding conductors may also enter boxes or the enclosures. Metal boxes are noted for specificity, and correlation with (a).
PANEL ACTION: Reject.
PANEL STATEMENT: The revised wording does not add clarity to the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1785)

5- 286 - (250-148): Accept
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Revise the first sentence to read as follows:
"Where more than one equipment grounding conductor enters an outlet, device, or junction box, all such . . ." (the remainder to be unchanged)
SUBSTANTIATION: The present requirement requires an equipment grounding conductor pulled through a pull box to be cut or tapped and connected to the box even though no similar requirement applies to conduit bodies used for the same purpose, and even though the other conductors running through the box are permitted to be left intact. In the event that a metal pull box is used with nonmetallic conduit or other wiring methods that do not themselves provide for grounding of the box, an equipment grounding conductor will be required to be run with the circuit conductors and the box will be required to be grounded by other provisions of Article 250, specifically 250-80 or 250-86 and Part F.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #2475)

5- 287 - (250-148): Reject
SUBMITTER: Jeffrey H. Armstrong, Electrical Training and Consulting Services
RECOMMENDATION: Reword to state that all boxes shall be grounded.
SUBSTANTIATION: Sections 250-148 and 250-148(a) are redundant.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no specific recommendation made by the submitter in the proposal. Section 4.3.3(c) of the Regulations Governing Committee Projects requires proposals to include proposed text, including the wording to be added, revised (and/or) revise, or deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3161)

5- 288 - (250-148 and (a)): Reject
SUBMITTER: Jeffrey H. Armstrong, Electrical Training and Consulting Services
RECOMMENDATION: 250-148 and 250-148(a) are redundant. Reword to state that all boxes shall be grounded.
SUBSTANTIATION: None given.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no specific recommendation made by the submitter in the proposal. Section 4.3.3(c) of the Regulations Governing Committee Projects requires proposals to include proposed text, including the wording to be added, revised (and/or) revise, or deleted. Also, this proposal does not provide substantiation for the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #1786)

5- 289 - (250-148(a)): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Revise the subsection to read as follows:
"A connection shall be made between the one or more equipment grounding conductors and a metal outlet box by means of . . ." (remainder to be unchanged).
SUBSTANTIATION: Connection methods for metal boxes other than outlet boxes are already covered in the main rule of Section 250-148. For large equipment grounding conductors, the rules of Section 110-14(b) and 250-8 are sufficient. Grounding screws and "listed grounding devices" are not appropriate, necessary, or available for such large conductors. This revision will also make subsection (a) consistent with subsection (b).
PANEL ACTION: Reject.
PANEL STATEMENT: The is no technical substantiation for this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3812)

5- 289a - (250-150): Reject
SUBMITTER: Douglas Hansen, Codecheck
RECOMMENDATION: Delete item 3 in the list of conditions allowing the frames of appliances to connect to the grounded conductor.
SUBSTANTIATION: This section contradicts Section 338-3(b) and is commonly used to justify uses of other wiring methods (such as nonmetallic sheathed cable) in the same application (using a bare grounded conductor to ground the frame of appliances). There is no longer any need for this item to be included in the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 250-150 does not exist in the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #771)

5- 290 - (250-162): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add to the first paragraph:
In all other respects grounding methods shall comply with applicable requirements prescribed in other parts of this code.
Revise (a) Exception No. 2: A rectifier-derived dc system supplied from an ac system complying with Section 250-20, where there is electrical isolation between the supply conductors and the derived system conductors, shall not be required to be grounded. Where there is a direct electrical connection between the ac system and the dc system, the derived dc system shall not be grounded.
SUBSTANTIATION: Since Part H doesn't specifically indicate other requirements covered in Part B which may be applicable for dc systems, the proposal would clarify that some of those requirements do apply, such as Sections 250-50; 250-56; 250-64; 250-68; 250-70, etc.
If Exception No. 2 is not used, a rectifier without an isolating transformer, if grounded, in effect provides a ground for the supply system, if ungrounded, or a short-circuit or second ground on a grounded supply conductor if the supply system is grounded, dependent on which dc conductor is grounded.
It is somewhat puzzling that such dc systems regardless of capacity or extent may be ungrounded while grounding is apparently required for dc generators regardless of capacity and 3-wire dc systems regardless of voltage or capacity. Such rectifier systems should supply various equipment in unlimited areas, without a ground detector, in contrast to Exception No. 1 which applies to other systems.

PANEL ACTION: Reject.
PANEL STATEMENT: The submitter is repeating the concept from the 90-3 unnecessarily. The submitter has not provided adequate substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #772)

5- 291 - (250-166(f) (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add new paragraph (f) to read as follows:

(f) Class 1, Class 2, and Class 3 Separtely Derived Systems. A separately derived system that supplies a Class 1, Class 2, or Class 3 circuit(s) shall not be required to have a grounding electrode conductor connection to a grounding electrode where all of the following conditions are met:

(1) The power source is rated not more than 1000 volt-amperes.

(2) The power source is a rectifier and the enclosure is grounded by one of the means specified in Section 250-118, or a stand-alone solar photovoltaic system.

(3) The conductor to be grounded is bonded to the rectifier enclosure or the solar photovoltaic power source disconnecting means by a jumper not smaller than the largest derived circuit conductor and not smaller than No. 14 copper or No. 12 aluminum or copper-clad aluminum.

SUBSTANTIATION: While some of these systems especially Class 2 and 3 may be exempt from grounding by (a), where they are grounded by choice or where the voltage is over 50 as indicated in (a), Table 11(b) of Chapter 9, and as required by Section 690-41, it appears a grounding electrode conductor sized in accorance with (b) connected to an electrode per (c), (d), or (e), or Section 690-47 is required.

There does not appear to be any present provision for such dc circuits as provided for ac circuits in the exception for Secton 250-30(2).

(See my proposal for Section 250-162(a), Exception No. 2).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes that repeating the requirement here is unnecessary. The recommended text does not add to the clarity of this section. The proposed new (f) is not appropriate for Section 250-166 titled "Size of Direct-Current Grounding Electrode Conductor."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #773)

5- 292 - (250-168): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Direct-Current Bonding Jumper. For grounded dc systems, an unspliced bonding jumper shall be used to connect the equipment grounding conductor(s) to the grounded conductor of the system. The point of connection shall be the same as the grounding electrode conductor as required in Section 250-164. The ~~the~~ size of the bonding jumper shall not be smaller than the system grounding electrode conductor specified in Section 250-166 (a) and (b).

SUBSTANTIATION: Which bonding jumper is referenced? A "main" bonding jumper must be inferred since specifics are lacking. Section 250-28 applies to ac systems, and Section 250-30(a)(1) does not apply. Since a main bonding jumper is a critical componet of a fault return path, a reduction in size per Section 250-166(c) and (d) should not be included, just as it is not included for ac system main bonding jumpers per Section 250-28(d).
PANEL ACTION: Reject.
PANEL STATEMENT: The recommended text is not clear and suggested wording is confusing. There is no substantiation for the bonding jumper to be unspliced.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #774)

5- 293 - (250-169): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Ungrounded Direct-Current ~~Separately Derived~~ Systems. Except as permitted in Section 250-34 for portable and vehicle-mounted generators, an ungrounded separately derived system supplied from a stand-alone power source such as an engine-generator set, and ungrounded individual services supplied from an off-premises supply station shall have a grounding electrode conductor connected to an electrode that complies with Part C, to provide for grounding of metal enclosures, raceways, cables, and exposed noncurrent-carrying metal parts of equipment. The grounding electrode conductor connection shall be to the metal enclosure, or nonflexible metal raceway at any point on the separately derived system from the source to the first system disconnecting means or overcurrent device ~~or it shall be made at the source of a~~ Where the separately derived system ~~that~~ has no disconnecting means or overcurrent device, or directly supplies multiple circuits the connection ~~it~~ shall be made at the source of the separately derived system. Where multiple circuits are directly supplied the equivalent area of the largest conductor shall be considered as the sum of the areas of the largest conductor of each circuit.

For services the grounding electrode conductor connection shall be made to the metal enclosure of the service conductors or to the nonflexible metal service raceway at any convenient point from the load end of the service drop or service-lateral to the service disconnecting means. Where a service consists of more than a single disconnect, as permitted in Section 230-40, Exception No. 2, a single point of connection shall be permitted. The size of the grounding electrode conductor shall be in accordance with Section 250-166.

SUBSTANTIATION: Part H has substantially incorporated requirements for dc system grounding electrode conductors and grounding electrodes, except ungrounded services do not appear to be specifically covered. Section 250-24(d) relates to ac services and Section 250-32(c) does not apply to services.

Nonflexible metal service raceways are proposed as a suitable connection point. One connection point is indicated as acceptable for multiple disconnects since required service bonding will provide adequate grounding.

Where separately derived systems directly supply multiple circuits, there is a question of how to size the grounding electrode conductor; should it be based on the largest conductor of any one circuit or the aggregate area of the largest conductors of each circuit?

(See substantiation for my proposal for Section 250-30(a)(1) for separately derived systems.)
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wording is unclear and confusing. The panel is not clear as to the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #775)

5- 294 - (250-184): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

(a) ~~Neutral~~ Grounded Conductor. The minimum insulation level for ~~neutral~~ grounded conductors of solidly grounded systems shall be 600 volts.

Exception No. 1: Bare copper conductors shall be permitted to be used for the ~~neutral~~ grounded conductor of service entrances, service-laterals, and ~~the neutral of~~ direct-buried portions of feeders.

Exception No. 2: Bare conductors shall be permitted for ~~the neutral of~~ overhead portions of spans installed outdoors, in accordance with Sections 225-4 and 230-22 Exception.

~~FPN: See Section 225-4 for conductor covering where within 10 ft (3.05 m) of any building or other structure.~~

(b) Multiple Grounding. The ~~neutral~~ grounded conductor of a solidly grounded system shall be permitted to be grounded at more than one point for:
(1) Services
(2) Direct-buried portions of feeders employing a ~~bare~~ copper ~~neutral~~ conductor.
(3) Overhead aerial portions installed outdoors.
(c) ~~Neutral~~ Grounding Conductor. The ~~neutral~~ grounding conductor shall be permitted to be a bare conductor if isolated from phase conductors and protected from physical damage.
SUBSTANTIATION: There doesn't seem to be a safety reason to limit this section to neutral which excludes its use where the service and distribution system is 2-wire, such as in mobile home parks, recreational vehicle parks, etc., where transformation is to single-phase low-voltage utilization values.
If the neutral (grounded) conductor of service entrances can be bare, why not service laterals?
The limitation of Exception No. 2 to neutrals would not permit a bare grounded conductor of a 2-wire system as a service-drop conductor since it is not specifically permitted, as required to invoke the exception for Section 225-4.
In (b)(2) the bare copper restriction precludes multiple grounding of insulated conductors, using approved splicing methods. The condition of a bare conductor does not seem pertinent.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not support the recommendation. Grounded conductors are usually neutral conductors, but in this section the grounded conductor is always a neutral. The section should remain as presently worded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17

(Log #3413)

5- 295 - (250-184): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Completely rewrite 250-184 as follows:
250-184. Solidly Grounded Neutral Systems.
(a) Neutral Conductor Insulation Rating. The minimum insulation level for neutral/identified conductors of solidly grounded systems shall be 600 volts.
Exception No. 1: Bare conductors shall be permitted to be used outdoors for the service entrances where the equipment is station type equipment located outdoors. The equipment grounding conductor or direct-buried portions of feeders may be bare conductor.
FPN: See Section 225-4 for conductor covering where within 10 ft (3.05 m) of any building or other structure.
(b) Grounding. The neutral/identified conductor of a solidly grounded neutral system above 1 kV and over (high voltage) shall be grounded at one location only, preferably at the source transformer or generator.
(3) The neutral/identified conductor shall be insulated and isolated from earth except at one location.
(4) A separate bare equipment grounding conductor shall be installed and run with the phase conductors and the insulated neutral/identified conductor and shall extend into the customer's property along with the insulated phase and insulated neutral/identified conductor(s).
(c) Utility Source. The interface between the utility source and the customer's property shall have:
(2) A neutral isolator/blocker device installed between the utility's multiple neutral grounded conductor and the customer's isolated and insulated neutral/identified conductor. Such neutral blocking device shall be listed by Underwriters Laboratories as per 250-2(d).
(3) A separate bare equipment grounding conductor shall be installed and run with the phase conductors and extending into the customer's property.
(d) Neutral/Identified Conductor. The neutral/identified conductor shall be an insulated conductor. The neutral/identified conductor shall have sufficient ampacity for the load imposed on the conductor, but not less than unbalanced ampacity of the phase conductors. The neutral/identified conductor shall be designed to carry unbalanced phase current continuously.
(e) Equipment Grounding Conductor.
(2) The equipment grounding conductor may be bare and shall have sufficient ampacity for the load imposed on the conductor, but not less than 20 percent of the ampacity of the phase conductors.
(3) The equipment grounding conductor shall be connected to each transformer and to the transformers' grounding electrode and at other additional locations by connection to existing ground electrodes.
(4) The equipment grounding conductor shall have at least one grounding electrode installed and connected to the equipment grounding conductor every 400 m and the maximum distance between any two adjacent electrodes shall not be more than 400 meters.
(5) The equipment grounding conductor shall be available for fault current duty only and the equipment grounding conductor shall not carry or conduct continuous current.
(6) In a multiple grounded shielded cable system there shall be, if required, a separate insulated neutral/identified conductor. The equipment grounding shield shall be grounded at each cable joint which is exposed to personnel contact.
SUBSTANTIATION: 250-184 is shown in its complete form for the ease of reading and understanding by the panel members. This will allow them to see how the individual proposals modifying 250-184 fit together.
There are such laws such Ohm's Law and Kirchoff's Laws. Now there is Zipse's Law — Zipse's Law:
"In order to have and maintain a safe electrical installation:
All continuously, flowing current shall be contained within an insulated conductor or if a bare conductor, the conductor shall be installed on insulators, insulated from earth, except at one place within the system and only one place can the neutral be connected to earth.
A system is defined as the conductors between transformers or after the last transformer."
Approximately 25 years ago, what is now Code Making Panel 19 made mandatory the connection of trailers using 4 or 5 wire systems. The panel recognized the hazards associated with multiple connection of the neutral conductor, identified conductor to earth/ground. Two (2) or three (3) phase conductors, and insulated neutral conductor and a bare ground conductor were required.
One or two Code cycles later another Code Making Panel made mandatory the connection of Marinas using 4 or 5 wire systems thus eliminating the hazardous condition of stray, uncontrolled flow of current over metallic conducting paths and water.
It was not until the 1996 edition of the NEC that this panel, Code Making Panel No. 5, saw clear to make ranges and dryers wiring mandatory using 4 or 5 wire systems with an insulated and isolated neutral/identified conductor and a separate equipment ground/earth conductor.
It makes sense then that the high voltage electrical systems under the control of the NEC and Code Making Panel No. 5 would follow the same logic, that the neutral/identified conductor would be insulated and connected to earth at only one place in order to eliminate hazardous flow of uncontrolled stray current. It has been reported that persons in showers and swimming pools and dairy cows have received electric shock from this stray uncontrolled flow of neutral return current flowing uncontrolled over the earth, metallic piping and other conductive surfaces.
If and when the public is informed of the dangers associated with multiple neutral to ground/earth connections that result in hazardous uncontrolled flow of stray current over the earth, interior water and gas piping systems and other conducting paths that result in electric shocks to the inhabitants, law suits will probably follow.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal calls for changes that would isolate the grounded conductor of the premises wiring system from the equipment grounding system. During fault and/or lightning disturbances, premises equipment with cases and frames referenced to the equipment grounding conductor will be subject to potentially damaging high voltage as a result of ground potential rise.
The substantiation cites elimination of stray current. The panel does not agree that the proposed arrangement will accomplish this. Stray current could still enter the premises system through the equipment grounding conductor proposed to be run to the source. Control of stray current can be accomplished by other means without subjecting premises wiring to the referenced hazards.
The submitter has not provided adequate substantiation for the proposed major changes in this section. Although the 4 or 5 wire systems are required for trailers and marinas, they are not required for other residential occupancies nor are they required for any commercial or industrial occupancy. The submitter has not substantiated reasons for requiring the 5 wire system for systems of 1 KV and over which are typically industrial facilities.

The following represent some of the areas where substantiation is lacking.

1) A neutral conductor of a grounded system is required to be identified by 200-2. There is no substantiation for the use of the term "neutral/identified".

2) There is no substantiation of why bare conductors can only be used at outdoor station type equipment.

3) There is no substantiation for permitting aluminum for a neutral conductor that was not previously permitted.

4) The neutral conductor is specified to be grounded in one location only. This requirement cannot be met for a service supplied directly from a utility high voltage system without an isolation transformer.

5) A neutral isolator/blocker cannot be provided unless the system is a separately derived system. There is no alternative given for a service supplied directly from the utility without a transformer.

6) There is no substantiation for requiring the neutral conductor to be insulated.

7) The equipment grounding conductor is specified to have "sufficient ampacity for the load imposed on the conductor". An equipment grounding conductor is not intended to carry load current.

8) The requirement for the equipment grounding conductor to have an ampacity not less than 20 percent of the phase conductor ampacity is not consistent with Table 250-122 with no substantiation.

9) There is no substantiation of why connection of the equipment grounding conductor to "additional" locations can only be to existing electrodes. If there are no existing grounding electrodes, is the equipment grounding conductor not grounded at other locations?

10) There is no substantiation for requiring the equipment grounding conductor to be connected to a grounding electrode at least every 400 meters.

11) A shielded cable is not specified as to when it is required.

12) There is no substantiation of why the equipment ground shield is to be grounded at each cable joint exposed to personnel contact.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: The proposal should be accepted in principle. The term "identified" can be deleted because it doesn't add clarity and is unnecessary. Bare neutral conductors are intended to be allowed only where they do not establish another "path" through the earth. Restricting neutral grounding to only one location can be accomplished within the scope of the NEC. Normal current should be restricted to those conductors that are insulated or isolated from the earth and other non-intended conductive paths.

(Log #3402)

5- 296 - (250-184(a)): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Delete 250-184(a) and replace with:

250-184. Solidly Grounded Neutral Systems.

(a) Neutral Conductor Insulation Rating. The minimum insulation level for neutral/identified conductors of solidly grounded systems shall be 600 volts.

SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.

It would appear to be shear folly for the NEC, Code Making Panel No. 5 to copy the NESC when there are flaws in that code. Other countries such as the European Community countries do not allow stray uncontrolled current to flow continuously of the earth that can and has resulted in electric shocks to not only cows, but humans also.

There are two technical papers with details of this problem on the web at location: www.mikeholt.com/Newsletters/8-16-99.doc and at www.mikeholt.com/Newsletters/8-17-99.doc.

For additional justification please see the other 250-184 proposals.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3403)

5- 297 - (250-184(a) Exception No. 1): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Delete 250-184(a) Exception No. 1 and replace with:

250-184. Solidly Grounded Neutral Systems.

Exception No. 1: Bare conductors shall be permitted to be used outdoors for the service entrances where the equipment is station type equipment located outdoors. The equipment grounding conductor of direct-buried portions of feeders may be bare conductor.

FPN: See Section 225-4 for conductor covering where within 10 ft (3.05 m) of any building or other structure.

SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.

For additional justification please see the other 250-184 proposals.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #1475)

5- 298 - (250-184(b)): Accept

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 4, 10, and 13 for information.

SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Change 250-184(b) to read:

(b) Multiple Grounding. The neutral of a solidly grounded neutral system shall be permitted to be grounded at more than one point and shall include the following:

1. Transformers supplying feeder taps or services to a building or other structure;
2. Underground portions of feeders where the neutral is exposed;
3. Overhead portion installed outdoors.

SUBSTANTIATION: Technically a feeder tap installed or owned by an independent operator of an overhead distribution system is not a service unless that operator is classified as a utility. The need for a multiple ground at this type installation is still valid. This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall

(CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.
Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3404)

5- 299 - (250-184(b)): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Delete 250-184(b) and
250-184(b)(1) and
250-184(b)(2) and
250-184(b)(3)
Replace with:
250-184. Solidly Grounded Neutral Systems.
(b) Grounding. The neutral/identified conductor of a solidly grounded neutral system above 1 kV and over (high voltage) shall be grounded at one location only, preferably at the source transformer or generator.
(1) The neutral/identified conductor shall be insulated and isolated from earth except at one location.
(2) A separate bare equipment grounding conductor shall be installed and run with the phase conductors and the insulated neutral/identified conductor and shall extend into the customer's property along with the insulated phase and insulated neutral/identified conductor(s).
SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.
For additional justification please see the other 250-184 proposals.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3405)

5- 300 - (250-184(c)(1)): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Delete 250-184(c)(1) and replace with:
250-184. Solidly Grounded Neutral Systems.
(c) Utility Source. The interface between the utility source and the customer's property shall have:
(1) A neutral isolator/blocker device installed between the utility's multiple neutral grounded conductor and the customer's isolated and insulated neutral/identified conductor. Such neutral blocking device shall be listed by Underwriters Laboratories as per 250-2(d).
SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.
For additional justification please see the other 250-184 proposals.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3406)

5- 301 - (250-184(c)(2)): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Delete 250-184(c)(2) and replace with:
(c) Utility Source. The interface between the utility source and the customer's property shall have:
(2) A separate bare equipment grounding conductor shall be installed and run with the phase conductors and extending into the customer's property.
SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.
For additional justification please see the other 250-184 proposals.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #1476)

5- 302 - (250-184(d) (New)): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 4, 10, and 13 for information.
The Technical Correlating Committee directs the Panel to provide a Title.
This action will be considered by the Panel as a Public Comment relative to the title.
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Add a paragraph (d) to section 250-184 to read:
(d) The neutral conductor shall be of sufficient ampacity for the load imposed on the conductor but not less than 20 percent of the ampacity of the phase conductors. The neutral conductor shall be grounded at each transformer and at other additional locations by connection to a made or existing electrode. At least one grounding electrode shall be installed and connected to the circuit every 400 m and the maximum distance between any two adjacent electrodes shall not be more than 400 meters. In a multi-grounded shielded cable system, the shielding shall be grounded at each cable joint which is exposed to personnel contact.
SUBSTANTIATION: The value of multiple grounding and a standard for its installation is recognized as good engineering practices throughout the utility industry in the USA. This proposal is in harmonization with 1997 NESC paragraph 93-C-2.
This proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Articles 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

BRENDER: It would be a mistake to adopt practices from the NESC into the NEC. The NESC applies to utilities only, and normally utilities would correct a phase imbalance of 10 percent or greater. Individual utility customers, of the type that would be governed by the National Electrical Code would not necessarily do so. Very simply, customers behave differently than utilities.

Further, most utilities usually order a 1/3 neutral per phase, which adds up to a full size neutral per circuit. Sometimes, owing to the nature of their systems, multiple paths may exist from a fault back to a source. Only under careful engineering supervision, which utilities are capable of, would they consider a smaller neutral.

I personally have encountered many technically-unsophisticated end users who have leased or purchased a facility served at distribution voltages over 1kV, and they do not have the trained personnel of a utility company to operate their high voltage internal systems, nor even an awareness of the level of training and supervision required.

Irrespective of the NESC, there is no substantiation presented that a 20 percent neutral is safe or adequate for customer systems. It is clear from the proposal's wording on 400 m spacing between grounding electrodes that the submitter had utility companies in mind. There is no reason whatsoever for the National Electrical Code to adopt utility practices to public-at-large facilities. This proposal diminishes safety.

DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3407)

5- 303 - (250-184(d) (New)): Reject

SUBMITTER: Donald W. Zipse, West Chester, PA

RECOMMENDATION: Add new text to read as follows:

250-184. Solidly Grounded Neutral Systems.

(d) Neutral/Identified Conductor. The neutral/identified conductor shall be an insulated conductor. The neutral/identified conductor shall have sufficient ampacity for the load imposed on the conductor, but not less than unbalanced ampacity of the phase conductors. The neutral/identified conductor shall be designed to carry unbalanced phase current continuously.

SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.

For additional justification please see the other 250-184 proposals.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 5-295.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3408)

5- 304 - (250-184(e)(1)): Reject

SUBMITTER: Donald W. Zipse, West Chester, PA

RECOMMENDATION: Revise text to read as follows:

250-184. Solidly Grounded Neutral Systems.

(e) Equipment Grounding Conductor.

(1) The equipment grounding conductor may be bare and shall have sufficient ampacity for the load imposed on the conductor, but not less than 20 percent of the ampacity of the phase conductors.

SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.

For additional justification please see the other 250-184 proposals.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 5-295.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3409)

5- 305 - (250-184(e)(2)): Reject

SUBMITTER: Donald W. Zipse, West Chester, PA

RECOMMENDATION: Revise text to read as follows:

250-184. Solidly Grounded Neutral Systems.

(e) Equipment Grounding Conductor.

(2) The equipment grounding conductor shall be connected to each transformer and to the transformer's grounding electrode and at other additional locations by connection to existing ground electrodes.

SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.

For additional justification please see the other 250-184 proposals.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 5-295.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3410)

5- 306 - (250-184(e)(3) (New)): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Add new text to read as follows:
250-184. Solidly Grounded Neutral Systems.
(e) Equipment Grounding Conductor.
(3) The equipment grounding conductor shall have at least one grounding electrode installed and connected to the equipment grounding conductor every 400 m and the maximum distance between any two adjacent electrodes shall not be more than 400 meters.
SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.
For additional justification please see the other 250-184 proposals.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3411)

5- 307 - (250-184(e)(4) (New)): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Add new text to read as follows:
250-184. Solidly Grounded Neutral Systems.
(e) Equipment Grounding Conductor.
(4) The equipment grounding conductor shall be available for fault current duty only and the equipment grounding conductor shall not carry or conduct continuous current.
SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.
For additional justification please see the other 250-184 proposals.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #3412)

5- 308 - (250-184(e)(5) (New)): Reject
SUBMITTER: Donald W. Zipse, West Chester, PA
RECOMMENDATION: Add new text to read as follows:
250-184. Solidly Grounded Neutral Systems.
(e) Equipment Grounding Conductor.
(5) In a multiple grounded shielded cable system there shall be, if required, a separate insulated neutral/identified conductor. The equipment grounding shield shall be grounded at each cable joint which is exposed to personnel contact.
SUBSTANTIATION: This is one of a series of proposals dealing with the potential for unsafe conditions resulting from the flow of stray, uncontrolled current over the earth, metallic piping such as metallic water piping, metallic gas piping, metallic process lines, etc., and building steel, and other conductive paths, including earth. They are submitted individually so that each proposal can be voted on separately and the panel not be forced to vote on the total changes as one proposal.
For additional justification please see the other 250-184 proposals.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 5-295.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
DOBROWSKY: See my Explanation of Negative Vote on Proposal 5-295.

(Log #1477)

5- 309 - (250-186): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 4, 10, and 13 for information.
SUBMITTER: William M. Lewis, Eli Lilly and Co.
RECOMMENDATION: Change Section 250-186 to read:
250-186. Impedance Grounded Neutral Systems.
Impedance grounded neutral systems <u>in which a grounding impedance, usually a resistor, limits the ground-fault current, shall be permitted where all of the following conditions are met.</u>
<u>(1) The conditions of maintenance and supervision ensure that only qualified persons will service the installation.</u>
<u>(2) Ground detectors are installed on the system.</u>
<u>(3) Line-to-neutral loads are not served.</u>
Impedance grounded neutral systems shall comply with the provisions of (a) through (d).
(a) Location. The grounding impedance shall be inserted in the grounding conductor between the grounding electrode of the supply system and the neutral point of the supply transformer or generator.
(b) Identified and Insulated. Where the neutral conductor of an impedance grounded neutral system is used, it shall be identified, as well as fully insulated with the same insulation as the phase conductors.
(c) System Neutral Connection. The system neutral shall not be connected to ground, except through the neutral grounding impedance.
(d) Equipment Grounding Conductors. Equipment grounding conductors shall be permitted to be bare and shall be <u>electrically</u> connected to the ground bus and grounding electrode conductor ~~at the service-entrance equipment or the disconnecting means for a separately derived system and extended to the system ground.~~

SUBSTANTIATION: Section 250-36 sets forth some rules for 480 to 1000 volt high impedance grounded systems. These requirements are also valid for over 600 volt systems and are brought forward to this section. Common practice for a medium voltage, impedance grounded system is to extend a grounding electrode conductor with the phase conductors for connection of equipment grounds. The requirement that the connection be made at the service disconnect is not a valid requirement.

This above proposal was developed by the Task Group based on the Task Group's review and discussion of the current requirements of Article 225, 230, 100, 110, 240, and 250. This proposal is one of 14 which makes up the Task Group's response to a recommendation by a TCC task group on usability in 1995. In considering the needed proposals, emphasis was placed on including in the NEC, practices which are recognized in the electrical industry as necessary for safe installation of over 600 volt systems. This is to provide guidance and direction for installation of these facilities which have not historically been included in the NEC.

The Task Group participants consisted of William M. Lewis (CMP 4); committee chair; Carl J. Fredericks (CMP 10); Tom Adams (CMP 4); John Beck (Chairman CMP 4); Mark Sumrall (CMP 4); Barry Hornberger, (CMP 13); William T. Beutler, P.E.; William Long, NEMA.

Interested persons (nonparticipants): Robert J. Pollock (CMP 4 and TCC); Merton Bunker (NFPA); Mark Earley (NFPA)

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #4189)

5- 310 - (250-186): Reject

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

Add the following sentence at the end of Section 250-186, and then add a new subsection (e), as follows:

Low-impedance grounded neutral systems shall additionally comply with (e) where equipment grounding conductors run separately from the associated phase conductors.

(e) Low-Impedance Grounded Neutral Systems. Where the electrical system is provided with relay protection such that ground faults will be cleared as rapidly as possible but, in any case, within 10 seconds, equipment grounding conductors shall be permitted to be run separately from the phase conductors. The grounding impedance shall be monitored, and in the event it shorts or opens, the system shall be disconnected or an alarm shall be provided at a constantly attended point. The equipment grounding return path shall meet the requirements of Section 250-2(d) without reliance on the existence of the grounding impedance in the circuit.

SUBSTANTIATION: This proposal responds to technical aspects of low-impedance grounded medium-voltage systems. These systems use grounding impedances to limit destructive fault current energy, rather than to prevent disorderly shutdowns as in the case of high-impedance grounded systems. This means that instead of remaining on line with supervised alarms until an orderly shutdown can be arranged, they trip open quickly, functioning essentially as grounded systems in terms of automatic fault clearing. The proposal parameter of ten seconds is based on the typical grounding resistor rating

On the other hand, these do have an impedance. in their neutral connections, which means that fault clearing depends on a relay which need not see large values of fault current in order to respond. At these low levels of fault current (on the order of a few hundred amperes), the impact of increased reactance due to separation of the grounding and phase conductors is minimal. The impedance of the reactance is several orders of magnitude above the reactance due to circuit separation, and therefore the impact of separating those conductors can be disregarded. Suppose the conductor separation causes increases the return impedance by 0.01 ohm. The clearing time for a relay monitoring a 20 ohm impedance won't vary because the total circuit impedance went from 20.41 ohms, for example, to 20.42 ohms. Literal enforcement of the present requirement is costly, impractical, and accomplishes nothing.

This is fundamentally different from high-impedance grounded systems. Although equipment grounding conductors on high-impedance grounded systems normally carry even lower values of fault current, as noted they stay on line until a shutdown can be arranged, and during this period they are essentially functioning as ungrounded systems. If a second fault occurs on a different phase during this period, the result is a short circuit that must be cleared immediately, often through inverse-time devices. Now, as in low-voltage grounded systems, the lowest possible impedance becomes critical.

For this reason, the proposed separation allowance is restricted to low-impedance grounded systems. Such an allowance is inappropriate for ungrounded systems and high-impedance grounded systems, and must never be considered for solidly grounded systems. However, for low-impedance grounded systems, it is both practical, safe, and widely done.

This is an even more conservative version of the original proposal as rejected during the previous comment period. The gravamen of the panel objection was that if the grounding impedance became shorted or grounded, the system would function as grounded or ungrounded, respectively, and would need to comply with protective requirements accordingly. This version addresses that concern. Actually, the equipment grounding return path on these systems is excellent. These systems, when properly installed, have phenomenally low return impedances, and the grounding conductors will maintain continuity and conduct safely any currents likely to be imposed even with the resistance out of the circuit or with the resistance short-circuited. It's just that they are so well engineered that running individual return conductors is pointless.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel reaffirms its position that routing of an equipment grounding conductor separately from the phase conductors will reduce the fault currents and increase the clearing time. This proposal places no restrictions on the length and the spacing of the equipment grounding conductor from the phase conductors. Low impedance grounded systems are permitted provided that all the applicable requirements contained in the NEC are followed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

(Log #776)

5- 311 - (250-188): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add to first paragraph:

FPN: See Section 90-2(b) for installations not covered by this Code.

SUBSTANTIATION: A fine print note would be helpful to code users who may easily overlook provisions of Section 90-2(b).

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not add clarity. The panel does not agree with the substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

ARTICLE 280 — SURGE ARRESTERS

(Log #3681)

5- 312 - (280-11): Reject
SUBMITTER: Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL
RECOMMENDATION: Add the following text:
280-11. Location.
Surge arresters, listed and labeled, by a nationally recognized testing laboratory, shall be installed v on all services. Surge arresters shall be permitted to be located indoors or outdoors. Surge arresters shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.
SUBSTANTIATION: The reason for adding this requirement is because of all the damage that results from lightning strikes, especially with all the new electronic equipment being installed. It is felt that with a minimal investment, many dollars may be saved by installing surge protection.
PANEL ACTION: Reject.
PANEL STATEMENT: The installation of a surge arrester is not prohibited. There is no substantiation to require surge arresters on all installations. The Code can require listing, but does not require listing by a nationally recognized testing laboratory. Installation of surge arresters as proposed at service level would not necessarily protect electronic equipment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #2257)

5- 313 - (280-20 (New)): Reject
SUBMITTER: Charles J. Kovarik, Baltimore, MD
RECOMMENDATION: Add the following:
280-20. Where Required. A surge arrestor, selected per 280-4, shall be installed on the service entrance or feeder conductors for individual dwelling units as permitted under this article.
SUBSTANTIATION: My experience in 12 years of investigating fires due to electrical causes includes a disproportionate number of residential fires from surge-induced failures, particularly of electronic-based appliances. The use of surge arrestors as proposed is a cost-effective means of reducing such losses, which will otherwise continue to increase with many new electronic-based products emerging each year. Nondwelling applications do not have the same potential for such losses.
PANEL ACTION: Reject.
PANEL STATEMENT: The installation of a surge arrester is not prohibited. There is no substantiation to require surge arresters on all dwelling unit installations. Installation of surge arresters as proposed at service level may not necessarily protect electronic equipment in all cases.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #1056)

5- 314 - (280-21, 22, and 23): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 280 as follows:
280-21 - change "No. 14 copper or No. 12 aluminum" to "14 AWG copper or 12 AWG aluminum"
280-22 - change "No. 14 copper or No. 12 aluminum" to "14 AWG copper or 12 AWG aluminum"
280-23 - change "No. 6" to "6 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #458)

5- 315 - (280-24(b)(1) and (2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 280-24(b)(1), replace "20 ft (6.1 m)" with "6.0 m (20 ft)."
2. In Section 280-24(b)(2), replace "20 ft (6.1 m)" with "6.0 m (20 ft)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show the SI unit as the preferred and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #3266)

5- 316 - (285 (New)): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Add a new Article 285 as follows:
Article 285 - Transient Voltage Surge Suppressors (TVSS)
I. General.
285-1. Scope. This article covers general requirements, installation requirements, and connection requirements for Transient Voltage Surge Suppressors (TVSS) installed on premises wiring systems.
285-2. Definition. A Transient Voltage Surge Suppressor is a protective device for limiting transient voltages by diverting or limiting surge current, and it also prevents continued flow of follow current while remaining capable of repeating these functions.
285-3. Uses Not Permitted. The use of a TVSS shall not be permitted on the following:
1) Circuits exceeding 600 volts.
2) Ungrounded electrical system as permitted in Section 250-21.
3) Where the rating of the TVSS is less than the maximum continuous phase-to-ground power frequency voltage available at the point of application.
FPN No. 1: For further information on Transient Voltage Surge Suppressors, see NEMA LS-1. The selection of a properly rated Transient Voltage Surge Suppressor is based on criteria such as maximum continuous operating voltage, the magnitude and duration of overvoltages at the suppressor location as affected by phase-to-ground faults, system grounding techniques, and switching surges..
285-4. Number Required. Where used at a point on a circuit, the TVSS shall be connected to each ungrounded conductor.
285-5. Listing. A TVSS shall be a listed device.
285-6. Short Circuit Current Rating. The TVSS shall be marked with a short circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating.
II. Installation.
285-11. Location. TVSS shall be permitted to be located indoors or outdoors and shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.
285-12. Routing of Connections. The conductors used to connect the Transient Voltage Surge Suppressor shall not be any longer than necessary and shall avoid unnecessary bends.
285-21. Connection of the TVSS. Where a TVSS is installed, the following shall apply:
(A)Location.
(1) Service Supplied Building or Structure. The TVSS shall be connected on the load side of a service disconnect overcurrent device required in 230-91.
(2) Feeder Supplied Building or Structure. The TVSS shall be connected on the load side of the first overcurrent device at the building or structure.

Exception to 1 and 2: Where the TVSS is also Listed as a Surge Arrester, the connection shall be as permitted by Article 280.

(3) Separately Derived System. The TVSS shall be connected on the load side of the first overcurrent device in a separately derived system.

(B) Conductor Size. Line and ground connecting conductors shall not be smaller than No. 14 copper or No. 12 aluminum.

(C) Connection Between Conductors. A transient voltage surge suppressor shall be permitted to be connected between any two conductors - ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only by the normal operation of the TVSS during a surge.

285-25. Grounding. Transient voltage surge suppressor grounding connections shall be made as specified in Article 250 unless otherwise noted in this article. Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.

SUBSTANTIATION: The Transient Voltage Surge Suppressor has become a common component of the electrical distribution system in North America. Unfortunately, the NEC presently does not recognize the installation of a TVSS, which has unique performance and safety concerns in comparison to a Surge Arrester in Article 280. Manufacturers of TVSS products reference Articles 250 and 280 as part of their installation instructions, but installers, and inspectors find nothing in the NEC recognizing a TVSS. This new proposed Article 285 is intended to address the unique safety concerns of TVSS products. It is recognized that some of the material is the same as that in Article 280, but a separate article is strongly recommended because there are differences between surge arresters and there is presently confusion generated among users between an arrester and a TVSS.

Transient Voltage Surge Suppressors (TVSS) are being installed in residential, commercial, and industrial facilities in order to protect sensitive electronic equipment. TVSS products function similar to surge arresters, however, in order to provide protection for electronic equipment, TVSS devices begin to operate (i.e. - conduct electricity), much closer to the system operating voltage than a typical surge arrester. The NEC does not recognize or address the unique safety implications associated with the TVSS operating characteristics and the UL 1449 safety standard. Surge arresters are evaluated using a variety of IEEE standards, not UL 1449. TVSS products are tested at much lower surge current levels compared to surge arresters, therefore the NEC needs to include the additional safety requirements specific to TVSS devices.

The UL 1449 Safety Standard evaluates products with a maximum rating of 600V and assumes the TVSS is installed on the load side of the service disconnect and its overcurrent protection. The NEC must require that a TVSS be installed on the load side of a service disconnect's overcurrent protection device in order to preserve the safety requirements found in UL 1449. The overcurrent protection is necessary to protect the conductors and electrical equipment if the TVSS is subjected to a system over-voltage. The over-voltage can send the TVSS directly into conduction, as properly designed, but if the overvoltage continues for a period of time beyond its designed capabilities it can cause the TVSS to fail shorted.

The following is the specific substantiation for each Section:

285-1 - This scope is specific to TVSS devices and parallels that for Article 280.

285-2 - This definition is based on the definition contained in UL 1449.

285-3 (1) is from the scope of UL1449.

285-3 (2) is a recognized condition that must be addressed. The modes of protection for TVSS devices are line-to-line (L-L) and line-to-ground (L-G). No reference to ground exists on an ungrounded system allowing the operating voltage to fluctuate. ANSI / IEEE 242-1996 is an industry accepted standard on the Protection and Coordination of Industrial and Commercial Power Systems. A review of ungrounded systems is found in Chapter 7 on page 277 starting with Section 7.25. In reference to IEEE 242, the electrical system in an ungrounded configuration can be subjected to severe overvoltages to ground, as high as 6 to 8 times the normal system operating voltage, when a fault condition arises. TVSS devices will go directly into conduction mode as a result of these extreme overvoltages. Once again, this ungrounded operating condition subjects the TVSS to extreme overvoltages for a long duration causing thermal damage and device failure.

285-3 (3) parallels the limitation specified in Section 280-4(a) for surge arresters.

285-4 - This is a parallel requirement to Article 280 to indicate that the TVSS (where used) must be connected to each ungrounded conductor. Without this requirement, the TVSS will not accomplish the intended objective of protection.

285-5 - Because of the possible failure modes and the wide variety of types of TVSS devices, it is important that the product be evaluated to a recognized standard. Since the AHJ cannot determine compliance of the product in the field the listing requirement is necessary. UL 1449 - Transient Voltage Surge Suppressors would be the appropriate standard for this evaluation and it is noted that the standard includes the evaluation of a TVSS in accordance with the NEC as part of the standard's scope. This requirement is parallel to that in 280-4(a) for Surge Arresters on <1000 volt systems.

285-6 - TVSS products must also have a short circuit current rating. Understanding that short circuit current ratings are usually addressed in section 110-10, this is a unique marking requirement for TVSS devices not currently required for surge arresters. Because this has been one of the key areas of misapplication of TVSS devices, it is important to point out the limitation in the article. The common technology, Metal-Oxide Varister(MOV), employed by TVSS products make a direct line-to-line or line-to-ground connection in order to conduct current through the components during an over-voltage condition. A common mode of failure for an MOV is to establish a direct short between conductors. The available fault current may follow the conduction path under this shorted condition. The TVSS may incur thermal damage and fail in an unsafe manner if it does not have the appropriate short circuit current ratings for the system on which it is employed.

285-11 - Parallels Section 280-11.

285-12 - Parallels Section 280-12.

285-21 - The location requirement in Part A specifically address where the TVSS can be installed in the electrical system on a building or structure or on a separately derived system. Exposure to externally high level surge sources is not just found at the service but on feeders to other buildings or structures. These location requirements are exempt if the device has been tested to the surge current levels of an arrester. The requirement also addresses the necessity of overcurrent protection for the TVSS on a separately derived system. An arcing fault in the TVSS, using number 12 conductors, is not going to be detected by the transformer primary protection.

280-25 - Parallels Section 280-25.

PANEL ACTION: Accept in Principle.

Article 285 – Transient Voltage Surge Suppressors: TVSS ~~–1~~I. General

285.1 Scope. This article covers general requirements, installation requirements, and connection requirements for ~~T~~transient ~~V~~voltage ~~S~~surge ~~S~~suppressors (TVSS) installed on premises wiring systems.

285.2 Definition. A ~~T~~transient ~~V~~voltage ~~S~~surge ~~S~~uppressor (TVSS) is a protective device for limiting transient voltages by diverting or limiting surge current, and it also prevents continued flow of follow current while remaining capable of repeating these functions.

285.3 Uses Not Permitted. ~~The use of a~~ A TVSS shall not be ~~permitted~~ used ~~on~~ in the following:

(1) Circuits exceeding 600 volts.

(2) Ungrounded electrical systems as permitted in Section 250-21.

~~(3) Where the rating of the TVSS is less than the maximum continuous phase-to-ground power frequency voltage available at the point of application.~~

FPN ~~No. 1~~: For further information on ~~Transient Voltage Surge Suppressors~~TVSS's, see Standard for Low Voltage Surge Suppression Devices NEMA LS 1 – 1992 ~~NEMA LS 1~~. The selection of a properly rated TVSS ~~Transient Voltage Surge Suppressor~~ is based on criteria such as maximum continuous operating voltage, the magnitude and duration of overvoltages at the suppressor location as affected by phase-to-ground faults, system grounding techniques, and switching surges.

285.4 Number Required. Where used at a point on a circuit, the TVSS shall be connected to each ungrounded conductor.

285.5 Listing. A TVSS ~~transient voltage surge suppressor~~ shall be a listed device.

285.6 Short Circuit Current Rating. The TVSS ~~transient voltage surge suppressor~~ shall ~~be marked with a short circuit current rating and shall~~ not be installed at a point on the system where the available fault current is in excess of the marked ~~that~~ rating.

II. Installation

285.11 Location. TVSS's ~~Transient voltage surge suppressors~~ shall be permitted to be located indoors or outdoors and shall be made inaccessible to unqualified persons, unless listed for installation in accessible locations.

285.12 Routing of Connections. The conductors used to connect the TVSS to the line or bus and to ground shall not be any longer than necessary and shall avoid unnecessary bends.

III. Connecting Transient Voltage Surge Suppressors

285.21 Connection ~~of the TVSS~~. ~~Where a TVSS is installed the following shall apply.~~ A TVSS shall be connected as follows:

(A) Location.

(1) Service Supplied Building or Structure. The ~~TVSS~~ transient voltage surge suppressor shall be connected on the load side of a service disconnect overcurrent device required in 230-91.

(2) Feeder Supplied Building or Structure. The ~~TVSS~~ transient voltage surge suppressor shall be connected on the load side of the first overcurrent device at the building or structure.

Exception to 1 and 2: Where the TVSS is also ~~L~~listed as a ~~S~~surge ~~A~~arrester, the connection shall be as permitted by Article 280.

(3) Separately Derived System. The TVSS shall be connected on the load side of the first overcurrent device in a separately derived system.

(B) Conductor Size. Line and ground connecting conductors shall not be smaller than No. 14 copper or No. 12 aluminum.

(C) Connection Between Conductors. A TVSS ~~transient voltage surge suppressor~~ shall be permitted to be connected between any two conductors – ungrounded conductor(s), grounded conductor, grounding conductor. The grounded conductor and the grounding conductor shall be interconnected only by the normal operation of the TVSS during a surge.

285.25 Grounding. Except as indicated in this Article, TVSS ~~transient voltage surge suppressor~~ grounding connections shall be made as specified in article 250. ~~unless otherwise noted in this article.~~ Grounding conductors shall not be run in metal enclosures unless bonded to both ends of such enclosure.

PANEL STATEMENT: In Section 285.3, the third item was deleted because it was a "use not permitted." All other changes were editorial.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

DIAZ: This proposal requires all Transient Voltage Surge Suppressors, (TVSS), have short circuit current ratings. The product standard defines permanently connected TVSS as either "one port" devices or "two port" devices. A "one port" device is connected across the line(s), neutral and ground, and has no load connection. Therefore, this device would not carry fault current and subsequently does not have a short circuit rating. A "two port" device has line and load connections and will carry fault current. Such devices are required to be subjected to a withstand test and are required to be marked with a short circuit withstand rating. Section 285-6 of this proposal should be revised to indicate that only "two port" devices having line and load connections shall be marked with a short circuit rating.

Note: Supporting material available for review upon request at NFPA headquarters.

COMMENT ON AFFIRMATIVE:

DOBROWSKY: The third item in Section 285-3 should not be deleted. A TVSS should not be permitted where the voltage rating is less than the line to ground voltage.

ARTICLE 300 — WIRING METHODS

Note from the TCC: Renumbering/Relocation of Chapter 3 Articles: As part of the effort to provide common numbering and arrangement of the raceway and wire/cable articles in Chapter 3, the majority of Articles in Chapter 3 will receive new article numbers at the end of the processing of the NEC. This effort is in conjunction with the efforts of CMP 7 and CMP 8 to provide common format and numbering within the majority of articles under their jurisdiction.

The Technical Correlating Committee is responsible for the placement and numbering of Articles. A study has been completed by the Usability Task Group recommending a new numbering system. That recommendation has been reviewed and accepted by the Technical Correlating Committee. The numbering shown in the following chart will be used.

RENUMBERING/RELOCATION OF CHAPTER 3 ARTICLES

1999 NEC	2002 NEC	Title
300	300	Wiring Methods
(305)	527	Temporary Wiring
310	310	Conductors for General Wiring
373	312	Cabinets, Cutout Boxes and Meter Socket Enclosures
370	314	Outlet, Device, Pull and Junction Boxes, Conduit Bodies and Fittings
333	320	Armored Cable: Type AC
363	322	Flat Cable Assemblies: Type FC
328	324	Flat Conductor Cable: Type FCC
325	326	Integrated Gas Spacer Cable: Type IGS
326	328	Medium Voltage Cable: Type MV
334	330	Metal-Clad Cable: Type MC
330	332	Mineral-Insulated Metal-Sheathed Cable: Type MI
336	334	Nonmetallic-Sheathed Cable: Types NM, NMC, and NMS
340	336	Power and Control Tray Cable: Type TC
338	338	Service-Entrance Cable: Types SE and USE
339	340	Underground Feeder and Branch-Circuit Cable: Type UF
345	342	Intermediate Metal Conduit: Type IMC
346	344	Rigid Metal Conduit: Type RMC
350	348	Flexible Metal Conduit: Type FMC
351A	350	Liquidtight Flexible Metal Conduit: Type LFMC
347	352	Rigid Nonmetallic Conduit: Type RNC
343	354	Nonmetallic Underground Conduit with Conductors: Type NUCC
351B	356	Liquidtight Flexible Nonmetallic Conduit: Type LFNC
348	358	Electrical Metallic Tubing: Type EMT
349	360	Flexible Metallic Tubing: Type FMT
331	362	Electrical Nonmetallic Tubing: Type ENT
374	366	Auxiliary Gutters
364	368	Busways
365	370	Cablebus
358	372	Cellular Concrete Floor Raceways
356	374	Cellular Metal Floor Raceways
362A	376	Metal Wireways
362B	378	Nonmetallic Wireways
353	380	Multioutlet Assembly
342	382	Nonmetallic Extensions
352C	384	Strut-Type Channel Raceway
352A	386	Surface Metal Raceways
352B	388	Surface Nonmetallic Raceways
354	390	Underfloor Raceways
318	392	Cable Trays
324	394	Concealed Knob-and-Tube Wiring
321	396	Messenger Supported Wiring
320	398	Opening Wiring on Insulators
380	404	Switches
-	406	Receptacles, Cord Connectors, and Attachment Plugs (Caps)
384	408	Switchboards and Panelboards

All comments on proposals in this ROP should be made to the existing Article and NOT the new Article numbers. Staff will make the changes to the new Article numbers before printing the 2002 NEC.

In addition to the renumbering, each renumbered Article will have a note after the title indicating the previous article number for that material. Also, a new informative annex will be added to provide a cross-reference of the renumbered Articles from the 1999 NEC to the 2002 NEC.

(Log #1151a)

3- 4 - (300): Reject
SUBMITTER: Don R. Fowlkes, City of Chattanooga, TN
RECOMMENDATION: Possible wording:
"Somewhere in Article 210 or 300 needs heading "Complete Wiring System".
SUBSTANTIATION: Before an electrical wiring system can be considered complete, it must form proper connections between the power source and the final outlet and/or load.
As an inspector, I am required to refer to a code reference to disapprove any code violation. At present, there is no code reference stating when wiring is incomplete (namely branch circuits). It would help the inspectors to be able to cite a code reference when wiring is not complete. Any wording to this effect would be very helpful.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal doesn't comply with Section 4-3.3 (c) of the NFPA Regulations Governing Committee Projects by providing specific Code text and suggested location within the Code for the change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1272)

3- 5 - (300): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 300-4(a)(1) replace "11/4 in. (31.8 mm)" with "32 mm (1 1/4 in.)"
2. In Section 300-4(a)(1) replace "1/16 in. (1.59 mm)" with "1.6 mm (1/16 in.)"
3. In Section 300-4(a)(2) replace "1/16 in. (1.59 mm)" with "1.6 mm (1/16 in.)"
4. In Section 300-4(b)(2) replace "1/16 in. (1.59 mm)" with "1.6 mm (1/16 in.)"
5. In Section 300-4(d) replace "11/4 in. (31.8 mm)" with "32 mm (1 1/4 in.)"
6. In Section 300-4(d) replace "1/16 in. (1.59 mm)" with "1.6 mm (1/16 in.)"
7. In Section 300-4(e) replace "1/16 in. (1.59 mm)" with "1.6 mm (1/16 in.)"
8. In Section 300-4(e) replace "11/4 in. (31.8 mm)" with "32 mm (1 1/4 in.)"
9. In Section 300-5(d) replace "8 ft (2.44 m)" with "2.5 m (8 ft)"
10. In Section 300-5(d), first paragraph, replace "18 in. (457 mm)" with "450 mm (18 in.)"
11. In Section 300-5(d), second paragraph, replace "18 in. (457 mm)" with "450 mm (18 in.)"
12. In Section 300-5(d) replace "12 in. (305 mm)" with "300 mm (12 in.)"
13. In Section 300-6(c) replace 1/4-in. (6.35-mm)" with "6 mm (1/4 in.)"
14. In Section 300-14 replace "6 in. (152 mm)" with "150 mm (6 in.)"
15. In Section 300-14 replace "8 in. (203 mm)" with "200 mm (8 in.)"
16. In Section 300-14 replace "3 in. (76.2 mm)" with "75 mm (3 in.)"
17. In Section 300-21 FPN, replace "24 in. (610 mm)" with "600 mm (24 in.)"
18. In Section 300-22(b) replace "4 ft. (1.22 m)" with "1.2 m (4 ft.)"
19. In Section 300-22(c)(1) Ex. replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)"
20. In Section 300-39 replace "1 in. (25.4 mm)" with "25 mm (1 in.)"
21. In Section 300-50(a)(2) replace "3 in. (76 mm) with "75 mm (3 in.)"
22. In Section 300-50(b) replace "8 ft (2.44 m)" with "2.5 m (8 ft)"
23. In Table 300-50 Ex. No. 1 replace "24 in. (610 mm)" with "600 mm (24 in.)"
24. In Table 300-50 Ex. No. 2 replace "6 in. (152 mm) for each 2 in. (50.8 mm)" with
" 150 mm (6 in.) for each 50 mm (2 in.) "
25. In Table 300-50 Ex. No. 3 replace "4 in. (102 mm)" with "100 mm (4 in.)"
26. In Table 300-50 Ex. No. 3 replace "6 in. (152 mm)" with "150 mm (6 in.)"
27. In Table 300-50 Ex. No. 5 replace "18 in. (457 mm)" with "450 mm (18 in.)"
28. In Table 300-50 Ex. No. 6 replace "2 in. (50.8 mm)" with "50 mm (2 in.) "

SUBSTANTIATION: The proposed revisions are intended to comply with the NFPA No. 1M Manual of Style, Section 4.1 with respect to the placement of units.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3062)

3- 6 - (300-1(c) (New)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add a new section to read:
(c) Trade Sizes and Metric Designators. Trade Sizes and Metric Designators for conduit, tubing and associated fittings and accessories are designated as follows:

Table 300-1(c). Trade Sizes and Metric Designator

Trade Size	Metric Designator
3/8	12
1/2	16
3/4	21
1	27
1 1/4	35
1 1/2	41
2	53
2 1/2	63
3	78
3 1/2	91
4	103
5	129
6	155

Note: The Trade Sizes and Metric Designators are for identification purposes only and do not relate to actual dimensions.

SUBSTANTIATION: This information has previously appeared in various Code articles and appropriately belongs in this General section. Fittings and other accessory items for a particular product are designated the same so compatibility is assured. This is a companion proposal to others, which delete the FPNs in various articles, thus eliminating a lot of redundant text.
PANEL ACTION: Accept in Principle.
The Panel revises the proposal to read as follows:
"(c) Metric Designators and Trade Sizes. Metric Designators and Trade Sizes for conduit, tubing, and associated fittings and accessories are designated in Table 300-1(c) :
Table 300-1(c). Metric Designator and Trade Sizes"
(Reverse the two columns so that Metric Designators is the first column)
Change from note to FPN to read as follows: "FPN: The Metric Designators and Trade Sizes are for identification purposes only and are not actual dimensions."

PANEL STATEMENT: The changes include the reversing of the order of Metric Designators and Trade Sizes to utilize the same format of the TCC for metrics and changing the existing note to a Fine Print Note for clarity. Also adding a comma after tubing to provide for proper grouping.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #777)

3- 7 - (300-2(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Voltage. Except as otherwise permitted in this code ~~Wiring~~ wiring methods specified in Chapter 3 shall be used for voltages 600-volts, nominal, or less...
(Remainder unchanged).
SUBSTANTIATION: Editorial. Wiring methods not covered by Chapter 3 are apparently sanctioned in Articles 225, 430, 551, 552, 555, 610, 620, 645, 650, 660, 668, 669, 690, 725, 760, etc. Even though most are outside Chapters 1 through 4, they are numerous enough to warrant notation.
PANEL ACTION: Reject.
PANEL STATEMENT: This is adequately covered by 300-1(a) and the last sentence of 300-2(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #778)

3- 8 - (300-3): Accept in Principle in Part
Note: The Technical Correlating Committee directs that the panel review this Proposal relative to the action on Proposal 3-11. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Single Conductors. Except as otherwise permitted in this code ~~Single~~ single conductors ~~specified in Table 310-13~~ shall only be installed where part of a recognized wiring method of Chapter 3.
(b) Conductors of the Same Circuit. Where the wiring method is a raceway, auxiliary gutter, cable tray, cablebus, multiconductor cable or cord, or direct-burial, single conductors, ~~All~~ all conductors of the same circuit and, where used, ~~the grounded conductor and~~ all equipment grounding or bonding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, trench, cablebus, cable, or cord, unless otherwise permitted in accordance with (1) through (4).
(1) No change.
(2) Grounding and Bonding conductors. Equipment grounding conductors shall be permitted to be installed outside a raceway or cable assembly where in accordance with the provisions of Section 250-130(c) for certain existing installations or in accordance with Section 250-134 (b) for dc circuits. Where permitted elsewhere in this code other grounding and bonding conductors shall be permitted to be run separately from the circuit conductors. ~~Equipment bonding conductors shall be permitted to be installed on the outside of raceways in accordance with Section 250-102(e).~~
(3) Delete.
(4) No change.
(c)(1) No change to text.
(c)(1) FPN No. 1: See Section 725-26(b) for Class 1 circuit conductors and Section 725-54(a)(1) for Class 2 and Class 3 circuit conductors.
FPN No. 2: See Section 230-7 for service conductors.
SUBSTANTIATION: "Part of a recognized wiring method" is open to interpretation, i.e., (1) the conductors must be an integral component of a raceway, cablebus, gutter, cabletray, etc. installation or open single conductors may be used where extended from or connected to (part of) the Chapter 3 wiring method. It appears the former is intended, as Section 310-13 also refers to Chapter 3 wiring methods. Single conductors appear to be permitted by other articles where not part of a Chapter 3 wiring method, e.g., Sections 110-34(c); 225-6; 230-21; 300-5(i); 300-20(b); 305-4(b), Exception; 426-42; 427-47. Single open conductors are commonly used as open aerial spans, in transformer vaults, battery room, etc. not covered by Articles 320, 321, or 324. It seems this general requirement should also apply to conductors in the other ampacity tables of Article 310.
The provisions of (b) imply that conductors must utilize one of the wiring methods indicated. It does not provide for wiring whereby single-conductor Type MI cable or flexible cable of Table 400-5(b) is used, nor Article 320 or 324. Sections (b)(3) and 330-16 do not specifically alter or modify the basic requirements of (b). The proposal applies the requirements to multiconductor cables and includes cablebus which is not considered a raceway.
Reference to the grounded conductor is superfluous, since where used it is a circuit conductor. Bonding conductors should be included in (b) since equipment bonding jumpers are only permitted outside a raceway if 6 ft or less in length. Since the last sentence of (b)(2) covers equipment bonding jumpers, the proposal includes coverage of other grounding/bonding conductors such as the grounding electrode conductor (Section 250-64) bonding jumpers between electrodes (Section 250-50) bonding conductors for interior piping (Section 250-104), and separate grounding conductors of Sections 250-32(f) and 250-138(b).
Since (b)(3) is an "otherwise permitted" subsection to the basic rule of (b) it infers that conductors of the same circuit may be run in different raceways or cables if enclosed in nonmagnetic metal such as brass or aluminum, or nonmetallic sheath. Such separation of conductors appears to be permitted only by the exception for (b)(1) which is limited to paralleled conductors, nonmetallic raceways, and underground installation. The reference to Section 300-20(b) reinforces this view since it deals with single conductors (one or paralleled). Single conductor Type MI cable is adequately covered in Article 330.
Fine print notes are modified to include other pertinent sections that may modify (c)(1).
PANEL ACTION: Accept in Principle in Part.
Accept the addition of the phrase "and Bonding" to the title of (b)(2) to read as follows:
"(2) Grounding and Bonding Conductors".
Accept the addition of "and bonding conductors" to the third line of the existing text in Section 300-3(b) to read as follows:
"(b) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor, all equipment grounding conductors and bonding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4)."
The committee rejects the remainder of the proposal.
PANEL STATEMENT: The addition of the phrase to the title of (b)(2) was accepted since the text does deal with both grounding and bonding conductors and should be appropriately labeled. The "or bonding conductors" was changed to "and bonding conductors" and added to the third line of the existing text since bonding conductors are also covered in (2) of the existing text.
The suggested change to (a) is too vague and doesn't comply with Section 4-1 of the NEC Style Manual to improve clarity by referencing specific sections of the Code.
The additional text suggested for (b) is already stated at the end of the existing sentence in (b) and makes the sentence more complex than necessary.
The suggested sentence added to (b)(2) is too vague and doesn't comply with Section 4-1 of the NEC Style Manual to improve clarity by referencing specific sections of the Code. The existing sentence dealing with bonding conductors has a specific reference to Section 250-102(e) that more appropriately complies with the style manual.
The additional reference suggested to (c)(1), FPN is unnecessary since the requirements for conductor insulation are located in Section 725-26(b) and may send the wrong message to the user of the Code since the general rule in Section 725-54(a)(1) is to not allow insulation to act as a separation between voltage systems.
The added FPN referencing Section 230-7 is not adding clarity and does not comply with Section 4-1 of the NEC Style Manual. Additional references are not necessary and tend to be less user friendly.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2790)

3- 9 - (300-3(3)): Reject
SUBMITTER: Jonathan DaBoi Saravia, E. Freetown, MA
RECOMMENDATION: In the first sentence add the word paralleled as the first word.
SUBSTANTIATION: This section permits conductors of the same circuit contained in nonferrous or other nonmagnetic wiring methods to be in separate raceways. I believe the intent was to make an exception for parallel conductors contained in nonferrous or other nonmagnetic wiring methods, but that is not how this section currently reads. The word parallel must appear in this section to clarify the intent.
PANEL ACTION: Reject.
PANEL STATEMENT: This section applies not only to paralleled conductors but also to single conductors run in nonmagnetic wiring methods. Single conductors with a nonmetallic sheath that are not run in parallel can be installed in a trench with entry into a magnetic metal enclosure requiring compliance with Section 300-20(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2591)

3- 10 - (300-3(b)): Accept in Part
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise Section 300-3(b) to read as follows:

(b) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4).

Where permitted in (1) through (4), conductors in wiring methods with a nonmetallic or other nonmagnetic sheath shall comply with the provisions of Section 300-20(b).

(1) Paralleled Installations. Conductors shall be permitted to be run in parallel in accordance with the provisions of Section 310-4. ~~The requirement to run all circuit conductors within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord shall apply separately to each portion of the paralleled installation, and the equipment grounding conductors shall comply with the provisions of Section 250-122.~~ Conductors installed in nonmetallic raceways run underground shall be permitted to be arranged as isolated phase installations in accordance with Section 300-5(I), Exception No. 2. Parallel runs in cable tray shall comply with the provisions of Section 318-8(d).

~~Exception: Conductors installed in nonmetallic raceways run underground shall be permitted to be arranged as isolated phase installations. The raceways shall be installed in close proximity and the conductors shall comply with the provisions of Section 300-20(b).~~

(2) Grounding and Bonding Conductors. Equipment grounding conductors shall be permitted to be installed outside a raceway or cable assembly where in accordance with the provisions of Section 250-130(c) for certain existing installations, or in accordance with Section 250-134(b), Exception No. 2, for dc circuits. Equipment bonding conductors shall be permitted to be installed on the outside of raceways in accordance with Section 250-102(e).

(3) ~~Nonferrous Wiring Methods.~~ MI Cable. ~~Conductors in wiring methods with a nonmetallic or other nonmagnetic sheath shall, where in different raceways, auxiliary gutters cable trays, trenches, cables, or cords, comply with the provisions of Section 300-20(b).~~ Conductors in single-conductor Type MI cable with a nonmagnetic sheath shall comply with the provisions of Section 330-16.

(4) Enclosures. Where an auxiliary gutter runs between a column-width panelboard and a pull box, and the pull box includes neutral terminations, the neutral conductors of circuits supplied from the panelboard shall be permitted to originate in the pull box.

SUBSTANTIATION: The action of Comment 3-17 of the 1998 ROC was to accept in principle. Part of the substantiation made by the submitter of the comment, as found on page 260 of the ROC, follows:

"This comment is an attempt to rescue the baby from the bath water. It restructures the section to minimize, but not eliminate exceptions, in accordance with my views expressed in the comment on Proposal 3-10. It does so without making changes in the technical content."

Comment 3-17 was made on Proposal 3-12. Proposal 3-12 sought to remove the Exceptions in 300-3(b) and to make them positive text. The panel rejected the proposal and referenced the statement in Proposal 3-10 as their panel statement. The panel statement in 3-10 is "The panel believes that the intent of the relocated exception was changed without sufficient substantiation. The directive received from the Correlating Committee to incorporate exceptions into the main text needs to be addressed by a task force with sufficient time to address all of the concerns and coordinate all of the revisions as well as provide for the balloting process to be completed."

The general rule, as given in 300-3(b), is "All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4)." This language means that (1) through (4) are permissions to deviate from the general rule. However, the second sentence in item (1), as written, establishes installation criteria for paralleled conductors. These conditions did not appear in the 1996 NEC or in Proposal 3-10. The 1996 NEC made a simple reference to Section 310-4. This installation criteria should not be located here. If the panel or the submitter of Comment 3-17 feel this language is critical, a proposal should be made to include the language in 310-4. Additionally, the reference to Section 250-112 I contained in 310-4 and need not be restated here.

Taken in relation to the general statement in 300-3(b), item number (3) is a permission to not have "All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors" "be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord." The second sentence in (3) is essentially the same as found in the 1996 NEC. The first sentence, however, seems not to correlate with the provisions of the 1996 NEC. This sentence appears to introduce new permissions which did not have the benefit of public review as they were made at the comment stage rather than the proposal stage. Taken as a permission, this sentence makes it possible to expand the use of single conductors for beyond that found in the 1996 NEC. The permission, as found in the 1999 NEC, permits all nonmetallic and nonmagnetic cables, cords, etc., to have a conductor from one nonmetallic or nonmagnetic cable, cord, etc. and a conductor from another nonmetallic or nonmagnetic cable, cord, etc. for as many nonmetallic or nonmagnetic cable, cord, etc. as wanted to make a circuit. For example, there are four (4) type NM-B cables operating at 120-volts in the same nonmagnetic box. It is now possible to take an ungrounded conductor from one cable, an ungrounded conductor from another cable, a neutral from another cable, and an equipment grounding conductor from another cable to form a multiwire branch-circuit. This permission was not granted in the 1996 NEC. Part of the proposed revisions in (3) seek to restore the 1996 position on is issue.

The 1999 language in the first sentence in (3) would be applicable to all installations where single conductors were employed and magnetic metals were located between the single conductors. For that reason, this requirement is better located ahead of items (1) through (4) and made to apply to each of the items rather than only one. By locating it ahead of the permissions, it is not a permission to expand the use of single conductors but a statement of fact.

This proposal seeks to restore the permissions given in the 1996 NEC while not introducing new material or making changes which have not had the benefit of public review. It also seeks to delete some language found in the 1999 edition which was not found in 1996 edition.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3449)

3- 11 - (300-3(b)): Accept in Principle

Note: The Technical Correlating Committee directs that the panel review this Proposal relative to the action on Proposal 3-8. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise Section 300-3(b) to read as follows:

(b) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4).

Where permitted in (1) through (4), conductors in wiring methods with a nonmetallic or other nonmagnetic sheath shall comply with the provisions of Section 300-20(b).

(1) Paralleled Installations. Conductors shall be permitted to be run in parallel in accordance with the provisions of Section 310-4. ~~The requirement to run all circuit conductors within the same raceway, auxilliary gutter, cable tray, trench, cable, or cord shall apply separately to each portion of the paralleled installation, and the equipment grounding conductors shall comply with the provisions of Section 250-122.~~ Conductors installed in nonmetallic raceways run underground shall be permitted to be arranged as isolated phase installations in accordance with Section 300-5(I), Exception No. 2. Parallel runs in cable tray shall comply with the provisions of Section 318-8(d).

~~Exception: Conductors installed in nonmetallic raceways run underground shall be permitted to be arranged as isolated phase installations. The raceways shall be installed in close proximity and the conductors shall comply with the provisions of Section 300-20(b).~~

(2) Grounding and Bonding Conductors. Equipment grounding conductors shall be permitted to be installed outside a raceway or cable assembly where in accordance with the provisions of Section 250-130(c) for certain existing installations, or in accordance with Section 250-134(b), Exception No. 2, for dc circuits. Equipment bonding conductors shall be permitted to be installed on the outside of raceways in accordance with Section 250-102(e).

(3) ~~Nonferrous Wiring Methods.~~ MI Cable. ~~Conductors in wiring methods with a nonmetallic or other nonmagnetic sheath shall, where run in different raceways, auxilliary gutters, cable trays, trenches, cables, or cords, comply with the provisions of Section 300-20(b).~~ Conductors in single-conductor Type MI cable with a nonmagnetic sheath shall comply with the provisions of Section 330-16.

(4) Enclosures. Where an auxilliary gutter runs between a column-width panelboard and a pull box, and the pull box includes neutral terminations, the neutral conductors of circuits supplied from the panelboard shall be permitted to originate in the pull box.

SUBSTANTIATION: The action of Comment 3-17 of the 1998 ROC was to accept in principal. Part of the substantiation made by the submitter of the comment, as found on page 260 of the ROC, follows. "This comment is an attempt to rescue the baby from the bath water. It restructures the section to minimize, but not eliminate exceptions, in accordance with my views expressed in the comment on proposal 3-10. It does so without making changes in the technical content."

Comment 3-17 was made on Proposal 3-12. Proposal 3-12 sought to remove the Exceptions in 300-3(b) and to make them positive text. The Panel rejected the proposal and referenced the statement in Proposal 3-10 as their Panel Statement. That Panel Statement 3-10 is "The panel believes that the intent of the relocated exception was changed without sufficient substantiation. The directive received from the Correlating Committee to incorporate exceptions into the main text needs to be addressed by a task force with sufficient time to address all of the concerns and coordinate all of the revisions as well as provide for the balloting process to be completed."

The general rule, as given in 300-3(b), is "All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, auxilliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4)." This language means that (1) through (4) are permissions to deviate from the general rule. However, the second sentence in item (1), as written, establishes installation criteria for paralleled conductors. These conditions did not appear in the 1996 NEC or in Proposal 3-10. The 1996 NEC made a simple reference to Section 310-4. This installation criteria should not be located here. If the panel or the submitter of Comment 3-17 feel this language is critical a proposal should be made to include the language in 310-4. Additionally, the reference to Section 250-112 I contained in 310-4 and need not be restated here.

Taken in relation to the general statement in 300-3(b), item number (3) is a permission to not have "All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors" " be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord." The second sentence in (3) is essentially the same as found in the 1996 NEC. The first sentence, however, seems not to correlate with the provisions of the 1996 NEC. This sentence appears to introduce new permissions which did not have the benefit of public review as they were made at the comment stage rather than the proposal stage. Taken as a permission, this sentence makes it possible to expand the use of single conductors for beyond that found in the 1996 NEC. The permission, as found in the 1999 NEC, permits all nonmetallic and nonmagnetic cables, cords, etc, to have a conductor from one nonmetallic or nonmagnetic cable, cord, etc. and a conductor from another nonmetallic or nonmagnetic cable, cord, etc. for as many nonmetallic or nonmagnetic cable, cord, etc. as wanted to make a circuit. For example, there are four (4) type NM-B cables operating at 120-volts in the same nonmagnetic box. It is now possible to take an ungrounded conductor from one cable, an ungrounded conductor from another cable, a neutral from another cable, and an equipment grounding conductor from another cable to form a multiwire branch-circuit. This permission was not granted in the 1996 NEC. Part of the proposed revisions in (3) seek to restore the 1996 position on this issue.

The 1999 language in the first sentence in (3) would be applicable to all installations where single conductors were employed and magnetic metals were located between the single conductors. For that reason, this requirement is better located ahead of items (1) through (4) and made to apply to each of the items rather than only one. By locating it ahead of the permissions, it is not a permission to expand the use of single conductors but a statement of fact.

This proposal seeks to restore the permissions given in the 1996 NEC while not introducing new material or making changes which have not had the benefit of public review. It also seeks to delete some language found in the 1999 edition which was not found in 1996 edition.

PANEL ACTION: Accept in Part.

Modify 300-3(b) to read as follows:

"(b) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4).

Where permitted in (1) through (4), conductors in wiring methods with a nonmetallic sheath or other nonmagnetic sheath shall comply with the provisions of Section 300-20(b).

(2) Grounding and Bonding Conductors. Equipment grounding conductors shall be permitted to be installed outside a raceway or cable assembly where in accordance with the provisions of Section 250-130(c) for certain existing installations, or in accordance with Section 250-134(b), Exception No. 2, for dc circuits. Equipment bonding conductors shall be permitted to be installed on the outside of raceways in accordance with Section 250-102(e)."

The panel reject the balance of the proposal.

PANEL STATEMENT: The proposed addition of the sentence in (b) was moved from existing (3) and should remain as it is presently located in the Code since (3) only deals with installations in nonferrous wiring methods. By placing it in the beginning of the section, it implies that ferrous raceways do not have to comply with Section 300-20 when, in fact, they do.

The exception to Section 300-3(b)(1) is an exception to the general rule as stated in (1) and should remain an exception. The directive from the TCC to the Code Making Panels for the 1999 NEC cycle was to convert any mandatory exceptions into positive text since these mandatory exceptions were a requirement anyway. A true exception to the general rule should remain as an exception since it is more easily identified as being an exception.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:
KREINER: The panel action modifies text in 300-3(b) to include the statement: "Where permitted in (1) through (4), conductors in wiring methods with a nonmetallic sheath or other nonmagnetic sheath shall comply with the provisions of Section 300-20(b)." The panel statement says: "The proposed addition of the sentence in (b) was moved from existing (3) and should remain as it is presently located in the Code since (3) only deals with installations in nonferrous wiring methods. By placing it in the beginning of the section, it implies that ferrous raceways do not have to comply with Section 300-20 when, in fact, they do." The panel statement clearly indicates the panel did no want this sentence included in 300-3(b). It should either be struck out in the panel action or eliminated.

(Log #3734)

3- 12 - (300-3(b)): Accept in Part
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Revise Section 300-3(b) to read as follows:
(b) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4). Where permitted in (1) through (4), conductors in wiring methods with a nonmetallic or other nonmagnetic sheath shall comply with the provisions of Section 300-20(b).
(1) Paralleled Installations. Conductors shall be permitted to be run in parallel in accordance with the provisions of Section 310-4. ~~The requirement to run all circuit conductors within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord shall apply separately to each portion of the paralleled installation, and the equipment grounding conductors shall comply with the provisions of Section 250-122.~~ Conductors installed in nonmetallic raceways run underground shall be permitted to be arranged as isolated phase installations in accordance with Section 300-5(I), Exception No. 2. Parallel runs in cable tray shall comply with the provisions of Section 318-8(d).
~~Exception: Conductors installed in nonmetallic raceways run underground shall be permitted to be arranged as isolated phase installations. The raceways shall be installed in close proximity and the conductors shall comply with the provisions of Section 300-20(b).~~
(2) Grounding and Bonding Conductors. Equipment grounding conductors shall be permitted to be installed outside a raceway or cable assembly where in accordance with the provisions of Section 250-130(c) for certain existing installations, or in accordance with Section 250-134(b), Exception No. 2, for dc circuits. Equipment bonding conductors shall be permitted to be installed on the outside of raceways in accordance with Section 250-102(e).
(3) ~~Nonferrous Wiring Methods.~~ MI Cable. ~~Conductors in wiring methods with a nonmetallic or other nonmagnetic sheath shall, where in different raceways, auxiliary gutters cable trays, trenches, cables, or cords, comply with the provisions of Section 300-20(b).~~ Conductors in single-conductor Type MI cable with a nonmagnetic sheath shall comply with the provisions of Section 330-16.
(4) Enclosures. Where an auxiliary gutter runs between a column-width panelboard and a pull box, and the pull box includes neutral terminations, the neutral conductors of circuits supplied from the panelboard shall be permitted to originate in the pull box.
SUBSTANTIATION: The action of Comment 3-17 of the 1998 ROC was to accept in principal. Part of the substantiation made by the submitter of the comment, as found on page 260 of the ROC, follows. "This comment is an attempt to rescue the baby from the bath water. It restructures the section to minimize, but not eliminate exceptions, in accordance with my views expressed in the comment on proposal 3-10. It does so without making changes in the technical content."
Comment 3-17 was made on Proposal 3-12. Proposal 3-12 sought to remove the Exceptions in 300-3(b) and to make them positive text. The Panel rejected the proposal and referenced the statement in Proposal 3-10 as their Panel Statement. That Panel Statement 3-10 is "The panel believes that the intent of the relocated exception was changed without sufficient substantiation. The directive received from the Correlating Committee to incorporate exceptions into the main text needs to be addressed by a task force with sufficient time to address all of the concerns and coordinate all of the revisions as well as provide for the balloting process to be completed."
The general rule, as given in 300-3(b), is "All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, auxilliary gutter, cable tray, trench, cable, or cord, unless otherwise permitted in accordance with (1) through (4)." This language means that (1) through (4) are permissions to deviate from the general rule. However, the second sentence in item (1), as written, establishes installation criteria for paralleled conductors. These conditions did not appear in the 1996 NEC or in Proposal 3-10. The 1996 NEC made a simple reference to Section 310-4. This installation criteria should not be located here. If the panel or the submitter of Comment 3-17 feel this language is critical a proposal should be made to include the language in 310-4. Additionally, the reference to Section 250-112 I contained in 310-4 and need not be restated here.
The Exception following (1) can be made into positive text by incorporating it into (1). This proposal seeks to do so by adding a new last sentence to (1).
Taken in relation to the general statement in 300-3(b), item number (3) is a permission to not have "All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors" " be contained within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord." The second sentence in (3) is essentially the same as found in the 1996 NEC. The first sentence, however, seems not to correlate with the provisions of the 1996 NEC. This sentence appears to introduce new permissions which did not have the benefit of public review as they were made at the comment stage rather than the proposal stage. Taken as a permission, this sentence makes it possible to expand the use of single conductors for beyond that found in the 1996 NEC. The permission, as found in the 1999 NEC, permits all nonmetallic and nonmagnetic cables, cords, etc, to have a conductor from one nonmetallic or nonmagnetic cable, cord, etc. and a conductor from another nonmetallic or nonmagnetic cable, cord, etc. for as many nonmetallic or nonmagnetic cable, cord, etc. as wanted to make a circuit. For example, there are four (4) type NM-B cables operating at 120-volts in the same nonmagnetic box. It is now possible to take an ungrounded conductor from one cable, an ungrounded conductor from another cable, a neutral from another cable, and an equipment grounding conductor from another cable to form a multiwire branch-circuit. This permission was not granted in the 1996 NEC. Part of the proposed revisions in (3) seek to restore the 1996 position on this issue.
The 1999 language in the first sentence in (3) would be applicable to all installations where single conductors were employed and magnetic metals were located between the single conductors. For that reason, this requirement is better located ahead of items (1) through (4) and made to apply to each of the items rather than only one. By locating it ahead of the permissions, it is not a permission to expand the use of single conductors but a statement of fact.
This proposal seeks to restore the permissions given in the 1996 NEC while not introducing new material or making changes which have not had the benefit of public review. It also seeks to delete some language found in the 1999 edition which was not found in 1996 edition.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3886)

3- 13 - (300-3(b)(3)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 7-126 and 7-126a. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 for information. This action will be considered by the Panel as a Public Comment.
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise text to read as follows:
(3) Nonferrous Wiring Methods. Conductors in wiring methods with a nonmetallic or other nonmagnetic sheath shall, where run in different raceways, auxiliary gutters, cable trays, trenches, cables, or cords, shall comply with the provisions of

Section 300.20(b). Conductors in single-conductor Type MI cable with a nonmagnetic sheath shall comply with the provisions of Section 330.16.
SUBSTANTIATION: Editorial correction.
PANEL ACTION: Accept in Principle.
Revise text to read as follows:
"(3) Nonferrous Wiring Methods. Conductors in wiring methods with a nonmetallic or other nonmagnetic sheath , where run in different raceways, auxiliary gutters, cable trays, trenches, cables, or cords, shall comply with the provisions of Section 300.20(b). Conductors in single-conductor Type MI cable with a nonmagnetic sheath shall comply with the provisions of Section 330.16."
PANEL STATEMENT: The change meets the submitter's intent and places the "shall" in the correct location.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4433)

3- 14 - (300-3(c)(1)): Reject
SUBMITTER: William Mattson, Lawrence Berkley Lab
RECOMMENDATION: Revise text to read as follows:
300.3(c)(1) 600 Volts, Nominal, or Less. Conductors of circuits rated 600 volts, nominal, or less, ac circuits, and dc circuits shall be permitted to occupy the same equipment wiring enclosure, cable, or raceway. All conductors shall have an insulation rating equal to ~~at least the maximum circuit voltage applied~~ the highest insulation rating of any conductor within the enclosure, cable, or raceway, up to 600 volts.
SUBSTANTIATION: To avoid limitations created when combining conductors in enclosures, cables or raceways, with maximum insulation ratings less than 600 volts, with conductors rated at 600 volts.
PANEL ACTION: Reject.
PANEL STATEMENT: There are installations where the maximum voltage levels are 240 volts for all of the power circuits enclosed in the raceway but the Class 1 control circuits that are functionally associated as allowed by Section 725-26(b) may be power-limited to a maximum of 1000 VA with a maximum 30 volts. This change would require all conductor insulation to be rated for 600 volts if any conductor in the raceway is rated for 600 volts and this would be overly restrictive for no technical reason. The maximum voltage of any circuit in the raceway should determine the insulation rating of the other conductors, not the insulation ratings of the other conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1821)

3- 15 - (300-3(c)(1), FPN): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Relocate the existing fine print note to follow the first sentence, and change it to become a rule as follows:
"Section 725-54(a)(1) restricts Class 2 and Class 3 circuit conductors from being installed in the same enclosure, cable, or raceway."
SUBSTANTIATION: The current reference continues to be ignored always by installers! The words in the section will make it very clear that there are restrictions. I had a student in Ohio almost faint when I mentioned this rule, which was not properly enforced at the local level by the authority having jurisdiction.
PANEL ACTION: Reject.
PANEL STATEMENT: The Fine Print Note provides information to alert the user of the Code to look in Section 725-54 when dealing with Class 2 and Class 3 conductors. Section 90-3 already states that Chapter 7 can supplement or modify the general rules in Chapters 1 through 4. The FPN provides enough information to warn the user of the existence of a variation of the general rule and should not be placed into Article 300 as another mandatory reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #411)

3- 16 - (300-4): Reject
SUBMITTER: Russell A. Jones, Charlottesville, VA
RECOMMENDATION: Add new second sentence to main paragraph:
A router or any other power tool, shall not be used to cut through sheetrock or any other material, that has been placed over an electrical box containing electrical wires, to access the box.
SUBSTANTIATION: The wires are being nicked or cut through. Where only the wire insulation has been cut through applying electrical tape does not in my opinion comply with "a workmanlike installation". What about the small nicks that aren't noticed? Splicing wire onto the wires that have been badly nicked or cut through, does not in my opinion comply with "At least 6 in. of free conductor - for splices etc." (not as splices), or "a workman like installation". I've yet to see a sheetrocker using a router, nick or cut a wire or wires, in less than one out of fifty or so work boxes.
PANEL ACTION: Reject.
PANEL STATEMENT: The tools used by another building trade to cut sheet rock around outlet boxes cannot be limited or eliminated by the NEC. Section 300-4 addresses protection against physical damage of conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CASPARRO: Although I agree with the Panel Statement that tools used by another building trade to cut sheet rock around outlet boxes cannot be limited or eliminated by the NEC, the effects of wires being nicked and cut is becoming a serious problem and needs to be addressed. Blank plates can be mounted over the outlet boxes before the sheet rock is installed, but this now becomes an added expense for the electrical contractor.

(Log #4438)

3- 17 - (300-4(2), Exception): Reject
SUBMITTER: Thomas Royer
RECOMMENDATION: Revise the Exception to read as follows:
Exception: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, ~~rigid nonmetallic conduit,~~ or electrical metallic tubing.
SUBSTANTIATION: Using PVC conduits in notches subjects the conductors to sheet rock screws from screw guns. The plastic should be protected in the notches.
PANEL ACTION: Reject.
PANEL STATEMENT: The section referenced should be 300-4(A)(2). The submitter had not provided technical substantiation for his proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
CASPARRO: According to the Fact Finding Report File #E7330 Project 93ME50090 supplied with the 2002 Proposals, rigid nonmetallic conduit suffered considerable damage from nails and screws. For example a total of 25 tests were done with drywell screws. The screws penetrated the interior of the conduit 15 times or 60 percent. Of 25 tests done with drywall screws / drill point, the screw penetrated the interior of the conduit 18 times or 72 percent. These percentages are much too high, thereby jeopardizing the safety of the conductors.
Based on Panel Action on Proposal 3-31, it seems consistent to accept the submitter's proposal.
GRUBER: I agree with Mr. Casparro's negative comment.

(Log #1408)

3- 18 - (300-4(a)(1)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence to read:
(1) Bored Holes. In both exposed and concealed locations where a cable or raceway-type wiring method is installed through bored or punched holes in ~~joists, rafters or~~ wood or metal framing members, holes shall be bored or punched so that ~~the~~ no edge of the hole is ~~not~~ less than 1 1/4 in. (31.8mm) from the nearest edge of the ~~wood~~ framing member.
(Remainder unchanged).

SUBSTANTIATION: This section does not specifically cover punched holes in metal framing members and may be perceived as not covering bored holes in metal members. Cables and raceways are commonly run through bored or punched holes in metal framing members and subject to penetration by wall cover screws and other fasteners. The protection required by subsection (b)(1) appears related to sharp edges. Sections 333-7(a), 334-10(a)(1), and 336-9 require protection for cables run through metal members.

"Framing members" renders "joists" and "rafters" superfluous since it covers those specific members and all others regardless of designation.

Wording should be explicit enough to prevent the 12 in. measurement being made to the hole edge farthest from the nearest edge of the framing member, which is apparently the intent. As presently worded, this is not specifically prohibited.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 300-4(A) relates specifically to cables and raceways through wood members. Parentheses (B) relates to metal framing members.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2266)

3- 19 - (300-4(a)(1)): Reject
SUBMITTER: John Stacey, City of St. Louis, Elect. Insp. Dept.
RECOMMENDATION: The word cable should be ~~A~~ cable(s)in both the first and last sentence. Strike the word A before cable.
SUBSTANTIATION: This will clarify that more than a cable may go through a bored hole.
PANEL ACTION: Reject.
PANEL STATEMENT: The word "cable" in the first sentence is an adjective describing a wiring method. In the last sentence, this section deals with the protection of the cable(s), not the quantity of cables. The text as presently worded indicates a cable wiring method and could apply to one or more cables installed in a bored hole.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1694)

3- 20 - (300-4(a)(1), Exception): Reject
SUBMITTER: Edmund J. Dagner, Lake County Dept. of Growth Mgmt, FL
RECOMMENDATION: Delete rigid nonmetallic conduit.
SUBSTANTIATION: Drywall screws and nail guns used to install drywall or sheet rock will go into rigid nonmetallic conduit Schedule 40 and Schedule 80, creating a short in feeders and branch circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter had not provided technical substantiation for his proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2

EXPLANATION OF NEGATIVE:
CASPARRO: See my Explanation of Negative Vote on Proposal 3-17.
GRUBER: I agree with Mr. Casparro's negative comment.

(Log #4031)

3- 21 - (300-4(a)(1), Exception and FPN (New)): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add an Exception and a Fine Print Note to read as follows:
Exception: A plate or bushing of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the 45-N scale shall be permitted.
FPN: One way to determine applicable requirements for steel hardness is to refer to the Standard Hardness Conversion Tables for Metals (ASTM E140-97).
SUBSTANTIATION: Steel plates of 1/16 in. thickness cause bulging on drywall. The above described plates (1/32 in. thickness) prevent screws and nails from penetrating into the cable and maintain the safety of technicians and occupants.
PANEL ACTION: Reject.
PANEL STATEMENT: Twisted and imperfect studs, electrical boxes with raised nail brackets designed to be installed on the edge of a stud, plumbing pipes, and many other construction related items can cause bulges in drywall, but a properly installed steel nail plate that is 1/16th inch in thickness would not create an unnecessary bulge in the drywall. The submitter had not provided any technical substantiation for this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1691)

3- 22 - (300-4(a)(2), Exception): Reject
SUBMITTER: Edmund J. Dagner, Lake County Dept. of Growth Mgmt, FL
RECOMMENDATION: Delete rigid nonmetallic conduit.
SUBSTANTIATION: Drywall screws and nail guns used to install drywall or sheet rock will go into rigid nonmetallic conduit Schedule 40 and Schedule 80, creating a short in feeders and branch circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement for Proposal 3-17.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
CASPARRO: See my Explanation of Negative Vote on Proposal 3-17.
GRUBER: I agree with Mr. Casparro's negative comment.

(Log #4032)

3- 23 - (300-4(a)(2), Exception and FPN (New)): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add an Exception and a Fine Print Note to read as follows:
Exception: A plate or bushing of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the 45-N scale shall be permitted.
FPN: One way to determine applicable requirements for steel hardness is to refer to the Standard Hardness Conversion Tables for Metals (ASTM E140-97).
SUBSTANTIATION: Steel plates of 1/16 in. thickness cause bulging on drywall. The above described plates (1/32 in. thickness) prevent screws and nails from penetrating into the cable and maintain the safety of technicians and occupants.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2860)

3- 24 - (300-4(b) and (2)): Reject
SUBMITTER: Bill F. Neitzel, Madison, WI
RECOMMENDATION: Revise the text for 300-4(b) and 300-4(b)(2) as follows:
"(b) Cables and Raceways Through Metal Framing Members.
(2) Cables and Raceways. Where nails and screws are likely to penetrate cables or raceways, a steel plate, or steel clip..."
Add exception:
Exception: Steel plates shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing.
SUBSTANTIATION: The same hazards exist for MC cable, ac cable, flexible metal conduit etc. in metal framing members as it does in wood framing members. Revising this text would give better flow and consistency to this section of the code.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 300-4(b) covers nonmetallic-sheathed cable and electrical nonmetallic tubing so an exception for rigid metal conduit, IMC, rigid nonmetallic conduit, and EMT would not apply.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3242)

3- 25 - (300-4(b)(1)): Reject
SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council
RECOMMENDATION: Revise text to read as follows:
(b) Nonmetallic-Sheathed Cables and Electrical Nonmetallic Tubing Through metal Framing Members.
(1) Nonmetallic-Sheathed Cable. In both exposed and concealed locations where nonmetallic-sheathed cables pass through either factory or field punched, cut, or drilled slots or holes in metal members, the cable shall be protected by listed bushings or grommets covering all metal edges and securely fastened in the opening prior to installation of the cable.
SUBSTANTIATION: This proposal was originally developed by the Task Group on Nonmetallic-Sheathed Cable based on their review of appropriate uses for Nonmetallic-Sheathed Cable. This review indicates that the critical issue in the safe use of Nonmetallic-Sheathed Cable in metal framing members (typical steel studs) is protection of the cable during installation. This includes the pulling of the cable through openings in the studs and the normal movement (adjustment or straightening) of the studs after the cable is in place.
Section 300.4(b)(1) presently identifies the minimum construction standards for bushings used to protect Nonmetallic-Sheathed Cable. A safety standard exists (UL Standard for Safety 635) which provides testing and listing requirements for bushings intended to be used for this purpose. The standard includes acceptable types of materials for such bushings and pull test to assure that the bushings remain in place during the installation of cables. The task group believes that a requirement for listing is necessary to assure that bushings used for the protection of Nonmetallic-Sheathed Cable will perform effectively.
The recommendation for the deletion of the term "grommet" is based on a review of common definitions of the term which nearly all refer to a "a metal eyelet" or opening for a rope. The definition of the term busing includes "a lining of an opening for one or more electrical wires to pass through". Use of the term "busing" is also consistent with the Safety Standard which uses the term "stud bushing" to describe bushings intended to meet the requirements of Section 300.4.
NMHC is submitting this proposal to forward the work of the Task Group on Nonmetallic Sheathing to Panel 7.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-25a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4096)

3- 25a - (300-4(b)(1)): Reject
SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council
RECOMMENDATION: Revise text to read as follows:
(b) Nonmetallic-Sheathed Cables and Electrical Nonmetallic Tubing Through metal Framing Members.
(1) Nonmetallic-Sheathed Cable. In both exposed and concealed locations where nonmetallic-sheathed cables pass through either factory or field punched, cut, or drilled slots or holes in metal members, the cable shall be protected by listed bushings ~~or grommets~~ covering all metal edges and securely fastened in the opening prior to installation of the cable.
SUBSTANTIATION: This proposal was originally developed by the Task Group on Nonmetallic-Sheathed Cable based on their review of appropriate uses for Nonmetallic-Sheathed Cable. This review indicates that the critical issue in the safe use of Nonmetallic-Sheathed Cable in metal framing members (typical steel studs) is protection of the cable during installation. This includes the pulling of the cable through openings in the studs and the normal movement (adjustment or straightening) of the studs after the cable is in place.
Section 300.4(b)(1) presently identifies the minimum construction standards for bushings used to protect Nonmetallic-Sheathed Cable. A safety standard exists (UL Standard for Safety 635) which provides testing and listing requirements for bushings intended to be used for this purpose. The standard includes acceptable types of materials for such bushings and pull test to assure that the bushings remain in place during the installation of cables. The task group believes that a requirement for listing is necessary to assure that bushings used for the protection of Nonmetallic-Sheathed Cable will perform effectively.
The recommendation for the deletion of the term "grommet" is based on a review of common definitions of the term which nearly all refer to a "a metal eyelet" or opening for a rope. The definition of the term bushing includes "a lining of an opening for one or more electrical wires to pass through". Use of the term "bushing" is also consistent with the Safety Standard which uses the term "stud bushing" to describe bushings intended to meet the requirements of Section 300.4.
NMHC is submitting this proposal to forward the work of the Task Group on Nonmetallic Sheathing to Panel 3.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter states that UL 635 provides testing and listing standards for bushings intended for use in factory or field punched steel studs. UL 635 covers the listing of bushings and accessories for insulated bushings for protection of cables, cords, and insulated conductors where routed through internal or external walls of electrical equipment. It also covers the use of insulated bushings for providing strain relief and protection for flexible cords and single conductors in electrical equipment. It specifically states that it does not cover bushings used in conjunction with rigid or flexible conduit, conduit fittings, electrical metallic tubing, armored cable, or non-metallic sheathed cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4033)

3- 26 - (300-4(b)(2), Exception and FPN (New)): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add an Exception and a Fine Print Note to read as follows:
Exception: A plate or bushing of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the 45-N scale shall be permitted.
FPN: One way to determine applicable requirements for steel hardness is to refer to the Standard Hardness Conversion Tables for Metals (ASTM E140-97).
SUBSTANTIATION: Steel plates of 1/16 in. thickness cause bulging on drywall. The above described plates (1/32 in. thickness) prevent screws and nails from penetrating into the cable and maintain the safety of technicians and occupants.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4190)

3- 27 - (300-4(d)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Delete this subsection.
SUBSTANTIATION: This is a companion proposal to one made for Section 336-9 to include this provision for nonmetallic sheathed cables. Taken together, both proposals transfer this restriction to the type of cable for which it is appropriate. There have been many studies done that well demonstrate that armored cables roll out of the way of a penetrating nail or screw. In fact, it is much more difficult to damage an armored cable assembly than it is a rigid steel raceway, whether EMT or even rigid or intermediate steel conduit, and certainly more difficult than rigid nonmetallic conduit. CMP 3 should revisit the technical merits of this requirement.
In the last cycle, CMP 3 rejected a similar proposal by effectively reiterating that due to unsubstantiated "statements from the field" CMP 3 would continue to refuse to be confused by objective information in the fact finding studies. This code rule is an economic benefit for a special interest masquerading as a safety requirement, and as such it discredits the process. If this subsection is removed, then CMP 7 will write appropriate

protection rules within its articles, rules that should reasonably differ according to the different cable constructions.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide technical substantiation for this proposal. Also the field comments were not substantiated.
This subsection should remain in Section 300-4 since it covers more than just cable systems and also provides the user of the Code with a single location with which to deal with conductor protection in both cables and raceways.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
ANDREWS: The first two sentences of the Panel Statement are confusing. The last paragraph of the submitter's substantiation included the charge that similar proposal in the 1999 cycle was rejected due to "unsubstantiated statements from the field." In the Panel discussion it was noted that proper substantiation had been submitted in past cycles, and it was considered unnecessary to repeat them again when the proposal itself was basically unchanged. Unfortunately, the second sentence of the Panel Statement indicates the submitter's claim was true, when the exact opposite is the case. The word "not" in the second sentence should be removed.
BEILE: The panel statement is wrong by including the sentence, "Also the field comments were not substantiated." Field reports were substantiated by former Code-Making Panel 3 members.

(Log #4034)

3- 28 - (300-4(d), Exception and FPN (New)): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add an Exception and a Fine Print Note to read as follows:
Exception: A plate or bushing of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the 45-N scale shall be permitted.
FPN: One way to determine applicable requirements for steel hardness is to refer to the Standard Hardness Conversion Tables for Metals (ASTM E140-97).
SUBSTANTIATION: Steel plates of 1/16 in. thickness cause bulging on drywall. The above described plates (1/32 in. thickness) prevent screws and nails from penetrating into the cable and maintain the safety of technicians and occupants.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1692)

3- 29 - (300-4(d) Exception No. 1): Reject
SUBMITTER: Edmund J. Dagner, Lake County Dept. of Growth Mgmt, FL
RECOMMENDATION: Delete rigid nonmetallic conduit.
SUBSTANTIATION: Drywall screws and nail guns used to install drywall or sheet rock will go into rigid nonmetallic conduit Schedule 40 and Schedule 80, creating a short in feeders and branch circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-20.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CASPARRO: See my Explanation of Negative Vote on Proposal 3-17.
GRUBER: I agree with Mr. Casparro's negative comment.

(Log #779)

3- 30 - (300-4(d) Exception No. 3): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 19 for information.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete Exception No. 3.
SUBSTANTIATION: This exception came into the 1990 code based on the premise that factory supervision and tests negated the need for the rule. A nail or screw for nonconductive wall covering, cabinets, etc., which penetrates insulation and only contacts an ungrounded conductor is not likely to be detected by a dielectric test or continuity test to ground or grounded conductor, where the wiring method is nonmetallic such as NM, ENMT, NMRC, etc. Are the factory supervision and tests more effective than a qualified inspector requiring proper clearance or protection?
This section is intended to provide protection also against future installation of nails or screws by occupants. If spaced or protected in accordance with the rule there may be protection, but a past dielectric or continuity test offers no such protection. If such tests are suitable in lieu of spacing or protection, they should be an option for all installations. In my opinion, this exception provides a lesser level of safety for occupants of mobile homes and recreational vehicles.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4127)

3- 31 - (300-4(d) Exception No. 4 (New)): Reject
SUBMITTER: George A. Straniero, AFC Cable Systems, Inc.
RECOMMENDATION: Add an Exception No. 4 to read as follows:
"Interlocked steel armored MC and AC cables not exceeding four conductors no larger than 10 AWG."
SUBSTANTIATION: A similar proposal was submitted for the 1999 code. It is being resubmitted for consideration by the panel for the 2002 code. The substantiation for the proposal is fact-finding report that demonstrates the ability of steel armored cables to resist nail penetrator. In fact, the report shows that steel armored cables resist nail penetration equal to or better than wiring methods currently accepted from the requirements of 300-4(d). The proposal was not accepted last cycle based on nondocumented beliefs. The proposal should be accepted based on the documented performance I have submitted.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The fact finding report shows that these cables receive varying amounts of sheath damage and\or penetrations which would appear to justify the requirement, rather than justifying its elimination. Enforcement of this proposal would be difficult, since there is no external marking on the AC & MC cables indicating whether the sheath is aluminum or steel, the AHJ would then have to determine the sheathing type under often adverse conditions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1693)

3- 32 - (300-4(e), Exception): Reject
SUBMITTER: Edmund J. Dagner, Lake County Dept. of Growth Mgmt, FL
RECOMMENDATION: Delete rigid nonmetallic conduit.
SUBSTANTIATION: Drywall screws and nail guns used to install drywall or sheet rock will go into rigid nonmetallic conduit Schedule 40 and Schedule 80, creating a short in feeders and branch circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal on 3-20.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2

EXPLANATION OF NEGATIVE:
CASPARRO: See my Explanation of Negative Vote on Proposal 3-17.
GRUBER: I agree with Mr. Casparro's negative comment.

(Log #4035)

3- 33 - (300-4(e), Exception and FPN (New)): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add an Exception and a Fine Print Note to read as follows:
Exception: A plate or bushing of 1/32 in (0.8 mm) thickness with a minimum hardness of 45 on the 45-N scale shall be permitted.
FPN: One way to determine applicable requirements for steel hardness is to refer to the Standard Hardness Conversion Tables for Metals (ASTM E140-97).
SUBSTANTIATION: Steel plates of 1/16 in. thickness cause bulging on drywall. The above described plates (1/32 in. thickness) prevent screws and nails from penetrating into the cable and maintain the safety of technicians and occupants.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1057)

3- 34 - (300-4(f)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 4" to "4 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4458)

3- 35 - (300-4(g), 370-15(c)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for information.
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
RECOMMENDATION: Add new text to read as follows:
"Equipment located within 78 in. vertically from streets, alleys, parking lots, or sidewalks, where access by the general public is not restricted by physical barriers, shall be considered "subject to severe mechanical damage."
SUBSTANTIATION: The CMP and Correlating Committee have accepted the concept that equipment subject to severe mechanical damage does require protection in order to fulfill the mandate of 90-1(a). So many of these installations are damaged, whether casually, spitefully, or accidentally. Every member of the committee is likely to come upon on instance of what I'm talking about while walking no more than a mile in just about any neighborhood. Installers should be put on notice that this should be treated like any other instance where sever mechanical damage required suitable protection I doubt the committee would want to change the wording to say, "some cases where equipment is subject to sever mechanical damage it require protection but other such equipment does not." This is not an instance where an NEIS is likely to be of help; it's not clearly a 110-12 issue. The rule should reflect the reality that most of these are at risk, rather than an implicit base assumption that they are not. It's burdensome for a Code official to have to make the call. "This one is at risk, that one really isn't." I've heard again and again from inspectors that a uniform rule would be easier to enforce and therefore ultimately safer.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 300 deals with wiring methods and Section 300-4 specifically deals with protection of conductors where installed as or in a wiring method. The proposal covers a very wide concept of protection of all electrical equipment and may be more appropriately covered in Article 110 for Requirements for Electrical Installations. However, Sections 110-3(a)(1), 110-3(a)(2), 110-3(a)(8), 110-26(f)(2), and 110-27(b) already seem to apply to those situations where electrical equipment may be subjected to damage of any kind. Locating electrical equipment in streets, alleys, parking lots, or sidewalks that are accessible to the general public would not necessarily mean that electrical equipment is subject to severe mechanical damage. This should remain a judgement call by the authority having jurisdiction based upon the actual installation in accordance with Section 110-2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4017)

3- 37 - (300-5): Reject
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: Revise text to read as follows:
300-5(d), second paragraph:
"Service laterals, feeders, and branch circuits that are not encased in concrete and that are buried 18 in. or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 12 in. above the underground installation."
SUBSTANTIATION: Feeders and branch circuits can also be placed below grade for various reasons. Why would the NEC single out feeders? It may be said that service laterals are not equipped with stringent overcurrent/short circuit protection that the NEC mandates. These feeder and branch circuits, in most cases, are not protected by GFCI device so the same hazard of electrocution is still very much present.
I do not think the NEC singled out only feeders, the previous code proposal probably addressed feeders only. This code change would increase safety in and around the public and private sector.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CASPARRO: See my Explanation of Negative Vote on Proposal 3-45.

(Log #780)

3- 38 - (Table 300-5): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise column 5 heading:
Class 2 circuits and Circuits for Control of Irrigation ~~and~~ or Landscape Lighting, Limited to Not More than 30 Volts, and Installed with Type UF or other Identified Cable or in Raceway.
SUBSTANTIATION: This column does not provide for Class 2 circuits unless they are used for irrigation control and landscape lighting (both required?). There does not seem to be a specific reference in Article 725 which allows column 5 to be used.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 725-3 states that compliance with Article 300 is not necessary, unless specifically referenced within Article 725. Due to its power limitations, a Class 2 circuit will not initiate a fire and provides acceptable protection from a shock hazard. Since it is not considered to be a shock hazard, compliance with the minimum cover requirements in Table 300-5 is not a safety issue. A person can certainly use the Table but the minimum requirements in Table 300-5 should not be mandatory. Placing the requested text into the Table would require a change for Article 725 and then would become mandatory without any potential safety problem.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1269)

3- 39 - (Table 300-5): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 1) Revise the table heading as follows:

Table 300-5. Minimum Cover Requirements, 0 to 600 Volts, Nominal, Burial in mm (inches) ~~inches~~ (Cover is defined as the shortest distance in mm (inches) ~~inches~~ measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.)

2) Split Table 300-5 Column 1 as follows:

mm	Inches
600	24
450	18
0	0
450	24
600	24
450	18
450	18

3) Split Table 300-5 Column 2 as follows:

mm	Inches
150	6
150	6
0	0
100	4
600	24
450	18
450	18

4) Split Table 300-5 Column 3 as follows:

mm	Inches
450	18
300	12
0	0
100	4
600	24
450	18
450	18

5) Split Table 300-5 Column 4 as follows:

mm	Inches
300	12
50	6
0 (in raceway only)	0 (in raceway only)
150 (direct burial)	
100 mm (in raceway)	6 (direct burial)
4 (in raceway)	
600	24
300	12
450	18

6) Split Table 300-5 Column 5 as follows:

mm	Inches
150	6
50	6
0 (in raceway only)	0 (in raceway only)
150 (direct burial)	6 (direct burial)
100 mm (in raceway)	4 (in raceway)
600	24
450	18
450	18

7) Delete Note 1 to Notes to Table 300-5. Renumber existing notes accordingly.

8) Revise existing Note 2 to read as follows:

Raceways approved for burial only where concrete encased shall require concrete envelope not less than 50 mm (2 in.) ~~2 in.~~ thick.

9) Revise existing Note 3 to read as follows:

Where solid rock prevents compliance with the cover depths specified in this table, the wiring shall be installed in metal or nonmetallic raceway permitted for direct burial. The raceways shall be covered by a minimum of 50 mm (2 in.) ~~2 in.~~ of concrete extending down to rock.

SUBSTANTIATION: The proposed revisions are intended to comply with the NFPA No. 1M Manual of Style, Section 4.1 with respect to the placement of units The existing Table 300-5 columns have been split into two columns, one for burial depth in mm, the other for burial depth in inches. NFPA editorial staff may format the information in the most suitable format for inclusion in Table 300-5.

PANEL ACTION: Accept in Principle.

Modify the table heading to read as follows: "Table 300-5. Minimum Cover Requirements, 0 to 600 Volts, Nominal, Burial in mm (inches) (Cover is defined as the shortest distance in mm (inches) measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.)"

2) Split Table 300-5 Column 1 as follows:

mm	Inches
600	24
450	18
0	0 (in raceway only)
450	18
600	24
450	18
450	18

3) Split Table 300-5 Column 2 as follows:

mm	Inches
150	6
150	6
0	0
100	4
600	24
450	18
450	18

4) Split Table 300-5 Column 3 as follows:

mm	Inches
450	18
300	12
0	0
100	4
600	24
450	18
450	18

5) Split Table 300-5 Column 4 as follows:

mm	Inches
300	12
50	6
0 (in raceway only)	0 (in raceway only)
150 (direct burial)	6 (direct burial)
100 mm (in raceway)	4 (in raceway)
600	24
300	12
450	18

6) Split Table 300-5 Column 5 as follows:

mm	Inches
150	6
50	6
0 (in raceway only)	0 (in raceway only)
150 (direct burial)	6 (direct burial)
100 mm (in raceway)	4 (in raceway)
600	24
450	18
450	18

7) Delete Note 1 to Notes to Table 300-5. Renumber existing notes accordingly.

8) Revise existing Note 2 to read as follows:

"Raceways approved for burial only where concrete encased shall require concrete envelope not less than 50 mm (2 in.) thick."

9) Revise existing Note 5 to read as follows:

"Where solid rock prevents compliance with the cover depths specified in this table, the wiring shall be installed in metal or nonmetallic raceway permitted for direct burial. The raceways shall be covered by a minimum of 50 mm (2 in.) of concrete extending down to rock."

PANEL STATEMENT: The items changed were strictly editorial.

The changes include:

In item 2) in the proposal recommendation, insert "(in raceway only)" after both 0 (zeros) in the 4th line down and replace "24" with "18" in the 5th line down.

In item 5), place "6 (direct burial)" opposite "150 (direct burial)" and place "4 (direct burial)' opposite "100', delete the " mm" before "(in raceway).

In item 9), replace Note 3 with Note 5 in the proposal recommendation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1403)

3- 40 - (Table 300-5): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: In the first row, under column 4, under the Figure 12, add (direct burial or in Col. 3 raceway).
SUBSTANTIATION: The 12 in. cover requirement even where conductors are installed in rigid metal conduit, requires these specific branch circuits to be at a greater depth than column 2 which would otherwise apply to non-GFCI protected circuits with higher voltage and overcurrent protection. The proposal clarifies that where installed in Column 3 raceway, the burial depth can be reduced.
PANEL ACTION: Reject.
PANEL STATEMENT: The Table already allows residential branch circuits rated at 120 volts or less with GFCI protection and a maximum overcurrent protection of 20 amperes or less to be installed in direct burial nonmetallic raceways at a burial depth of 12 inches rather than 18 inches or direct burial cables or conductors at 12 inches rather than 24 inches. The proposal recommendation does not seem to provide clarification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2959)

3- 41 - (300-5(a)(1) (New)): Reject
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Add new text to read as follows:
(1) Raceways, used as a means of wire management, need not be listed when used with cables suitable for direct burial. The nonlisted raceway and direct burial cables shall be installed with the sufficient cover per Column 1 of Table 300-5.
SUBSTANTIATION: Cables suitable for direct burial are often sleeved in various raceways for design reasons. If such cable is installed with the sufficient cover for direct burial, then the characteristics of the raceway need not be evaluated. Other rules of the Code that apply to raceways generally may apply. See Section 300-5(h).
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal uses substantiation of design reasons. The design reasons are not known. There is no definition of the term "wire management" and does not comply with the NEC Style Manual. A sleeve used in this application should consist of a listed conduit. Non listed products could contain internal defects that could damage the conductors and have not been tested for the suitability of the application. Also, the panel is concerned about the potential of adding future circuits to this installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
FORSBERG: The panel stated that the raceway was required to be listed. A panel proposal should have been developed stating so. There continues to be listed direct burial cable being installed in nonlisted raceways.

(Log #2839)

3- 36 - (300-5(b)): Reject
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Revise as follows:
"~~Service laterals~~ Conductors that are not encased in concrete or protected by ground-fault circuit-interrupters (GFCI) and that are buried 18 in. (457 mm) or more below grade shall have their location identified by a warning ribbon that is ~~placed in the trench~~ located at least 12 in. (305 mm) above the underground installation."
SUBSTANTIATION: All direct-buried conductors should be marked to help minimize dig-in accidents and to additionally recognize that a GFCI may be substituted for the marker.
"Trench" is deleted as the same problem exists with drilled holes. Equipment is available that can drill multiple holes in one setting so a marker tape can be pulled through the upper one.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel understands that this is referenced to 300-5(d). The substantiation is not thorough enough to address all of the concerns of the panel. These concerns include such things as:
A method of installing a tape above bored holes, GFCI requirement, burial depths less than 18". The panel is concerned about the elimination of the service lateral requirement. Also, does the proposal address only direct burial conductors and not cables?
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CASPARRO: The intent of the submitter's proposal is the protection of the conductors. GFCI protection is for personnel only.

(Log #781)

3- 42 - (300-5(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete this section.
SUBSTANTIATION: This section appears totally related to design, not safety. Cables suitable for direct-burial outside a building or embedded in a concrete slab, or under an exterior slab for a driveway, patio, parking lot, etc. do not require raceways. The literal wording requires a raceway to be extended beyond perimeter walls even if cable is installed wholly within building perimeter.
PANEL ACTION: Reject.
PANEL STATEMENT: Table 300-5, Column 1 already requires a raceway where installing direct burial conductors or cables under a building. Installing direct burial cables or conductors either in the concrete slab of a building or under the concrete slab of a building and any movement or shift of the building slab or foundation may cause damage to the conductors. Damaged conductors and any ensuing leakage current that could occur into or through the concrete would be a hazard. Enclosing these cables or conductors under the slab of a building is more than a design consideration. This section does not apply to raceways that originate and terminate in the same building.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CASPARRO: I agree with the last sentence of the substantiation of the submitter. The literal wording of (300-5(c)) does seem to require that a raceway run underground must extend beyond the outside walls of the building. The last sentence of the Panel Statement should become part of (300-5(c)).

(Log #285)

3- 43 - (300-5(d)): Reject
SUBMITTER: Larry T. Smith, Nat'l Electrical Seminars
RECOMMENDATION: Revise the second paragraph to read:
"Service laterals that are not encased in concrete and that are buried 18 in. (457 mm) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 12 in. (305 mm) above the ~~underground installation~~ service lateral. Horizontally bored service laterals shall be exempt from this requirement."
SUBSTANTIATION: How is the installer to provide a warning ribbon above a service lateral that is being horizontally bored under a roadway, or parking lot, or street intersection? The nature of horizontal boring is used in those areas where trenching is impractical. At present, the only way to comply with this paragraph is to bore a second hole above the service lateral for the warning ribbon. The new wording will exempt horizontally bored services from the requirement of a warning ribbon.
The words underground installation are vague; if the warning ribbon is to be placed at least twelve inches above the service lateral, it should just say so.
PANEL ACTION: Reject.
PANEL STATEMENT: Present language only addresses trenching and not boring, thus boring is already excluded from the ribbon requirement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #532)

3- 44 - (300-5(d)): Reject
SUBMITTER: John M. Vargo, City of Lorain, OH
RECOMMENDATION: Delete text:
~~In no case shall the protection be required to exceed 18 in. (457 mm) below finished grade.~~
SUBSTANTIATION: This sentence contradicts Table 300-5's requirement in column 1 that direct buried cables or conductors must be buried a minimum of 24 inches in all locations not specified below.
PANEL ACTION: Reject.
PANEL STATEMENT: The 18 in in the first paragraph of 300-(5) is for vertical protection. It has nothing to do with cover requirements which is in Table 300-5. This sentence requires protection of the direct burial conductors from a depth of a least 18 inches below grade and up to 8 feet above grade. This sentence makes it clear that this protection does not have to be provided below 18 inches from grade. For example, a raceway sleeve could be installed for the direct burial conductors at 18 inches below grade and would not be required to start at the 24 inch depth of the direct burial conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1894)

3- 45 - (300-5(d)): Reject
SUBMITTER: Paul Casparro, Scranton Electricians JATC/Rep. Scranton Electricians JATC (IBEW-NECA)
RECOMMENDATION: Revise second paragraph to read as follows:
Service laterals, feeders, and branch circuits that are not encased in concrete and that are buried 18 in. (457 mm) or more below grade shall have their location identified by a warning ribbon that is placed in the trench or at least 12 in. (305 mm) above the underground installation.
SUBSTANTIATION: It has been my experience recently that even though there as built drawings, underground installations tend to get dug up accidentally without a warning ribbon. This proves to be costly for the owner, not to mention a safety hazard. For the sake of safety a warning ribbon should be placed over all underground installations not encased in concrete.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-36.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CASPARRO: Warning ribbon or tape was added for the 1999 code to reduce the risk of an accident or electrocution during excavation near underground service lateral conductors and to correlate the NEC with Utility Company practices. This requirement did not extend to feeders and branch circuits because those circuits contain short circuit protection. It is the submitter's intent to protect feeders and branch circuits from unnecessary damage due to excavation for renovations or new construction. These damages impose an additional expense to the contractor.
This proposal should be accepted.

(Log #2900)

3- 46 - (300-5(d)): Reject
SUBMITTER: James H. Maxfield, Dover, NH
RECOMMENDATION: Revise second paragraph as follows:
Service laterals or underground service entrance conductors that are not encased in concrete...
SUBSTANTIATION: Where meter enclosures are installed between the street main and the point of entrance to a building. currently there is no language to require the installation of warning ribbon above the underground service entrance conductors. The added language would reduce the likelihood of an accident when working near underground service entrance conductors which do not contain short circuit protection.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement for proposal 3-36. Refer to the definition of " Service lateral" and " Service entrance conductors" as found in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
CASPARRO: I believe the submitter's intent is correct to protect not only service laterals but also underground service entrance conductors.
Conductors on the utility side of the service point are not covered by the NEC. Most utilities are now requiring warning tape in their trenches. Why not bring the tape all the way to the meter and service equipment and eliminate any unnecessary damage to these conductors.
GRUBER: I agree with Mr. Casparro's negative comment.

(Log #2960)

3- 47 - (300-5(d)): Accept
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
"Where the enclosure or raceway is subject to physical damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, Schedule 80 rigid nonmetallic conduit, or equivalent.
Conductors or cables used in enclosures or raceways in underground installations shall be listed for wet locations."
SUBSTANTIATION: This proposal revises the aforementioned section to protect the conductors and cables from corrosions due to condensation or water they may accumulate in the raceways. This is a normal practice but needs to be defined in the code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4191)

3- 48 - (300-5(d)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
"Service laterals and underground service entrance conductors that are not encased in concrete and that are buried 18 in. (457 mm) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 12 in. (305 mm) above the underground installation."
SUBSTANTIATION: Underground service entrance conductors present the same exposure as service laterals and should be treated consistently. This was an oversight in the original submittal and should be corrected at this point.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the definition of " Service lateral" and " Service entrance conductors" as found in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CASPARRO: See my Explanation of Negative Vote on Proposal 3-46.

(Log #782)

3- 49 - (300-5(i)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Conductors of the Same Circuit. All conductors of the same circuit and, where ~~used~~ provided ~~the grounded conductor and~~ all separate equipment grounding conductors shall be installed in the same raceway or cable. ~~or shall be installed in close proximity in the same trench.~~
Exception No. 1: Conductors in parallel as provided in Section 310-4 shall be permitted in separate raceways or cables provided each phase or polarity, grounded conductor, and separate equipment grounding conductor is contained in ___ each raceway or cable. shall contain all conductors of the same circuit including grounding conductors.
Exception No. 2: Isolated phase, polarity, and grounded conductor installations shall be permitted in nonmetallic

raceways or cables in close proximity where conductors are paralleled as permitted in Section 310-4, and where conditions of Section 300-20 are met.

Exception No. 3: Switch loops shall be permitted to consist of only those conductors connected to the switching device(s) and, where provided, the equipment grounding conductor.

Exception No. 4: Single-conductor Type MI cable with a nonmagnetic sheath shall be permitted where installed in conformance with Section 330-16.

Exception No. 5: Single conductors approved for direct-burial shall be permitted where installed in close proximity in the same trench.

SUBSTANTIATION: Cables should be included in the rule and Exceptions No. 1 and 2 since the reasons for grouping raceways applies to cables. The phrase "or shall be installed in close proximity in the same trench" is apparently intended for installations covered in Exceptions No. 2 and 5, but literally voids the basic requirement if the raceways are so installed.

Including "grounded conductor" is superfluous as it is a circuit conductor.

Exception No. 1 is revised for clarity. Polarity is included to cover dc circuits as past panel comments have indicated intent to require grouping for dc conductors.

Switch loops are not presently exempted from including a grounded conductor; Type MI cable is not presently exempted from the rule.

PANEL ACTION: Accept in Part.

Accept the addition of "cable" in the text of both the main Section and the two exceptions with the words "nonmetallic-sheathed" added to cables in Exception No. 2..

Accept the addition of "polarity, and grounded conductor" in Exception No. 2.

Reject the remainder of the proposed changes.

The section should read as follows:

"(i) Conductors of the Same Circuit. All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be installed in the same raceway or cable or shall be installed in close proximity in the same trench.

Exception No. 1: Conductors in parallel in raceways shall be permitted, but each raceway or cable shall contain all conductors of the same circuit including grounding conductors.

Exception No. 2: Isolated phase, polarity, and grounded conductor installations shall be permitted in nonmetallic raceways or nonmetallic-sheathed cables in close proximity where conductors are paralleled as permitted in Section 310-4, and where the conditions of Section 300-20 are met."

PANEL STATEMENT: Cable was added to the section and two exceptions since the same requirements should apply to cables as applies to raceways. The addition of polarity and grounded conductors to the second exception recognizes that dc and grounded conductors should also be permitted where installed in either nonmetallic conduit or nonmetallic-sheathed cable.

The change to delete the grounded conductor in the base section would make it less clear that the grounded conductor must be included where it is actually used in the circuit. The word "separate" was not accepted since Section 250-122 already requires equipment grounding conductors, whether one or more is installed, to be in the same raceway or cable as the circuit conductors. The phrase "or shall be installed in close proximity in the same trench" was left in the base section since the installation could be in a raceway, a cable, or a trench.

The reference to Section 310-4 in the proposed changes in the first exception is an unnecessary reference since conductors in parallel already must comply with Section 310-4. Section 4.1 of the NEC Style Manual discourages unnecessary use of references unless clarity is improved.

The proposed Exception No. 3 is not necessary since switch loops are already part of the circuit and as long as both the power down and the switched leg back up are installed in the raceway or cable, the cancellation of the lines of flux surrounding the individual conductors will occur. If an equipment grounding conductor is pulled with the switch loop, it must also be included in the same raceway, cable, or trench.

The proposed Exception No. 4 is not necessary. Section 300-1 states that Article 300 covers wiring methods for all wiring installations unless modified by other articles. Section 330-16 already specifically covers single conductor MI cables installations.

The proposed Exception No. 5 is not necessary since the text is already covered in the base section by the phrase "or shall be installed in close proximity in the same trench." Deleting text from the base section and adding the text into an exception does not promote usability of the Code.

The grounded conductor is not part of the circuit conductors in all cases and is not superfluous. As an example see 250-24(b) for clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2961)

3- 50 - (300-5(j) (New)): Reject

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions

RECOMMENDATION: Add new text to read as follows:

(j) Directional Boring. Cables or conduit or other raceways shall be listed for the use with directional boring equipment.

SUBSTANTIATION: This proposal adds a new section to address cables and raceways used with directional boring equipment. Currently nonlisted and listed raceways are being used with directional boring equipment that have resulted in failures in the field. Continuous reeled raceways have "necked down", reducing the cross sectional area due to the pulling. Raceway joints have separated or loosened underground which have damaged cables during pulling and/or has allowed excessive moisture into the raceway. This new section will require cables and raceways to be evaluated for the use with directional boring equipment.

PANEL ACTION: Reject.

PANEL STATEMENT: This item should be numbered 300-5(k) instead of 300-5(j). This is specific to a certain application and the requirement is broad based for all products. Continuous reel raceways that neck down are the result of pulling and may not be only related to directional boring equipment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

CASPARRO: The submitter's intent is correct to use listed cables, conduit or other raceways with directional boring equipment.

FORSBERG: The panel should not ignore directional boring practices. Unapproved joints will separate when pulled with directional boring equipment.

(Log #4328)

3- 51 - (300-5(j), FPN): Accept

SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services

RECOMMENDATION: In the second line of the FPN revise expansion joint to read: "expansion fitting."

SUBSTANTIATION: To correlate with the definition of the term Fitting in Article 100 since the prime reason is mechanical, the term fitting should be used.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1774)

3- 52 - (300-6): Reject

SUBMITTER: Richard E. Loyd, Perryville, AR

RECOMMENDATION: Delete existing text and replace with the following:

300-6. Protection Against Corrosion and Degradation. Raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be of materials suitable for the environment in which they are to be installed.

(a) General. Ferrous Metal Raceways. ~~Ferrous~~ Raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, metal elbows, couplings, fittings, supports and support hardware shall be protected against corrosion inside and outside by a suitable corrosion-resistant coating. The threads at joints shall be permitted to be coated with an electrically conductive compound.

(1) Where protected from corrosion solely by enamel, they shall not be used outdoors or in wet locations as described in (c). Where boxes or cabinets have an approved system of organic coatings and are marked "Raintight," Rainproof," or "Outdoor Type," they shall be permitted outdoors.

(2) In Concrete or in Direct Contact with the Earth. Ferrous or nonferrous metal raceways, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be permitted to be installed in concrete or in direct contact with the earth, or in areas subject to severe corrosive influences where made of material judged suitable for the condition, or where provided with corrosion protection approved for the condition.

(b) Nonmetallic raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing cabinets, ~~metal~~ elbows, couplings, fittings, supports, and support hardware shall be suitably protected against corrosion and degradation.

(1) Exposed to Sunlight. Where exposed to sunlight or other forms of ultraviolet degradation they shall utilize materials or coatings approved for the installation and shall be listed sunlight resistant.

(2) Exposed to Chemical Degradation. Where subject to chemical solvent vapors, ~~airborne or~~ splash or immersion exposure they shall utilize materials or coatings ~~be~~ suitable for the installation.

(c) Indoor Wet Locations. In indoor wet locations, and in locations where walls are frequently washed or where there are surfaces of absorbent materials, such as damp paper or wood, the entire wiring system, where installed exposed, including all boxes, fittings, conduits, and cable used therewith, shall be mounted so that there is at least a 1/4-in. (6.35 mm) airspace between it and the wall or supporting surface.

Exception: Nonmetallic raceways, boxes, and fittings shall be permitted to be installed without the airspace on a concrete, masonry, tile, or similar surface.

(d) Supporting hardware. All supports, bolts, straps, screws, etc., shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

FPN: In general, areas where salts, acids and alkali chemicals are manufactured, processed, handled ~~and~~ or stored may present such corrosive conditions, particularly when wet or damp. Severe corrosive conditions may also be present in portions of water and wastewater treatment plants, pulp and paper plants, petrochemical operations, primary metals production facilities, direct burial applications in corrosive soils, food processing areas subject to frequent washdowns, installations immediately adjacent to a seashore and swimming pool areas; and areas where chemical deicers are used.

SUBSTANTIATION: Article 300 covers the general requirements for all wiring methods and Section 300-6 as stated only covers metal wiring methods and yet references nonmetallic wiring methods. Many corrosion and degradation issues need to be clearly addressed in Article 300. I believe this proposal does that.

PANEL ACTION: Reject.

PANEL STATEMENT: This rewrite has added confusion and put an increased amount of restrictions on the nonmetallic products currently used without substantiation.

Nonmetallic products do not corrode or "degrade" due to mold and fungus. In fact, these products have an indefinite life span for these environments.

Exposure to sunlight, corrosion, and temperature are all addressed in each of the individual non metallic raceway articles.

This proposal does not clearly indicate changes to the existing text.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

GRUBER: See my Explanation of Negative Vote on Proposal 3-53.

(Log #3167)

3- 53 - (300-6): Reject

SUBMITTER: Tim Andrassy, Steel Tube Inst.

RECOMMENDATION: Revise this section to read:

300-6. Protection Against Corrosion, Chemical Exposure, Sunlight Degradation, and Temperature Extremes. ~~Metal~~ rRaceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be ~~of materials~~ suitable for the environment in which they are to be installed.

(a) ~~General.~~ Ferrous metal raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, metal elbows, couplings, fittings, supports, and support hardware shall be ~~suitably~~ protected against corrosion inside and outside (except threads at joints) by an approved corrosion resistant coating ~~of approved corrosion resistant material such as zinc, cadmium, or enamel.~~ Threads at joints shall be permitted to be coated with an identified electrically conductive compound.

Exception: Stainless steel is not required to have protective coating(s).

(1) Protected from Corrosion Solely by Enamel. Where protected from corrosion solely by enamel, they shall not be used outdoors or in wet locations as described in (d~~c~~). Where boxes or cabinets have an approved system of organic coatings and are marked "Raintight," "Rainproof," or "Outdoor Type," they shall be permitted outdoors.

~~Exception: Threads at joints shall be permitted to be coated with an identified electrically conductive compound.~~

(2 ~~b~~) In Concrete or in Direct Contact with the Earth. Ferrous or ~~nonferrous~~ metal raceways, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be permitted to be installed in concrete or in direct contact with the earth, or in areas subject to severe corrosive influences where made of materials ~~judged~~ approved as suitable for the condition, or where provided with corrosion protection approved for the condition.

(b) Non-ferrous metal raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, nipples, fittings, and support hardware shall be protected by an approved corrosion resistant material or coating where embedded or encased in concrete or where in direct contact with soil.

(c) Nonmetallic raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be made of material approved as suitable for the condition, and shall comply with 1, 2, and 3 as applicable to the specific installation.

(1) Exposed to Sunlight. Where exposed to sunlight or other forms of ultraviolet degradation materials or coatings approved for the installation shall be utilized and shall be listed as sunlight resistant.

(2) Chemical Exposure. Where subject to chemical solvent vapors, or splash or immersion exposure, materials or coatings approved for the specific reagent shall be utilized.

(3) Temperature Extremes. Where exposed to environments having extreme temperatures the material shall not be used beyond its listed temperature limitations to protect against cracking, or sagging and melting.

(d~~c~~) Indoor Wet Locations. In addition to (a), (b), or (c), as applicable, ~~I~~ in ~~portions of dairies, laundries, canneries, and other~~ indoor wet locations, and in locations where walls are frequently washed or where there are surfaces of absorbent materials, such as damp paper or wood, the entire wiring system, where installed exposed, including all boxes, fittings, conduits, and cable used therewith, shall be mounted so that there is at least a 1/4-in. (6.35-mm) airspace between it and the wall or supporting surface.

~~Exception: Nonmetallic raceways, boxes, and fittings shall be permitted to be installed without the airspace on a concrete, masonry, tile, or similar surface.~~

(e) Supporting hardware. All supports, bolts, straps, screws, etc., shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

FPN: In general,the following are locations where severe corrosive influences may be present, ~~corrosion concerns might need to be evaluated,~~ particularly when expected to be wet or

damp: (1) areas where salts, acids and alkali chemicals are manufactured, processed, handled or ~~and~~ stored, (2) portions of water and wastewater treatment plants, (3) pulp and paper plants, (4) petrochemical operations, (5) primary metals production facilities, (6) direct burial applications in corrosive soils (generally less than 2000 ohms/centimeter), (7) food processing areas subject to frequent washdowns, (8) ~~may present such corrosive conditions, particularly when wet or damp. Severe corrosive conditions may also be present in portions of meatpacking plants, tanneries, glue houses, and some stables;~~ installations immediately adjacent to a seashore and swimming pool areas; and (9) areas where chemical deicers are used.~~; and storage cellars or rooms for hides, casings, fertilizer, salt and bulk chemicals.~~

SUBSTANTIATION: This article has been rewritten for clarity and to provide guidance for the full variety of products available and updated locations. Section (b) has been added to include requirements from the listing. Chemical exposure has been added to cover those materials subject to other than corrosion from some environments. The exception to (d) has been deleted. Discussion at CMP 3 have indicated that mold and fungus can degrade nonmetallics without this air space.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation for the rewrite of this section is "for clarity and to provide guidance for the full variety of products available and updated locations". Instead this rewrite has added confusion and put an increased amount of restrictions on the nonmetallic products currently used without substantiation.

The removal of the exception for nonmetallic raceways, boxes, and fittings without an airspace is not substantiated. Nonmetallic products do not corrode or "degrade" due to mold and fungus. In fact, these products have an indefinite life span for these environments.

Exposure to sunlight, corrosion, and temperature are all addressed in each of the individual non metallic raceway articles.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

CASPARRO: This proposal should be accepted in part. Accept everything but deletion of the FPN. Safeguarding against deterioration of plastic is just as important as safeguarding against corrosion of metal. Plastics are not resistant to all chemicals and the Code should recognize this. The language is very similar to that proposed by the Chemical Manufacturers Association for Article 344 of the 1999 NEC. Nonmetallic producers did not object. It is better to put all these type requirements into one Section of the Code.

GRUBER: This proposal should be accepted in part.

The part not accepted is deletion of the exception to (d) Indoor Locations.

In response to the Panel comment:

The text regarding nonmetallic raceways, etc. requires only that they be made of:

(a) "material approved as suitable for the condition"

(b) The "exposed to sunlight" and "temperature extremes" is not new language. It can be found in the nonmetallic raceway articles.

(c) The "chemical exposure" text is not overly restrictive since it does not require a specific reagent, it only requires approval. This is an appropriate requirement because nonmetallics should not be used where they will be exposed to chemicals which would either degrade or deteriorate them.

Corrosion requirements for all the conduits are contained to some extent in the specific raceway articles. However, this rewrite pulls the variety of concerns into one location. If the text is not needed for nonmetallics, then perhaps 300-6 should be deleted and the language in each specific wiring method article would govern in all cases.

Rather than "adding confusion", the proposed text clarified the various requirements.

(Log #266)

3- 54 - (300-6(a)): Reject

SUBMITTER: Charles M. Trout, Maron Electric Co.

RECOMMENDATION: In the first sentence, delete the parenthesis and the words (except threads at joints). In the Exception, delete the words "permitted to be" so that the Exception shall now read:

"Threads at joints shall be coated with an identified electrically conductive compound."

SUBSTANTIATION: The problems of corrosion at threaded joints in metal raceways and the resulting high resistance connections have been well documented. In order to comply with the intent of Section 300-6 relative to protection against corrosion, the words "(except at threaded joints)" must be deleted. The importance of the application of a listed electrically conductive sealing compound cannot be ignored. The manufacturers applied corrosion resistance coating will be compromised at any threaded location. The resultant high resistance connection will prevent the installation from being in conformance with Section 250-2(d) and the integrity of the ground fault path will be severely diminished.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation does not provide technical documentation to support this proposal. The exception in the proposal has a mandatory requirement. The submitter has not provided the technical substantiation of corrosion at conduit joints to require all threads to have an additional coating.. Ferrous raceways (those that contain iron) often have a factory applied corrosion protection and include the threads at the end of the raceways and the coupling. A field-applied enamel coating is allowed only indoors and in occupancies not subject to severe corrosive influences. The existing exception in the 1999 NEC is permissive in allowing an identified electrically conductive compound to be applied for field threaded raceways. The proposed change makes "identified electrically conductive compounds" on all threads mandatory. The subject of this section is corrosion.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

BEILE: In the panel statement, there are two misstatements.

1. In the third line, the word "often" should be stricken. All steel conduit threads have factory applied corrosion protection.

2. In the fourth line, "field applied enamel" is not allowed on threads.

CASPARRO: I believe the submitter raises some valid concerns. The real concern was not with all threads, but rather with field cut threads, whereby corrosion protection is removed in the threading process and not replaced. The submitter proposed an electrically conductive compound but neglected to address the corrosion protection issue, which is what (300-6(a)) covers. The submitter was present at the Panel meeting and agreed to resubmit his proposal at the comment stage addressing these concerns.

GRUBER: The Panel Statement should have the word "often" deleted form the third sentence. "...Ferrous raceways (those that contain iron) ~~often~~ have a factory applied corrosion protection and ...".

All factory threads have a factory applied corrosion protection on them.

Also, a field-applied enamel coating is not permitted to be applied to threads.

(Log #607)

3- 55 - (300-6(a)(1) (New)): Accept in Principle

SUBMITTER: Mario L. Mumfrey, Cincinnati, OH

RECOMMENDATION: Add a new 300-6(a)(1) to read as follows:

Conduits, Raceways or Cables entering a building or structure through which moisture may contact energized live parts shall be sealed at point(s) of entry with a sealant identified and approved for such use.

FPN: This would now include all service entrance installations, not just underground.

SUBSTANTIATION: There is no clear language presently that requires sealing point(s) of entry of services into a building other than for Section 300-5(g) FPN as it relates to Section 230-8. By adding this new paragraph it may now prevent moisture and corrosion occurring in all SE equipment for all service applications. Some jurisdictions are enforcing the use of sealants under practical safeguarding, others are not.

We need this new wording for uniformity and compliance.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-61.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BEILE: This proposal should be rejected. See my Explanation of Negative Vote on Proposal 3-61.
GRUBER: See my Explanation of Negative Vote on Proposal 3-61.

(Log #2504)

3- 56 - (300-6(c)): Reject
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
RECOMMENDATION: On the fifth line — the entire metallic wiring system.
Remove the exception.
SUBSTANTIATION: This change permits the removal of the exception.
PANEL ACTION: Reject.
PANEL STATEMENT: The entire wiring system may not consist of all metal or all nonmetallic wiring systems but may be a mixture of both systems. A metal conduit system may be installed into a nonmetallic box. The existing text and exception allow nonmetallic raceways, nonmetallic boxes, and fittings to be installed without the fl inch spacing but the remainder to be spaced at least fl inch to allow proper water drainage to occur.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4120)

3- 57 - (300-6(c)): Accept
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: In the first line delete the word "dairies" and replace with the words dairy processing facilities so the section will read as follows:
"In portions of ~~dairies~~ dairy processing facilities, laundries, canneries,...".
SUBSTANTIATION: The reference needs to be change to avoid confusion with agricultural dairy farms which is covered in 547.4(b).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1167)

3- 58 - (300-6(c), Exception): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
Exception: Raceways and cables with a final outer nonmetallic jacket, nonmetallic raceways, boxes, and fittings shall be permitted to be installed without the airspace on a concrete, masonry, tile, or similar surface.
SUBSTANTIATION: Edit. Raceways and cables with a PVC jacket seem to be suitable as much as nonmetallic raceways. Deletion of commas after the words "raceway" and "boxes" will clearly indicate they are modified by the word "nonmetallic" and not segregated by the commas.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter had provided no technical substantiation for this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4121)

3- 59 - (300-6(c), Exception): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: Add a reference to agricultural buildings as permitted in 547-4(b) as follows:
Exception: Nonmetallic raceways, boxes, and fittings shall be permitted to be installed without the air space on a concrete, masonry, tile, or similar surface, and as permitted in 547.4(b) for agricultural buildings.
SUBSTANTIATION: This section must also recognize the special requirements in agricultural buildings where leaving the 1/4 in. air space creates another hazard of conductor and raceway exposure to damage.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal adds an unnecessary reference. Section 90-3 states that Chapters 5, 6, and 7 supplement or modify the requirements in Chapters 1 through 4. This proposed reference to Section 547-4(b) is not necessary in accordance with Section 4.1 of the 1999 NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1192)

3- 60 - (300-7(a) (New)): Accept in Principle
SUBMITTER: David A. Williams, Delta Twp Lansing, MI/Rep. IAEI
RECOMMENDATION: Add new text to 300-7(a) to read as follows:
(a) Sealing. Condensation in a raceway shall be limited by sealing the raceway where it is exposed to widely different temperatures.
SUBSTANTIATION: The present wording of this code section only applies to indoor raceway systems as in walk-in coolers. Walk-in coolers for beverages would be about 35°F and the room temperature of about 68°F, would have a temperature difference of 33°F. In areas of the country that are subject to very cold temperatures this is a problem with raceways entering buildings. The outside temperature could be below zero, creating a temperature difference in excess of 70°F. It is a problem that could easily be accomplished with nonhardening material such as Duct Seal placed into the raceway opening. I have seen load centers in homes that have a thick layer of frost on the panel cover due to the condensation freezing. Branch circuit overcurrent devices have had to be replaced long before normal due to the corrosion damage from the condensation entering the panel through the raceway. I believe this is a valid code change that does not increase the cost of the installation dramatically.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-61.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
BEILE: This proposal should be rejected. See my Explanation of Negative Vote on Proposal 3-61.
FORSBERG: See my Explanation of Negative Vote on Proposal 3-61.
GRUBER: See my Explanation of Negative Vote on Proposal 3-61.

(Log #4397)

3- 61 - (300-7(a)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Monte R. Ewing, State of Wisconsin
RECOMMENDATION: Add new text to read as follows:
"Where portions of raceways are subjected to different temperatures, as in cold storage areas of buildings or where passing from a building interior to the exterior, the raceway shall be sealed to prevent the circulation of warm air to a colder section of the raceway."

SUBSTANTIATION: The present code implies that the interior of a raceway needs to be sealed to prevent condensation damage however, the present wording does not address the problems where raceways enter or leave a building to connect to metering equipment, rooftop equipment, or exterior equipment in general. In these cases a dew point is forming within the raceways causing the equipment inside and out (depending on the time of year) to fill with moisture and sometimes frost. This problem has been addressed by code in the State of Wisconsin and I feel that this problem needs to be addressed by the National Electrical Code.
PANEL ACTION: Accept in Principle.
Revise the text to read as follows:
"Where portions of a raceway or sleeving for cables are subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeving for cables shall be sealed to prevent the circulation of warm air to a colder section of the raceway or cable. The sealant used shall be approved for such use and the seal shall not be required to be an explosionproof seal."
PANEL STATEMENT: The major problems appear to be concerning raceways or sleeving for cables that enter a building from outside where there is a difference of temperature and where there is a known condensation problem. Not all areas of the country nor all interior building applications would require this sealing. The last sentence was added to make it clear that an approved sealant must be used that would not have deleterious effects on the conductor insulation. The last sentence also makes it clear that explosionproof seals are not necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
BEILE: This proposal should be rejected. While I agree with the situation the submitter described in his substantiation can be a problem, the revised language accepted by the panel is too restrictive. The panel notes in its Panel Statement that "not all areas of the country nor all interior building applicatons would require this sealing." The present wording, however, could be interpreted to mean that the sealing is always required. More appropriate text would be as follows:
"Where portions of a raceway or sleeving for cables are known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeving for cables shall be filled with approved material to prevent the circulation of warm air to a colder section of the raceway or cable. An expolsionproof seal shall not be required to be installed for this purpose."
FORSBERG: The requirement is vague and would basically require that all raceways be sealed. The language used was not the language agreed on by the task group assigned during the meeting.
GRUBER: This proposal should be rejected.
Certainly the situation the submitter described in his substantiation could be a problem, the revised language accepted by the Panel is too restrictive. The Panel notes in its Panel Statement that "not all areas of the country nor all interior building applications would require this sealing." The present wording, however, could be interpreted to mean that the sealing is always required. More appropriate text would be as follows:
"Where portions of a raceway or sleeving for cables are known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeving for cables be filled with approved material to prevent the circulation of warm air to a colder section of the raceway or cable. An explosionproof seal shall not be required to be installed for this purpose."

(Log #3928)

3- 62 - (300-7(a), FPN (New)): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Add a new Fine Print Note as indicated.
300.7(a) Sealing. Where portions of an interior raceway system are exposed to widely different temperatures, as in refrigerating or cold-storage plants, circulation of air from a warmer to a colder section through the raceway shall be prevented.
FPN: This section is not intended to require the use of a listed conduit seal fitting, unless so specified elsewhere in this code.
SUBSTANTIATION: Some authorities are interpreting this section so to require and explosion proof fitting in areas that only require a compound or other suitable means to block the transmission of air to areas of different ambient temperatures.
PANEL ACTION: Reject.
PANEL STATEMENT: Nowhere in this section does the phrase "conduit sealing fitting" occur and the section does not detail the method used to prevent the unwanted air circulation. The fine print note is not necessary to clarify the intent of this Section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #377)

3- 63 - (300-7(b)): Accept
SUBMITTER: Michael W. Rogers, Corey Electrical Engineering, Inc.
RECOMMENDATION: 1. Change paragraph title: (b) ~~Expansion Joints.~~ Expansion Fittings.
2. Change paragraph text: Raceways shall be provided with expansion ~~joints~~ fittings where necessary to compensate for thermal expansion and contraction.
SUBSTANTIATION: The term "Expansion Joint" usually refers to an architectural item that is built into a structure to allow for expansion and contraction, and/or vibration isolation. The term "Expansion Fitting" is used in 347-9 to describe a necessary conduit fitting used for compensating for thermal expansion and contraction. Other references in the code do not use the term "Expansion Joint" for anything other than an architectural reference.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4327)

3- 64 - (300-7(b)): Accept in Principle
SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services
RECOMMENDATION: Replace the words "Expansion Joints" to read "Expansion Fittings".
SUBSTANTIATION: To comply with the definition of the term Fitting in Article 100 since expansion fitting perform a mechanical rather than an electrical function.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Only the title text should be capitalized. See panel action on Proposal 3-63 which seems to meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3144)

3- 65 - (300-9): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for possible inclusion in Article 100. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Kylene Abram, Germfosk, MI
RECOMMENDATION: Move the description of the first floor in Section 336.5(a)(1) to the new Section of 300.9.
SUBSTANTIATION: The description of what is the first floor of a building is a general requirement that is used in more than just locations where nonmetallic-sheathed cable is installed and therefore should be located in Article 300. For example, the definition of first floor is also used in Section 331.3(a) Fine Print Note.
PANEL ACTION: Reject.
PANEL STATEMENT: Based upon the scope statement in Article 100, definitions that are used in two or more articles or apply to two or more articles should be located in Article 100 and not in Article 300.
This proposal should be sent by the TCC to Panel 1 for action.
Section 336-5(a)(1) clearly states the definition of first floor is for the purposes of Article 336.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2043)

3- 66 - (300-10 Exception No. 2): Accept in Principle
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Add new text to read:
"Isolated grounding circuits as permitted by Section 250-96(b)."
SUBSTANTIATION: This section permits an electrical raceway to be isolated from an enclosure by a nonmetallic fitting.
PANEL ACTION: Accept in Principle.
Renumber the existing Exception to be Exception No. 1.
Number the proposed exception as Exception No. 2.
Change the proposed exception into a complete sentence to comply with the 1999 NEC Style Manual. The entire change to read as follows:
" Exception No. 1: Short sections of raceways used to provide support or protection of cable assemblies from physical damage shall not be required to be made electrically continuous.
Exception No. 2: Equipment enclosures to be isolated as permitted by Section 250-96(b) shall not be required to be metallically joined to the metal raceway."
PANEL STATEMENT: The exceptions were renumbered and the proposed text was changed to make it into a complete sentence to comply with Section 3.1.4.1 of the 1999 NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP304)

3- 66a - (300-11(a)): Accept
SUBMITTER: CMP 3
RECOMMENDATION: Revise the existing text to add headings in (a) and (b) as follows:
"300-11. Securing and Supporting
(a) Secured in Place. Raceways, cable assemblies, boxes, cabinets, and fittings shall be securely fastened in place. Support wires that do not provide secure support shall not be permitted as the sole support. Support wires and associated fittings that provide secure support and that are installed in addition to the ceiling grid support wires, shall be permitted as the sole support. Where independent support wires are used, they shall be secured at both ends. Cables and raceways shall not be supported by ceiling grids.
(1) Fire Rated Assemblies. Wiring located within the cavity of a fire-rated floor–ceiling or roof–ceiling assembly shall not be secured to, or supported by, the ceiling assembly, including the ceiling support wires. An independent means of secure support shall be provided. Where independent support wires are used, they shall be distinguishable by color, tagging, or other effective means from those that are part of the fire-rated design.
Exception: The ceiling support system shall be permitted to support wiring and equipment that have been tested as part of the fire-rated assembly.
FPN: One method of determining fire rating is testing in accordance with Standard Methods of Tests of Fire Endurance of Building Construction and Materials, NFPA 251-1995.
(2) Non Fire Rated Assemblies. Wiring located within the cavity of a nonfire-rated floor–ceiling or roof–ceiling assembly shall not be secured to, or supported by, the ceiling assembly, ..."
SUBSTANTIATION: The panel added headings to conform with the 1999 NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #783)

3- 67 - (300-11(a), (b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Secured in Place. Raceways, cable assemblies, auxiliary gutters, cable trays, cablebus, boxes, cabinets, ~~and~~ fittings, and other electric equipment shall be securely fastened in place, except as otherwise permitted or required elsewhere in this Code.
(remainder unchanged)
(b) Raceways and Cables Used as Means of Support. Raceways or cables shall only be used as a means of support for other raceways, cables, conductors, or nonelectric equipment under the following conditions.
(1) Where the raceway or means of support is identified for the purpose or
(2) Where the raceway or cable contains power supply conductors for electrically controlled equipment and is used to support Class 2 circuit conductors or cables that are solely for the purpose of connection to the equipment control circuits.
(3) ~~Where the raceway is used to support boxes or conduit bodies in accordance with Section 370-23 or to support fixtures in accordance with Section 410-16(f).~~ Where an approved raceway mast is used for termination and support of outdoor aerial conductors.
(4) Where the raceway is used to support a bonding jumper installed in accordance with Section 250-102(e).
SUBSTANTIATION: Additional proposed items for (a) would be more inclusive and the last portion would correlate with Sections 347-9; 350-18, Exceptions; 351-8, Exceptions; 333-7(b); 334-10(b); 336-18, Exception No. 1; 348-13, Exception No. 2; etc., where movement or fishing without support is permitted.
In (b) cables such as Type AC, MC, MI, etc. are not presently included and seem to be as suitable as flexible conduit as a support for Class 2 conductors. Conductors (single) are added to the rule to preclude grounding electrode conductors, electrode bonding jumpers, piping system bonding jumpers, and the like. Not prohibiting (single) conductors is at odds with the concept of the rule and while not a literal violation violates the spirit of the rule.
Present (3) is deleted as unnecessary and superfluous as it relates to support of electrical equipment whereas the rule prohibits support of nonelectric equipment.
The proposed (3) and (4) are for correlation with other Code sections which permit such movement.
PANEL ACTION: Reject.
PANEL STATEMENT: The cables shall not be used to support for other cables or raceways. The submitter did not properly underline proposed new text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4192)

3- 68 - (300-11(a)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
1. Delete the second sentence in Section 300-11(a) which reads "Support wires and associated fittings that provide secure support and that are installed in addition to the ceiling grid support wires shall be permitted as the sole support."
2. Revise Section 300-11(a)(2) to read as follows:
(2) Nonfire-Rated Assemblies. Branch-circuit wiring associated with equipment that is located within, supported by, or secured to a suspended ceiling that is not an integral portion of a fire-rated floor/ceiling or roof/ceiling assembly shall be permitted to be supported by the ceiling support wires.
3. Delete Section 300-11(a)(2) Exception.
SUBSTANTIATION: The Committee believes installing additional support wires is unnecessary based on the successful experience with the 1996 state rule which allowed this practice in non-rated assemblies. The NEC exception is one that would never be practicable. The proposal does, however, trade some additional restrictions on wiring on support wires off against the allowance to use existing support wires. It does this by going back to the old principle that the only legitimate use for this support method is for branch circuit wiring to supply equipment such as lighting troffers and tele-power poles that are directly connected to the ceiling.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel re-affirms its position that an independent means of support shall be provided for all wiring, not just branch circuit wiring, in both fire-rated and nonfire rated floor/ceiling or roof/ceiling assemblies.
Support wires installed in addition to the ceiling grid support wires is one means to comply with this requirement. The panel believes the exception is merely an option for installers who may choose to evaluate the entire fire-rated or non fire-rated assembly, including all associated wiring.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CASPARRO: CMP-3 has worked hard over a number of code cycles to get (300-11(a)) to where it is. By rejecting this proposal, the Panel has retained a necessary, viable, safe and widely used alternative. The submitter provided no technical substantiation to warrant proposed change.

(Log #4364)

3- 69 - (300-11(a)): Reject
SUBMITTER: Ed Stubbs, City of Atlanta, GA
RECOMMENDATION: 330.11. Securing and Supporting. (Add to text)
(a) Secured in Place. (Add to last sentence) Fixtures installed in a ceiling grid shall comply with Section 410.16(c). Track lighting on a ceiling grid shall comply with Section 410.101(d).
SUBSTANTIATION: We all know that the sole purpose of a suspended grid ceiling was get away from structured ceilings and be able to install different type of fixtures of unlimited types. Well, when it was designed, lay in tiles an fixtures where designed to be installed with it. It was not designed to support raceways, cables and boxes. As 300-11 states, "Cables and raceways shall not be supported to the grid." It did not include fixtures. Another item that is supported by the grid is heating and air registers.
Section 410-16(c) does require that the fixture be supported to the grid by screws, chips, rivets, etc., and it doesn't refer you back to 300-11 as an exception. Contractors are having great difficulty in securing a fixture to a separate supporting wire with a high structured ceiling and grid ceiling over 6 ft between them. How do they know where to hang there support wires when the grid is not there? When the grid is installed, they can't get to the high structured ceiling without removing part of the grid assembly and get a lift in between. Now they may damage the grid trying to replace removed sections. Who is responsible now for the weakening of the grid? The same is for track lights. How can they be secured in place on a independent support wire. Where do you attach the wire on the track and how do you install the lay in tile if the track goes down the center of a tile? I believe this section should be added to relive the contractor of impossible odds of securing the fixture in a fire rated and nonfire rated ceiling.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel interprets the submitter's intent to address 300-11, not 330-11. The proposal adds an unnecessary reference. The language is already present in Section 410-16(c) and 410-101(d) which addresses the submitter's concerns. This section is not intended to provide support requirements for lighting fixtures or track lighting.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #292)

3- 70 - (300-11(b)): Accept in Principle
SUBMITTER: Don A. Hursey, Durham City County Insp., NC
RECOMMENDATION: Revise 300-11(b) to read as follows:
Raceways and cables used as means of support. Cables shall not be used as means of support for other raceways or cables.
Raceways shall only be used as a means of support for other raceways, cables, or nonelectric equipment under the following conditions:
SUBSTANTIATION: The NEC has never addressed cables being used as a means of support for other cables or raceways. It should not be allowed... period. Cables are not designed to be used as a supporting means.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-73.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1147)

3- 71 - (300-11(b)): Reject
SUBMITTER: Larry T. Smith, Nat'l Electrical Seminars
RECOMMENDATION: Revise text to read:
(b) Raceways Used as Means of Support. Raceways shall not be ~~only be~~ used as a means of support for other raceways, except as otherwise permitted in this Code. Raceways shall be permitted for the support of cables, or nonelectric equipment under the following conditions:
~~1. Where the raceways or means of support is identified for the purpose; or~~
1. ~~2.~~ Where the raceway contains power supply conductors for electrically controlled equipment and is used to support Class 2 circuit conductors or cables that are solely for the purpose of connection to the equipment control circuits; or 2.~~3.~~ Where the raceway is used to support boxes or conduit bodies in accordance with Section 370-23 or to support fixtures in accordance with Section 410-16(f).
SUBSTANTIATION: Section 300-11(b)(1) is completely misleading; there are no raceways identified for the purpose of supporting other raceways. As it is presently written, we are led to the conclusion that there might be a raceway listed for the purpose of supporting other raceways, and only after exhaustive reading of the UL General Information Directory for Electrical Equipment would we conclude that there are none. Every time I explain this in a seminar, participants shake their heads and mumble, 'Aw, not another one of those Code things'.
This is leading to misinterpretation and considerable misapplication in the field. A percentage of installers look at one inch rigid steel conduit, and assume that it just has to be identified for the purpose of supporting at least one other conduit; the existence of back to back support clamps fuels the confusion.
A case can be made for the use of a short section of raceway used to support other raceways, or nonelectrical equipment. Metal conduit used to enclose electrical conductors is metal piping — not electrical raceway. This practice could presumably continue.
PANEL ACTION: Reject.
PANEL STATEMENT: This section allows raceways as defined in Article 100 to provide support for other raceways, if the manufacturer has submitted it to a testing laboratory and had it identified as acceptable to support other raceways. The other part of this sentence deals with means of support that may be identified as a support mechanism for more than one raceway. The Code should not prevent a manufacturer from submitting a raceway or a support fitting for testing as a means of support for other raceways. The suggested text "except as otherwise permitted in this Code" is too vague and not in compliance with Section 4.1.1 of the 1999 NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2592)

3- 72 - (300-11(b)): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Add new wording to Section 300-11(b) so the Section reads as follows:
(b) Cables and Raceways Used as Means of Support. Cables shall not be used as a means of support for other cables, raceways, or nonelectric equipment.
Raceways shall only be used as a means of support for other raceways, cables, or nonelectric equipment under the following conditions:
1. Where the raceway or means of support is identified for the purpose; or
2. Where the raceway contains power supply conductors for electrically controlled equipment and is used to support Class 2 circuit conductors or cables that are solely for the purpose of connection to the equipment control circuits; or
3. Where the raceway is used to support boxes or conduit bodies in accordance with Section 370-23 or to support fixtures in accordance with Section 410-16(f).
SUBSTANTIATION: Cables are being used as a means of support for other cables and raceways. For example, one MC cable is being secured to the building framing and then several other MC cables, or other cables such as telephone or cable TV,

are secured to the original MC cable. The first cable is then subject to damage at terminations and at points where the cable is secured because of the additional weight applied by other cables, etc.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-73.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3450)

3- 73 - (300-11(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Add new wording to Section 300-11(b) so the Section reads as follows:
(b) Cables and Raceways Used as Means of Support. Cables shall not be used as a means of support for other cables, raceways, or nonelectric equipment.
Raceways shall only be used as a means of support for other raceways, cables, or nonelectric equipment under the following conditions:
1. Where the raceway or means of support is identified for the purpose; or
2. Where the raceway contains power supply conductors for electrically controlled equipment and is used to support Class 2 circuit conductors or cables that are solely for the purpose of connection to the equipment control circuits; or
3. Where the raceway is used to support boxes or conduit bodies in accordance with Section 370-23 or to support fixtures in accordance with Section 410-16(f).
SUBSTANTIATION: Cables are being used as a means of support for other cables and raceways. For example, one MC cable is being secured to the building framing and then several other MC cables, or other cables such as telephone or cable TV, are secured to the original MC cable. The first cable is then subject to damage at terminations and at points where the cable is secured because of the additional weight applied by other cables, etc.
PANEL ACTION: Accept in Principle.
Insert a new subsection (c) with a new title and the proposed first sentence to read as follows:
"(c) Cables Not Used as Means of Support. Cable wiring methods shall not be used as a means of support for other cables, raceways, or nonelectrical equipment."
PANEL STATEMENT: The additional section will make it very clear that cable wiring methods must not be used as a support either.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3733)

3- 74 - (300-11(b)): Accept in Principle
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Add new wording to Section 300.11(b) so the Section reads as follows:
(b) Cables and Raceways Used as Means of Support. Cables shall not be used as a means of support for other cables, raceways, or nonelectric equipment.
Raceways shall only be used as a means of support for other raceways, cables, or nonelectric equipment under the following conditions:
1. Where the raceway or means of support is identified for the purpose; or
2. Where the raceway contains power supply conductors for electrically controlled equipment and is used to support Class 2 circuit conductors or cables that are solely for the purpose of connection to the equipment control circuits; or
3. Where the raceway is used to support boxes or conduit bodies in accordance with Section 370.23 or to support fixtures in accordance with Section 410.16(f).
SUBSTANTIATION: Cables are being used as a means of support for other cables and raceways. For example, one MC cable is being secured to the building framing and then several other MC cables, or other cables such as telephone or cable TV, are secured to the original MC cable. The first cable is then subject to damage at termination's and at points where the cable is secured because of the additional weight applied by the other cables, etc.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-73.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #376)

3- 75 - (300-11(c) (New)): Reject
SUBMITTER: Bruce Fairweather, Electrical Safety Inc.
RECOMMENDATION: New text:
(c) Electrical conduits, cables and conductors shall not be supported or attached in any way to piping of liquid or gas delivery systems, waste product systems, or ductwork of environmental air systems.
SUBSTANTIATION: This is my second submission on this topic. The panel's comment to my 1999 Code proposal was that the intent of the paragraph was sufficient enough to preclude the use of specific wording.
From what I witness in the field on a day to day basis, the panel's intent is not recognized by many electricians. As long as I continue to find NM cable tie-wrapped to gas lines feeding boilers, hot air furnaces, and hot water heaters, or clamped to the exterior of environmental air supply and return ducts, or to sanitary drains then the panel's "intent" is esoteric and worse, unenforceable. Again, I suggest the inclusion of specific wording.
PANEL ACTION: Reject.
PANEL STATEMENT: The wording in the proposal is too restrictive. CMP 3 does not endorse using other systems as a support mechanism. However, there are conditions where associated wiring systems may only be supported by the other systems such as HVAC systems, Boiler systems, fire sprinkler control valves, etc..
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1457)

3- 76 - (300-12, Exception (New)): Reject
SUBMITTER: Joseph E. McCann, City of Coral Springs, FL
RECOMMENDATION: Add an exception to read as follows:
Exception: As provided for by 384-10 for free standing switchboards or floor standing panelboards.
SUBSTANTIATION: Raceways to a switchboard or free standing panelboard are not usually connected to the enclosures.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed exception is not necessary since Sections 250-96 and 250-102 already adequately cover the electrical continuity of the system. The purpose of Section 300-12 is to ensure that the raceways are continuous to the point of connection to the system and not broken somewhere along the length, unless being used as a protective sleeve. Section 384-10 does not take exception to the mechanical continuity. That section is related to clearances for conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #784)

3- 77 - (300-13(a)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) General. Conductors in raceways shall be continuous between outlets, boxes, devices, etc. There shall be no splice or tap within a raceway unless permitted by Sections 300-15; 352-7, 352-29, 352-48, 354-6 Exception, 362-7; 362-21; or 364-8(a).
SUBSTANTIATION: Editorial. Splices or taps are permitted by Section 352-48.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP301)

3- 77a - (300-14): Accept
SUBMITTER: CMP 3
RECOMMENDATION: Revise text in 300-14 to read as follows: "Exception: Conductors that are not spliced or terminated at the outlet, junction, or switch point shall not be required to comply with 300-14."
SUBSTANTIATION: This brings the exception into compliance with 3.1.4.1 of the 1999 NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3644)

3- 78 - (300-14): Reject
SUBMITTER: William E. Slater, Granger, IN
RECOMMENDATION: Revise 300-14 to read as follows:
300-14. Length of Free Conductors at Outlets, Junctions, and Switch Points. Where the opening to an outlet, junction or switch box is less than 8 in. (203 mm) in any dimension, each conductor shall be long enough to extend at least 3 in. (76.2 mm) outside the opening.
SUBSTANTIATION: The present requirement of at least 6 in. (152 mm) of free conductor, measured from the point in the box where it emerges from its raceway or sable sheath, is not practical for all box depths. Article 370-24 permits device boxes as shallow as 15/16 in. Some device boxes are as deep as 3-1/2 in. When a 15/16 in. deep box is used and 6 in. of free conductor extends from the back of the box, 5-1/16 in. of conductor extends outside of the box. When a 3-1/2 in. deep box is used and 6 in. of free conductor extends from the back of the box, only 2-1/2 in. of conductor extends outside of the box. This dimension is in conflict with the 3 in. minimum dimension required in the last sentence of the present wording. This proposal will eliminate this conflict and also provide 3 in. of free conductor, regardless of the box depth.
PANEL ACTION: Reject.
PANEL STATEMENT: The 6 inch measurement requirement is necessary to cover all aspects of make-up wire at outlet, junction, and switch points. The submitter's comment that only 2 1/2 inches of conductor would be available using a 3 1/2 inch box would be a violation of the Code since at least 3 inches must be available in accordance with the last sentence. Where using a 15/16 inch deep box, there must be a fixture shroud or some other method applied to allow the conductors to enter and terminate in the box. See Sections 370-16(a) and (b).
The submitter is also not covering in his proposed change the required length of free conductors for boxes where one of the box dimensions exceeds 8 inches.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2962)

3- 79 - (300-14 Exceptions No. 1 and No. 2 (New)): Reject
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
Exception No. 1: Conductors that are not spliced or terminated at the outlet, junction, or switch point.
Exception No. 2: Conductors that are spliced within a conduit body.
SUBSTANTIATION: This proposal allows splices to occur within conduit bodies without the required length of conductors. When splices do occur in conduit bodies the excessive conductor length may overfill the conduit body.
PANEL ACTION: Reject.
PANEL STATEMENT: A conduit body that contains splices does need extra room for the splicing devices plus the extra conductor length necessary to allow the conductor to be stripped and terminated so an exception is not warranted. Section 370-16(c)(2) provides requirements for sizing of conduit bodies where used for splicing, tapping, or connecting devices within the conduit body. The cubic inch capacity is marked on the conduit body and the maximum number of conductors is computed in accordance with Section 370-16(b) and the accompanying table. The splicing, tapping, or connecting of devices may necessitate the use of a larger conduit body with reducers on either or both ends to allow the extra room necessary for the splice or tap to occur.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1752)

3- 80 - (300-15): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise to read as follows:
300-15. Boxes, Conduit Bodies, or Fittings — Where Required
(a) Box or Conduit Body. Where the wiring method is conduit, electrical metallic tubing, Type AC cable, Type MC cable, Type MI cable, nonmetallic-sheathed cable, or other cables and cords, a box or conduit body complying with Article 370 shall be installed at each conductor splice point, outlet, switch point, junction point, or pull point, unless otherwise permitted in (b) through (n). A box shall be installed at each outlet and switch point for concealed knob-and-tube wiring.
SUBSTANTIATION: To clarify that in general cords need box's or conduit body's at splice points.
PANEL ACTION: Reject.
PANEL STATEMENT: Flexible cord splicing is already covered very specifically in Section 400-9 and, if the splice is made correctly, a box or conduit body is not necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4193)

3- 81 - (300-15): Accept in Principle in Part
Note: It was the action of the Technical Correlating Committee that this Proposal be correlated with the action on Proposal 3-84. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
300-15. Boxes, Conduit Bodies, or Fittings — Where Required.
~~(a) Box or Conduit Body.~~ Where the wiring method is raceway or multiconductor cable, conduit, electrical metallic tubing, or Type AC cable, Type MC cable, Type MI cable, nonmetallic-sheathed cable, or other cables, a box or conduit body complying with Article 370 shall be installed at each conductor splice point, outlet, switch point, junction point, or pull point, unless otherwise permitted in (~~b~~ a) through (~~n~~ m) below. A box shall be installed at each outlet and switch point for concealed knob-and-tube wiring. Fittings and connectors shall be used only with the specific wiring methods for which they are designed and listed.
(a) Wiring Methods With Interior Access. A box or conduit body shall not be required for splice, junction, switch, pull, and outlet points in wiring methods with removable covers, including busways, header-ducts, multioutlet assemblies, auxiliary gutters, and some surface raceways. The covers shall be accessible after installation.
(b) Equipment. An integral junction box or wiring compartment as part of approved equipment shall be permitted in lieu of a box.
(c) Protection. A box or conduit body shall not be required where cables enter or exit from conduit or tubing that is used to provide cable support or protection against physical damage. A fitting shall be provided on the end(s) of the conduit or tubing to protect the cable from abrasion.
(d) Type MI Cable. A box or conduit body shall not be required where accessible fittings are used for straight-through splices in mineral-insulated metal-sheathed cable.
(e) Integral Enclosure. A wiring device with integral enclosure identified for the use, having brackets that securely fasten the device to walls or ceilings of conventional on-site frame construction, for use with nonmetallic-sheathed cable, shall be permitted in lieu of a box or conduit body.
(FPN): See Sections 336-18, Exception No. 2; 545-10; 550-10(j); and 551-47(e), Exception No. 1.
(f) Fitting. A fitting identified for the use shall be permitted in lieu of a box or conduit body where no conductors are spliced or terminated within the fitting. The fitting shall be accessible after

installation. ~~and not containing spliced or terminated conductors.~~

(g) Direct-Buried Conductors. A box or conduit body shall not be required for ~~As permitted in Section 300-5(e) for~~ splices and taps in direct-buried conductors and cables made in accordance with Section 300-5(e).

(h) Insulated Devices. A box or conduit body shall not be required ~~As permitted in Section 336-21~~ for insulated devices supplied by nonmetallic-sheathed cable in accordance with the provisions of Section 336-21.

(i) Enclosures. A box or conduit body shall not be required where a splice, switch, or pull point is in a cabinet or cutout box, or in an enclosure for a switch or overcurrent device as covered in ~~As permitted in~~ Section 373-8 ~~Exception, for switches and overcurrent devices, and~~ or in a motor controller as covered in Section 430-10(a), ~~for motor controllers.~~ or in a switchboard or motor control center.

(j) Fixtures. A box or conduit body shall not be required where a fixture is used as a raceway in accordance with one of the exceptions to Section 410-31. ~~As permitted in Section 410-31 where a fixture is used as a raceway.~~

(k) Embedded. A box or conduit body shall not be required for splices where conductors are embedded as covered in Sections 424-40; 424-41(d); 426-22(b); 426-24(a); and 427-19(a).

~~(l) Manufactured Wiring System. Where manufactured wiring systems in accordance with Article 604 are used.~~

~~(m)~~ (l) Closed Loop. A box shall not be required with a closed-loop power distribution system where a device identified and listed as suitable for installation without a box is used. ~~with a closed-loop power distribution system.~~

~~(n)~~ (m) Manholes. A box or conduit body shall not be required for splice, junction, and pull points conductors in manholes and other electric enclosures intended for personnel entry where accessible ~~only~~ to qualified persons only. The installation shall comply with the provisions of Part D of Article 370.

SUBSTANTIATION: This is a largely editorial rewrite that corrects many errors and conflicts in the 1999 NEC. Point by point specific substantiation follows:

1. Since the two subsections (a) and (b) (of the 1996 NEC) can be combined, the litany of wiring methods at the opening is more confusing than helpful. The basic rule is to provide a box or conduit body for raceways and multiconductor cables, and that is how the rule should begin.
2. The stand-alone sentence on suitable fittings and connectors has been included in the main rule to allow ease of citation and to retain the format of a series of modifications to the principal rule contained within the paragraph.
3. The content of former subsection (a) has been retained as a new (a) in this comment. Given the revised structure, all that is necessary is to recast the exception as a rule. There is a very minor technical change in that the present exception covers splices and this comment adds other uses. This reflects widespread practice in the industry, with surface metal raceways listed and routinely used with receptacles, lampholders, etc. In fact the existing exception expressly includes multioutlet assemblies, for which the revised wording would be essential. The suggested wording also mentions busways because they routinely use splice connection points that don't involve boxes.
4. The equipment rule in (b) includes the wording now in the Code in order to clarify that this is in lieu of a box, but would also apply to transformer enclosures and the like. The wording also correlates with the wording in Section 370-23(f) Exception No. 2, which is important.
5. The remaining sections have a few words added in order to make them complete sentences. This is more appropriate for stand-alone rules, particularly because the number of subsections involved in this case make for a substantial distance between the parent provisions and subsequent specific requirements.
6. The rules with section references have been editorially reformatted to use a parallel construction so as to be less confusing to the reader, and as required in the current style manual. In each case the sentence opens with the subject matter ("… not required for splices and taps …"; "… not required for insulated devices", etc.) and then closes with the section reference.
7. In (g) the word "direct" was added to provide better correlation with the actual requirement.
8. In (i) the original proposal has been broadened to cover other enclosures for which a requirement for a box has never been required as a practical matter, including cabinets and cutout boxes, (includes panelboards — see definition) switchboards and motor control centers. The reference in Article 373 has been corrected.
9. In (j) the suggested text references the exceptions and not the rule in Section 410-31. This is more technically correct because it is only the exceptions that permit what this rule seeks to permit.
10. I have suggested deleting (l) from the original proposal because, by virtue of Section 90-3, it is unnecessary to correlate requirements in Chapter 6 in this article. There are many other special provisions that could be brought forward; it is far better to simply stay in the first four chapters of the Code where correlation is critical. This is also reflected in the new style manual.
11. I am suggesting restricting the permission in manholes to splice, junction, and pull functions. If a light were installed in a manhole, for example, it should be on a box just like anywhere else. The permission should go directly to the unique function of the manhole as a large pull box that one has the ability to step into. In addition, I have taken material from the new manhole provisions in Article 370 for correlation, along with providing the appropriate reference.

PANEL ACTION: Accept in Principle in Part.

Delete "raceway or multiconductor cable" and "electrical metallic" in the proposal.

Insert the last two sentence before (a) as the first two paragraphs at the beginning of the Section.

In the proposal in (a), change the word "including" to "such as"

In (e), FPN, make the correction for 550-10(i) from (j) in the proposal and add 552-48(e), Exception No. 1.

In (f), change the word "no" to "not" and insert it after "are" and before "spliced"

In (g) and (h), Add the words "As permitted in Section 300-5(e)" and "As permitted in Section 336-21" at the beginning of the sentence.

In (i), change "as covered in" to "as permitted in" in the second line. Delete "switchboard or" in the last line.

In (m), delete "splice, junction, and pull points" in the first line and replace "and other electric enclosures intended for personnel entry" with "except where connecting to electrical equipment."

The changed proposal reads as follows:

"300-15. Boxes, Conduit Bodies, or Fittings - Where Required. A box shall be installed at each outlet and switch point for concealed knob-and-tube wiring.

Fittings and connectors shall be used only with the specific wiring methods for which they are designed and listed.

Where the wiring method is conduit, tubing, Type AC cable, Type MC cable, Type MI cable, nonmetallic-sheathed cable, or other cables, a box or conduit body complying with Article 370 shall be installed at each conductor splice point, outlet point, switch point, junction point, termination point or pull point, unless otherwise permitted in (a) through (m).

(a) Wiring Methods With Interior Access. A box or conduit body shall not be required for each splice, junction, switch, pull, termination, or outlet points in wiring methods with removable covers, such as wireways, multioutlet assemblies, auxiliary gutters, and surface raceways. The covers shall be accessible after installation.

(b) Equipment. An integral junction box or wiring compartment as part of approved equipment shall be permitted in lieu of a box.

(c) Protection. A box or conduit body shall not be required where cables enter or exit from conduit or tubing that is used to provide cable support or protection against physical damage. A fitting shall be provided on the end(s) of the conduit or tubing to protect the cable from abrasion.

(d) Type MI Cable. A box or conduit body shall not be required where accessible fittings are used for straight-through splices in mineral-insulated metal-sheathed cable.

(e) Integral Enclosure. A wiring device with integral enclosure identified for the use, having brackets that securely fasten the device to walls or ceilings of conventional on-site frame construction, for use with nonmetallic-sheathed cable, shall be permitted in lieu of a box or conduit body.

FPN: See Sections 336-18, Exception No. 2; 545-10; 550-10(i); 551-47(e), Exception No. 1; and 552-48, Exception No. 1.

(f) Fitting. A fitting identified for the use shall be permitted in lieu of a box or conduit body where conductors are not spliced or terminated within the fitting. The fitting shall be accessible after installation.

(g) Direct-Buried Conductors. As permitted in Section 300-5(e), a box or conduit body shall not be required for splices and taps in direct-buried conductors and cables.

(h) Insulated Devices. As permitted in Section 336-21, a box or conduit body shall not be required for insulated devices supplied by nonmetallic-sheathed cable.

(i) Enclosures. A box or conduit body shall not be required where a splice, switch, terminal or pull point is in a cabinet or cutout box, in an enclosure for a switch or overcurrent device as permitted in Section 373-8, in a motor controller as permitted in Section 430-10(a), or in a motor control center.

(j) Fixtures. A box or conduit body shall not be required where a fixture is used as a raceway as permitted in the exceptions to Section 410-31.

(k) Embedded. A box or conduit body shall not be required for splices where conductors are embedded as permitted in Sections 424-40, 424-41(d), 426-22(b),426-24(a), and 427-19(a).

(l) Closed Loop. A box shall not be required with a closed-loop power distribution system where a device identified and listed as suitable for installation without a box is used.

(m) Manholes. Where accessible only to qualified persons, a box or conduit body shall not be required for conductors in manholes, except where connecting to electrical equipment. The installation shall comply with the provisions of Part D of Article 370."

PANEL STATEMENT: Based upon the definition of a "raceway", not all raceway wiring methods would require a box or conduit body for a splice point. There is no reason to insert "multiconductor cable" since even single conductor cables, such as MI cable must have a junction box for splicing purposes. By removing "electrical metallic", this section now covers EMT, ENT, and flexible metallic tubing. This came from Proposal 3-82.

The last two sentences were moved to be the first two and made into separate paragraphs so that permission to go to (a) through (m) immediately precedes the text it addresses.

The submitter did a nice job of rewriting the text into complete sentences.

The change in (a) was to provide a list of examples of wiring methods with interior access, such as wireways, multioutlet assemblies, auxiliary gutters, and surface raceways.

The change in (e), FPN was a correction in the proposal reference from 550-10(j) to 550-10(i). The added reference to 552-48(e), Exception No. 1 was needed since it wasn't added when Article 552 was added to the Code.

The remainder of the changes in (f) through (l) were strictly editorial changes.

The change in (m) using the phrase "except where connecting to electrical equipment," was an attempt to clarify that boxes are only necessary in manholes where there is electrical equipment such as lights, receptacles, and switches.

The phrase "termination point" was inserted where necessary in the text to ensure that live conductors that are capped for future use are also enclosed in a box or conduit body.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2189)

3- 82 - (300-15(a)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Where the wiring method is conduit, ~~electrical metallic~~ tubing, Type AC cable,...
SUBSTANTIATION: As originally written this subsection does not include electrical nonmetallic tubing or flexible metallic tubing. Both of these raceway methods require boxes or conduit bodies. See Sections 331-12 and 349-17. By deleting "electrical metallic" all types of tubing are included. This is similar to using the general term "conduit" to include all types of conduit.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-81.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3012)

3- 83 - (300-15(a)): Accept in Principle
SUBMITTER: Robert H. Keis, Dover, DE
RECOMMENDATION: Insert the words "termination point" into the required locations or points where a box is required.
300-15. Boxes, Conduit Bodies, or Fittings—Where Required.
(a) Box or Conduit Body. Where the wiring method is conduit, electrical metallic tubing, Type AC cable, Type MC cable, Type MI cable, nonmetallic-sheathed cable, or other cables, a box or conduit body complying with Article 370 shall be installed at each conductor splice point, outlet, switch point, junction point, termination point, or pull point, unless otherwise permitted in (b) through (n). A box shall be installed at each outlet and switch point for concealed knob-and-tube wiring.
SUBSTANTIATION: The argument has come up recently about just taping the ends of an abandoned, but usable cable and leaving the cable end buried in a wall or laying in a ceiling. Nowhere in the code can I find a requirement that abandoned cables need to be removed and a lot of times that would be needless expense. Often cables are discontinued for one reason or another and may or could be utilized again in the future. This will settle a long standing argument. We tell the electrician when he violates the code to "read the words." He did just that, and that is reason for this proposal. The words aren't there!
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 3-81. However, truly abandoned wires should not remain energized or connected to a possible source of potential.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2840)

3- 84 - (300-15(c)): Accept
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Combine the present two sentences in to one sentence, substituting a "comma" where the "period" now resides, to it would read:
(c) Protection. Where cables enter or exit from conduit or tubing that is used to provide cable support or protection against physical damage, ~~.~~ ~~A~~ a fitting shall be provided on the end(s) of the conduit or tubing to protect the cable from abrasion.
SUBSTANTIATION: It appears the first sentence is missing a predicate and the second sentence is missing a subject. At present they appear to be two incomplete sentences.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2773)

3- 85 - (300-15(m)): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Add new text as follows:
Flexible Cord. Where conductors are spliced in accordance with Section 400-9, no box or conduit body shall be required.
SUBSTANTIATION: No box or conduit is necessary where flexible cord conductors are properly spliced in accordance with Section 110-14(b).
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement for flexible cords are in Article 400, in particular Section 400-9, and are not needed here. Section 300-1(a) already addresses the submitter's recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #785)

3- 86 - (300-16(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) A box or terminal fitting having a separately bushed hole for each conductor shall be used wherever a change is made from cablebus, busway, conduit, electrical metallic tubing...
(remainder unchanged).
SUBSTANTIATION: This section does not cover transitions to open wiring from cablebus or busways with bus stubs, which are not uncommon in switchgear or transformer rooms where open wiring may be permitted, or at service drops.
PANEL ACTION: Reject.
PANEL STATEMENT: Thie proposal is adequately covered by 364-8 and 365-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #786)

3- 87 - (300-16(b)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Bushing. A bushing shall be permitted in lieu of a box or terminal described in (a) where the conductors emerge from a raceway ~~or conduit~~ and enter or terminate at equipment, such as open switchboards, unenclosed control equipment, or where a raceway terminates under an open bottom switchboard or motor control center, within a pole supporting a lighting fixture(s) or sign(s), or at a location accessible to qualified persons only, such as a room or vault, fenced enclosure and similar locations, used primarily for the containment of batteries, transformers, switchboards, and other electrical distribution equipment.
SUBSTANTIATION: Editorial. Since a bushing is a terminal fitting, the fitting it may be used in lieu of should be noted. "Or conduit" is redundant.
Though it may be considered unnecessary to make a laundry list of all permitted (or common) uses, it would be helpful to Code users to indicate some of the more common uses where a bushing is, in practice, used at transitions to open conductors to allow for a more or less straight conductor emergence which is less stressful to conductor insulation, especially for large conductors and high-voltage conductors. The limited scope of the present wording may suggest the additional uses indicated are not permitted.
PANEL ACTION: Accept in Part.
The panel accepts the following to read:
"(b) Bushing. A bushing shall be permitted in lieu of a box or terminal where the conductors emerge from a raceway."
The remainder of the existing text to remain as is.
PANEL STATEMENT: The submitter is correct that a laundry list of applications is not necessary and certainly would not cover all of the possibilities. Information such as this would be better applied in the Handbook if anyone felt the need to include additional examples. The use of the word "conduit" is redundant and the panel agreed with the deletion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #124)

8- 9 - (300-18, Exceptions No. 4 and 5-(New)): Reject
NOTE: The following proposal consists of Comment 8-2 on Proposal 3-125 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 3-125 was:
Add:
Exception No. 4: Preassembled cable in nonmetallic conduit in accordance with Article 343.
Add:
Exception No. 5: Busway assemblies in accordance with Article 364.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: To correlate with the Panel Action on Proposal 8-5a, the Technical Correlating Committee directs that Exception No. 3 be revised to read as follows: "Exception No. 3: Prewired assemblies shall be permitted where indicated in Article 315." The Technical Correlating Committee directs Code-Making Panel 8 to add specific language to Article 315 recognizing flexible metal conduit and flexible metallic tubing as prewired assemblies. This action will be considered by Panel 8 as a Public Comment.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal's intent was to correct 300-18 of the 1996 NEC by adding both NUCC as a pre-wired assembly and pre-wired Busways. Panel 3 revised 300-18(a) to read "Pre-wired raceway assemblies shall be permitted only where specifically permitted in the Code for the applicable wiring method".
Article 315 (344) will not be adopted by Panel 8 (See Panel action and statement on 8-84) . Articles 343 and 364 will stand alone. 350-10(a)(5) allows Flexible Metal Conduit and Section 349-10(a) Exception 2 allows Flexible Metal Tubing to be pre-assembled.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

Note: The sequence no. 8-10 was not used.

(Log #787)

3- 88 - (300-18(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Complete Runs. Raceways, other than busways, cablebus, or exposed raceways having hinged or removable covers, shall be installed complete between outlets, junction or splicing points, or other terminations prior to the installation of conductors.
(remainder unchanged).
SUBSTANTIATION: Editorial. Cablebus is not deemed a raceway and should be equally suitable as wireways for exemption, "Other terminations" is proposed to clarify that panelboards, switchboards, switches, etc., are included since they may not be deemed as outlets or splicing points, and in the absence of a definition, not junction points.
PANEL ACTION: Reject.
PANEL STATEMENT: See 365-1 for the definition of "cablebus" which indicates that it is an assembly and understood to be "complete". The substantiation contradicts the proposed change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1833)

3- 89 - (300-18(b)): Reject
SUBMITTER: Randolph O. Lovelace, City of Orlando, FL
RECOMMENDATION: Delete all of the words after the word "raceway".
SUBSTANTIATION: Vague and undefined words that have no meanings, should be deleted here, or more accurate references given.
PANEL ACTION: Reject.
PANEL STATEMENT: Many prefabricated commercial and industrial electrical equipment manufacturers utilize welding to support raceways within the equipment and have strict control over any possible damage that could occur to the interior of the raceway. Deleting the text would not allow that electrical equipment manufacturer to weld the raceway into an integral part of the equipment. The submitter provided no technical substantiation for this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2190)

3- 90 - (300-18(c); 343-11; 345-11; 346-11; 347-14; 348-12; 351-10; 351-30 (New)): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Add a new Section 300-18(c) to read as follows:
Bends — Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) in conduit or tubing between pull points (for example, conduit

bodies and boxes).

The following paragraph will replace these sections:
343-11; 345-11; 346-11; 347-14; 348-12; 351-10; 351-30

Bends — Number in One Run. The number of bends in one run shall comply with 300-18(c).

SUBSTANTIATION: This rule appears in every conduit and tubing article except one. The NEC Style Manual 4.1.1 states, "Use references to other NEC rules to avoid repeating a requirement." Therefore, to avoid repetition of this rule it should appear once in Article 300 Wiring Methods and be referenced by all other articles.
PANEL ACTION: Reject.
PANEL STATEMENT: It is important to have this rule in each of the raceway articles. The submitter has not avoided repetition by this proposal since there is still a reference to go back to proposed Section 300-18(c) in each one of the raceway articles. These rules should remain in each article for simple ease of use and user friendliness.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1270)

3- 91 - (Table 300-19(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1) Split Table 300-19(a) "Conductors" Columns as follows:

Aluminum or Copper-Clad

Aluminum		Copper	
Meters	Feet	Meters	Feet
30	100	30	100
60	200	30	100
55	180	25	80
41	135	18	60
36	120	15	50
28	95	12	40
26	85	11	35

2) Delete the note below the Table as follows:

Note: For SI units, 1 ft = 0.3048 m.

SUBSTANTIATION: The proposed revisions are intended to comply with the NFPA No. 1M Manual of Style, Section 4.1 with respect to the placement of units The existing Table 300-19(a) "Conductors" columns have been split into two columns, one for conductor supports in meters, the other for conductor supports in feet. NFPA editorial staff may format the information in the most suitable format for inclusion in Table 300-19 (a).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #788)

3- 92 - (300-20(a), (b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

(a) Conductors Grouped Together. Where conductors carrying alternating current are installed in metal enclosures, ~~or~~ metal raceways, or contained in metal-armored cables, they shall be arranged to avoid heating the surrounding metal by induction. To accomplish this all circuit ~~phase~~ conductors and where used, ~~the grounded conductor and~~ all wire-type equipment grounding conductors shall be grouped together in the same raceway, cable, or approved enclosure.

Exception No. 1: No change.
Exception No. 2: No change.
Exception No. 3: Paralleled conductors shall be permitted in accordance with Section 310-4.
Exception No. 4: Single-conductor Type MI cable with a copper sheath shall be permitted in accordance with Section 330-16.
Exception No. 5: Grounded conductors supplied by a column-type panelboard using an auxiliary gutter and pull box with neutral terminations shall be permitted to terminate in the pullbox.

(b) Individual Conductors. Where a single conductor carrying alternating current passes through metal with magnetic properties, the magnetic effect shall be minimized by (1) cutting slots in the metal between the individual holes through which the individual conductors pass, or (2) passing all the conductors in the circuit through an insulating wall sufficiently large for all the conductors of the circuit.

Exception: In the case of circuits supplying vacuum or electric-discharge lighting systems for signs, or x-ray apparatus, the currents carried by the conductors are so small that the heating effect can be ignored where these conductors are placed in metal enclosures or pass through metal.

FPN: Because aluminum is not a magnetic metal, there will not be heating due to hysteresis; however, ~~induced~~ currents ~~will be present~~ can be induced. They will not be of sufficient magnitude to require ~~grouping of conductors or~~ special treatment in passing conductors through aluminum wall sections.
SUBSTANTIATION: Metal armored cables should be included, they can be misued in a manner to cause induction heating. For example, two 2-conductor cables can provide a 4-wire circuit; three 2-wire cables with same-phase conductors in each cable can provide a paralleled 3-wire circuit. Inclusion of cables would reinforce requirements of Sections 300-3(b) and 310-4 and cover single-conductor Type MI cable with a steel sheath.

"Circuit" conductor covers grounded conductors; "wire-type" grounding conductor is specific. "Grouped together" should be more specific; using the code as a guide for interpretation "grouped" as used in Sections 225-34(a); 230-72(a); and 330-16 is applied to separate enclosures and cables.

Proposed Exceptions No. 3, 4, and 5 would provide correlation and allow for installations not literally permitted by present wording.

"Approved enclosure" would cover installations in auxiliary gutters, cablebus, etc., which are not deemed "raceways".

The FPN phrase "grouping of conductors" may suggest the rule of (a) need not apply if the raceway is aluminum, although it is not an exception. This would conflict with Sections 300-3(b) and 310-4, Exception No. 2. Section 300-3(b)(3) requires compliance with (b) where passing through magnetic metal and doesn't modify the general requirements of Section 300-3(b) which doesn't differ for nonmagnetic enclosure.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement in the proposal singling out metal armored cable should not be in the NEC as it is in cable standards. The installer has no control over the placement of the conductors in the cable.

The proposed change to delete phase conductors and grounded conductors from the text was not accepted since these are very specific terms and help the user in identifying exactly which conductors must be grouped.

The proposed addition of "wire-type" is unnecessary since only equipment grounding conductors of the wire type would need to be grouped with the other conductors.

The proposed addition in the last sentence of the phrase "in the same raceway, cable, or approved enclosure" is redundant since it is also stated in the first sentence of the existing text.

Proposed Exception No. 3 and Exception No. 4 are unnecessary since this information is already covered in Sections 300-3(b)(1) and (b)(3) plus referenced in Section 330-16 back to Section 300-20(b) for single conductor MI cable.

Proposed Exception No. 5 is unnecessary since it is already covered in Section 300-3(b)(4). These column-type metal panelboards have been tested and listed with the auxiliary gutter and pullbox and can be considered as one complete piece of equipment.

The Panel disagrees with the submitter's statement that without these three exceptions, the installations of concern would not be permitted.

The FPN is very clear in its message involving aluminum and induced currents. Deleting the information on grouping of conductors through aluminum wall sections makes the FPN less clear and defeats the purpose of the FPN which is to provide clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4349)

3- 93 - (300-21, FPN): Accept in Part
SUBMITTER: Lawrence Brown, Nat'l Assn. of Home Builders
RECOMMENDATION: Revise text to read as follows:
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Model building codes also contain restrictions on membrane penetrations on opposite sides of a fire resistance rated wall assembly. An example is the 24-in. (610-mm) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. This separation may depend on a specified horizontal dimension, fireblocking, or the incorporation of listed products. Assistance in complying with Section 300.21 can be found in these building codes, fire resistance directories and product listings.
SUBSTANTIATION: Not only do the fire-resistance directories have specific requirements for the assemblies they have tested, the model building codes also have specific requirements. Please note the following Section 711.32 of the 2000 IBC. There are other alternative methods to achieve the ends of containing the spread of fire and the products of combustion besides a 24-in. separation. The use of solid fireblocking and listed products to provide necessary separation are also recognized. This information should also be included in the FPN to better inform the user.
ICC Section: 711.3.2 Membrane Penetrations. Membrane penetrations shall comply with Section 711.3.1. Where walls are required to have a minimum 1 hour fire resistance rating, recessed light fixtures shall be so installed such that the required fire resistance will not be reduced.
Exceptions:
1. Steel electrical boxes that do not exceed 16 square inches (0.0103 m^2) in area provided the total area of such openings does not exceed 100 square inches (0.0645 m^2) for any 100 square feet (9.29 m^2) of wall area. Outlet boxes on opposite sides of the wall shall be separated as follows:
1.1 By a horizontal distance of not less than 24 inches (610 mm), or
1.2 By a horizontal distance of not less than the depth of the wall cavity when the wall cavity is filled with cellulose loose-fill or mineral fiber insulation, or
1.3 By solid fire blocking in accordance with Section R602.81, or
1.4 By other listed materials and methods
2. Membrane penetrations for listed electrical outlet boxes of any materials are permitted provided such boxes have been tested for use in fire resistance-rated assemblies and are installed in accordance with the instructions included in the listing.
3. The annular space created by the penetration of a fire sprinkler provided it is covered by a metal escutcheon plate.
PANEL ACTION: Accept in Part.
The panel accepts the following to read:" FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire resistance rated wall assembly. An example is the 610 mm (24 in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with Section 300.21 can be found in building codes, fire resistance directories and product listings."
PANEL STATEMENT: The deleted sentence was not accepted because it contains terminology that may introduce more questions than clarification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2165)

3- 94 - (300-22, FPN): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
See Article 424, Part F for duct heaters.
SUBSTANTIATION: The subject of the reference is not given. The NEC Style Manual 4.1.2 states, "References shall indicate the subject of the rules being referenced; the subject shall follow the number." A fine print note should be written as a complete sentence. See examples in NEC Style Manual, 4.1.2 for well written fine print notes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3170)

3- 95 - (300-22(b)): Accept in Principle
NOTE: The Technical Correlating Committee directs that the panel clarify the Panel Action on this Proposal considering the comments on voting and the Panel Action on 3-98. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise the first sentence to read:
(b) Ducts or Plenums Used for Environmental Air. Only wiring methods without an overall nonmetallic covering and consisting of Type MI cable, Type MC cable employing a smooth or corrugated impervious metal sheath, electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, or rigid metal conduit shall be installed in ducts or plenums specifically fabricated to transport environmental air.
SUBSTANTIATION: Section 300-22(b) as currently written does not permit nonmetallics in these environmental air spaces. This proposal is to clarify that fact relative to a new rigid conduit product and does not affect any of the currently permitted products. The current text permits the use of "rigid metal conduit". Recent changes have been made to UL Safety Standard 6 "Rigid Metal Conduit", which now allows the listing of a metal conduit with a PVC coating as an alternative to metal conduit with galvanizing. If this change is not made in 300-22(b), this new type of conduit could be used in ducts or plenums, which was not the original intent. The 1999 UL Electrical Construction Equipment Directory (Green Book) states that, "Conduit with nonmetallic coatings has not been evaluated for use in ducts, plenums, or other environmental air spaces in accordance with Section 200-33 of the National Electrical Code."
PANEL ACTION: Accept in Principle.
Revise the first sentence to read:
"(b) Ducts or Plenums Used for Environmental Air. Only wiring methods without an overall nonmetallic covering and consisting of Type MI cable, Type MC cable employing a smooth or corrugated impervious metal sheath, electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, or rigid metal conduit shall be installed in ducts or plenums specifically fabricated to transport environmental air."
PANEL STATEMENT: The deletion was strictly editorial. In the proposer's substantiation, the reference in the UL Electrical Construction Equipment Directory should be Section 300-22, not 200-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
FORSBERG: The panel rejected similar text per Proposal 3-98 by the panel substantiation: "The substantiation covered only rigid metal conduit. There was no substantiation to include other products with over all nonmetallic covering." This panel substantiation also applies for Proposal 3-95. There are currently cables used with nonmetallic covers per Articles 725, 770, and 800.
COMMENT ON AFFIRMATIVE:
CASPARRO: The submitter's substantiation, which states that UL has not evaluated nonmetallic coatings for use in ducts, plenums, or other environmental air spaces, makes this proposal acceptable.
GRUBER: This proposal should be "Accept" not "Accept in Principle".
The Panel accepted the exact language from the proposal. The Panel's editorial comment about an incorrect Code reference (300-22 not 200-33) refers to the submitter's substantiation, not the proposal itself and therefore should only be a Panel comment regarding the substantiation.
KREINER: The first "and" in the second line of the Panel Action should be deleted since that was the reason for the Accept in Principle.

(Log #2060)

3- 96 - (300-22(c) Exception No. 2): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add an Exception to read as follows:
Exception No. 2: This section shall not apply to supervised industrial installations for semiconductor clean room facilities as defined by Section 240-91.
SUBSTANTIATION: Many Authorities Having Jurisdiction are unsure if this section should apply to semiconductor fabrication plants.
Semiconductor clean rooms are similar to Article 645 except that they have much more safety sensing devices and can not be interrupted during the process stage. See also NFPA 318.
To install the wiring methods in raceways only limits the ability to change the fabrication tools so that production can be maintained in as short of time as possible.
As defined in the Mechanical codes this room is somewhat like a plenum.
As defined in the electrical code this room is not a plenum but air moves around the room through the fabrication tools the same as data processing equipment.
The building Code states this fabrication area is a single conditioned environment.
The room is also separated from the rest of the building the same as if NFPA 75 was used in the design of this area.
A hardship is being placed on the technology industry because some Inspectors do not under stand that this room must change with the new technology being developed at a rapid pace.
Using section 300-22(c) impedes this process due to all the other combustible products being install in this OTHER SPACE.
Exhaust ducts up to 36 inches made out of plastic type materials.
Tubing used for gas sensing is combustible.
Cold water pipes used for the air handlers are insulated with pvc materials.
I hope the Panel will give this request serious consideration.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The definition for a supervised industrial installation in Section 240-91 only applies to Part H of Article 240 for special permission for overcurrent protection for feeders and branch circuits in large industrial installations used exclusively for manufacturing and process control activities. The submitter needs to provide much more technical documentation showing the containment of products of combustion within a limited area, types of filtering, fire protection techniques used in these areas, fan and electrical equipment shutdown during a fire emergency, and similar information that would allow deviation from the standard requirements found in Section 300-22(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2930)

3- 97 - (300-22(c)(1)): Reject
SUBMITTER: Timothy Arendt, City of Chicago
RECOMMENDATION: Revise text to read as follows:
"..., Type AC cable, ~~or other factory assembled multiconductor control or power cable that is specifically listed for the use,~~ or...".
SUBSTANTIATION: There is growing concern nationwide regarding combustible or limited combustible material used in this space. In Chicago survey has revealed that dangerous accumulations of cables does not exist due to the raceway requirement.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The supporting material does not back-up the submitter's proposal to deny the use of specifically listed plenum cable in this other space for environmental air. These cables have been tested and listed based upon low smoke producing characteristics. There has been no technical documentation submitted to indicate that permission to use this cable in an other space for environmental air should be rescinded.
The supporting material indicates that the NFPA Committee for NFPA 90A has recommended that an exception be inserted in NFPA 90A to allow the plenum cable for computer equipment and communications equipment in spaces for environmental air only where the cable is connected to equipment that is actually operational and to not allow cables in these areas not connected to operating equipment. This was turned down on the floor at the NFPA meeting, appealed to the Standards Council, and turned down by the Standards Council.
The second part of the supporting material submitted deals with research on duct mounted smoke detectors that would apply to Section 300-22(b) covering fabricated ductwork, not 300-22(c) covering other space used for environmental air.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3169)

3- 98 - (300-22(c)(1)): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise the last sentence in 300-22(c)(1) to read:
Other type cables and conductors shall be installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, rigid metal conduit, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers; <u>overall nonmetallic coverings shall not be permitted.</u>
SUBSTANTIATION: Section 300-22(c)(1) as currently written does not permit nonmetallics in these environmental air spaces. This proposal is to clarify that fact relative to a new rigid conduit product and does not affect any of the currently permitted products. The current text permits the use of "rigid metal conduit". Recent changes have been made to UL Safety Standard 6 "Rigid Metal Conduit", which now allows the listing of a metal conduit with a PVC coating as an alternative to metal conduit with galvanizing. If this change is not made in 300-22(b), this new type of conduit could be used in ducts or plenums, which was not the original intent. The 1999 UL Electrical Construction Equipment Directory (Green Book) states that, "Conduit with nonmetallic coatings has not been evaluated for use in ducts, plenums, or other environmental air spaces in accordance with Section 200-33 of the National Electrical Code."
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation covered only coated rigid metal conduit. There was no substantiation to include other products with over all nonmetallic covering.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
CASPARRO: In light of the action taken by CMP-3 on Proposal 3-99 on Section 300-22(c)(1) Exception, it would seem appropriate for consistency to accept the proposal.
GRUBER: I agree with Mr. Casparro's negative comment.

(Log #2500)

3- 99 - (300-22(c)(1), Exception): Accept
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, N
RECOMMENDATION: Delete the exception.
SUBSTANTIATION: The accommodation of a specific wiring method in this location should be removed. The use of liquidtight flexible metal conduit in single lengths of not over 6 feet but with no limit on the number of single lengths permitted has to be in conflict with the basic intent of this section, especially so since the section prohibits the use of MC cable with a nonmetallic covering.
For example, we could have 100 fixtures fed by 6 foot LTFMC fixture whips for a total of 600 feet of this product and that would be in compliance but if we had 2 feet of MC cable with a nonmetallic covering we would be in violation.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CASPARRO: Removal of what could potentially be unlimited lengths of up to 6 ft pieces of sealtite is a positive step for getting toxic substances from other spaces used for environmental air. The submitter and CMP-3 should be commended for this proposal.

(Log #4134)

3- 100 - (300-22(e)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information.

SUBMITTER: Marcelo M. Hirschler, GBH Int'l, Inc./Rep. Plenum Cable Assn.

RECOMMENDATION: Add new text to read as follows:

300.22. Wiring in Ducts, Plenums, and Other Air-Handling Spaces. The provisions of this section apply to the installation and uses of electric wiring and equipment in ducts, plenums, and other air-handling spaces.

FPN: See Article 424, Part F, Duct Heaters.

(e) Abandoned cables, not intended for future use, shall not be permitted to remain.

SUBSTANTIATION: There is a significant amount of information indicating that the amount of cables installed in plenums, and other air-handling spaces, is increasing rapidly. An understanding of cabling practices indicates that the most common way in which cable installation is carried out is by disconnecting existing cable and leaving it abandoned in place, while introducing the cable needed to perform the additional functions. This creates an increased fuel load in plenums and other air-handling spaces, which is best controlled. There is, as yet, no indication that the additional cable in plenums causes an added fire hazard, and the fire record of cables in concealed spaces, both above ceilings and below floors, remains excellent. In fact, plenum cables, which meet the fire test requirements of NFPA 262, have been shown to have extremely good fire performance and to spread flame only very slowly, if at all. However, this type of preventive measure is worthwhile.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's own substantiation states there is no indication that the additional cables in plenums caused an added fire hazard and that the fire record of cables in plenums is excellent. Requiring abandoned cables to be removed that are not intended for future use would be almost impossible to enforce. Many cables are installed for future use and cables are often swapped at patch panels to provide a very effective method of moving a computer or a piece of telecommunications equipment without having to pull a new cable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

ABSTENTION: 1

COMMENT ON AFFIRMATIVE:

CASPARRO: I'm not sure this proposal belongs in Chapter 3. The proposal submitted seems intended to address low voltage type wiring. The literal wording of the proposal appears to broaden the scope of the proposal to include cable assemblies. The provisions of Chapter 3 may be modified by Chapters 5, 6, and 7, as indicated in 90-3. Chapter 8 is independent of the other Chapters except where specifically referenced therein. I feel the concerns of the submitter can and will be addressed by other code panels.

EXPLANATION OF ABSTENTION:

FORSBERG: The Society of Plastic Industries could not come to agreement on this proposal.

(Log #1832)

3- 101 - (300-23): Reject

SUBMITTER: Dan Ward, City of Orlando, FL

RECOMMENDATION: Add a new sentence:

"See Sections 640-5, 725-5, 760-5, 770-7, 800-5, 820-5 and 830-6 for the same requirement.

SUBSTANTIATION: This sentence will make the code easier to use, without adding a fine print note. It belongs here because the rules are ignored.

PANEL ACTION: Reject.

PANEL STATEMENT: This rule applies generally. Mandatory replication of section is not necessary for the safe application of this code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #789)

3- 102 - (300-37): Accept in Part

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Aboveground Wiring Methods. Aboveground conductors shall be installed in rigid metal conduit, in intermediate metal conduit, in electrical metallic tubing, in rigid nonmetallic conduit, in auxiliary gutters, in cable trays, as busways, as cablebus, in other identified raceways, or as open runs of metal-clad cable suitable for the use and purpose. In locations accessible to qualified persons only, open runs of Type MV cable and bare conductors, including busbars, shall also be permitted where securely supported on insulators.

SUBSTANTIATION: Since auxiliary gutters are not considered raceways, the mandatory requirements of this section excludes their use. Bare busbars is somewhat redundant since they are bare conductors. Requirements for support seem warranted since Article 320 only applies to 600 volt or less systems. Section 300-11(a) reference to cable assemblies does not appear to include individual open conductors.

PANEL ACTION: Accept in Part.

Revise the text to read as follows:

"Aboveground Wiring Methods. Aboveground conductors shall be installed in rigid metal conduit, in intermediate metal conduit, in electrical metallic tubing, in rigid nonmetallic conduit, in auxiliary gutters, in cable trays, as busways, as cablebus, in other identified raceways, or as open runs of metal-clad cable suitable for the use and purpose."

The panel rejects the remainder of the proposal.

PANEL STATEMENT: The existing text covering both bare conductors and bare busbars makes it very clear that this section applies to both. The suggested change does not clarify the issue but actually obscures it somewhat. The submitter is correct that Article 320 would not apply, but Article 110, Part C does apply. The additional text for securing bare conductors and bare busbars is not necessary since it is already covered in Section 110-36.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

ANDREWS: This proposal should be rejected. The submitter proposed to add some words to this section. The only part accepted was to add the words "in auxiliary gutters" in the first sentence. The Panel accepted that the words could be added to the permitted wiring methods for any voltages above 600 volts since it was permitted for those 600 volts and below. However, there are no gutter products listed for use with systems over 600 volts.

The energy level of a fault or shout-circuit at the higher voltages are greatly different from those occurring at 600 volts and less. The response time of overcurrent protection and the magnetic stresses on equipment are different at the higher levels.

Review of the UL listing for wireways, auxiliary gutters, and associated fittings, (category ZOYX, page 117 of the UL "White Book", General Information for Electrical Equipment, 1999), shows UL870 Standard correlates Articles 362, 374, and 645. Upon double checking through Don Nissen of Underwriters Laboratories, UL Standard 870 shows listings for 600 volts and below. In order to comply with the second sentence of Section 300-2(a), UL would have to show a specific listing showing compliance with an appropriate NEC Article. Since Article 374 does not specifically mention auxiliary gutter use for over 600 volts, UL does not have any basis to list equipment for that use.

(Log #2044)

3- 103 - (300-37): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for comment on application of the subject wiring methods over 600 volts. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 7 and 11 for information. The Technical Correlating Committee notes that the Recommendation of this Proposal deletes some wiring methods without substantiation.

SUBMITTER: Gregory P. Bierals, Electrical Design Inst.

RECOMMENDATION: Revise text to read as follows:

"Aboveground conductors shall be installed in rigid metal conduit, intermediate metal conduit, EMT, in rigid nonmetallic conduit, in flexible metal conduit and liquidtight flexible metallic conduit at motor connections in lengths up to 6 ft."

SUBSTANTIATION: To correlate with Sections 430-123 and 430-145(b).

PANEL ACTION: Reject.

PANEL STATEMENT: The permission to use this wiring method for over 600 volt applications is very limited. To insert it within Section 300-37 would seem to be an invitation to misread and misapply it. If the user is installing a motor with a voltage in excess of 600 volts, then Part K of Article 430 should be read and the requirements specifically adhered to, especially Section 430-123.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4194)

3- 104 - (300-37): Reject

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Revise as follows:

"Aboveground conductors shall be installed in rigid metal conduit, in intermediate metal conduit, in electrical metallic tubing, in rigid nonmetallic conduit, in cable trays, as busways, as cablebus, in other identified raceways, or as open runs of metal-clad cable suitable for the use and purpose. Where rigid nonmetallic conduit is used, it shall be Schedule 80 or it shall be suitably encased in not less than 2 in. (50.8 mm) of concrete. In locations accessible to qualified persons only, open runs of Type MV cables, bare conductors, and bare busbars shall also be permitted. Busbars shall be permitted to be either copper or aluminum."

SUBSTANTIATION: The Advisory Committee believes that if rigid nonmetallic conduit is used for above grade use above 600V, the Code should require a small safety margin beyond what it requires for similar use for 600V and below. This proposal allows rigid nonmetallic conduit for this purpose, but asks for Schedule 80 (or concrete encasement otherwise) when so employed.

PANEL ACTION: Reject.

PANEL STATEMENT: There has been no technical substantiation provided to disallow the use of Schedule 40 PVC in above ground use or to require concrete encasement. Section 347-2 allows its use for underground installations without the added protection. Section 347-3(c) does not allow PVC where subject to physical abuse, unless specifically identified for such use.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #791)

3- 105 - (300-37, Exception (New)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add an exception to read as follows:

Exception: Flexible metal conduit, liquidtight flexible metal conduit, and liquidtight flexible nonmetallic conduit shall be permitted in accordance with Section 430-123 for motors and Section 600-32(a) for electric signs and outline lighting.

SUBSTANTIATION: Editorial. Many code users may not be ware of UL listing which "identifies" these raceways, along with the referenced sections, as suitable, since Articles 350 and 351 do not address such over 600 volt use for flexible metal conduit and liquidtight flexible metal conduit.

PANEL ACTION: Reject.

PANEL STATEMENT: The permission to use this wiring method for over 600 volt applications is very limited. To insert it within Section 300-37 would seem to be an invitation to misread and misapply it. If the user is installing a motor with a voltage in excess of 600 volts, then Part K of Article 430 should be read and the requirements specifically adhered to, especially Section 430-123. If the user of the Code is installing an electric sign or outline lighting, then Article 600 can certainly modify the requirements in Section 300-37. The submitter is incorrect in implying that liquidtight flexible nonmetallic conduit is acceptable for use with motors over 600 volts. The listing only allows this use for signs and Section 430-123 further backs that up.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2215)

3- 106 - (300-39): Reject

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

RECOMMENDATION: Revise the first two sentences to read:

Open runs of braid-covered insulated conductors shall have a ~~flame retardant~~ flame tested braid. If the conductors used do not have this protection, a ~~flame retardant~~ listed saturant shall be applied to the braid covering after installation.

SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

A "listed" saturant for the purpose could be evaluated for not only its capability to meet an applicable flame test requirement but other physical and electrical properties that may be necessary for this application.

PANEL ACTION: Reject.

PANEL STATEMENT: Panel 3 does not have jurisdiction over the specific technical issues of conductors and whether the braid is called flame-retardant or flame tested. This whole issue falls under the jurisdiction of Panel 6 and should be decided first by Panel 6. The word "listed" should not be added to saturant without some qualification as to the type of listed saturant. Is it a listed flame-tested saturant or listed flame-retardant saturant or is a listed saturant without any further explanation acceptable? The submitter should submit the technical substantiation to Panel 6 for this change.

The term "flame retardant" is used throughout the Code as a means of expressing to the user that the material resists ignition or the spread of flames, albeit the test methods are often not defined. The term "flame tested" would be similarly undefined, but can be understood to mean a test which does not necessarily measure the ability of a material to resist ignition or flame propagation. Some articles of the NEC offer information regarding the tests deemed appropriate for the required level of resistance to ignition or flame propagation. Others rely on the product standards to provide such information. The panel suggests that specific proposals be made wherever the generic reference to "flame retardant" is not sufficient.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3217)

3- 107 - (300-50): Reject
SUBMITTER: Allen L. Wadkins, Murray State Univ.
RECOMMENDATION: Add new text to read as follows:
Underground installations of conductors of 600 volts, or more, direct buried or in a raceway shall have an insulated conductor laid in some ditch line for locating purposes. The insulated conductor shall be terminated at each end of underground installation at a readily accessible location, to where a locating device may easily be connected.
SUBSTANTIATION: Underground high voltage lines have always been a difficult task to locate. Most locator equipment manufacturers do not recommend connecting to a conductor of 600 volts or more, for several reasons, mainly safety. Also, many h.v. faults and cables are unaccessible without a shutdown. The second means of locating is to connect the locator transmitter to the ground of the shielded cable which is very unreliable being that the locator indicates a signal on the ground and scatters the signal in the ground.
PANEL ACTION: Reject.
PANEL STATEMENT: Other detection methods exist that are tested and reliable. Utility companies and private locator companies have been locating underground cables and conductors for many years with a great deal of effectiveness. Locating the locator line after the system has been buried for a period of time would also be difficult. If the system is bored or vibrated into place then the locator line would also have to be installed. Section 90-1(b) states that the Code contains provisions considered necessary for safety and free from hazard. This is not a safety issue. The panel considered that the submitter intended his proposal to read "over 600 volts, Nominal" instead of "600 volts, or more".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1271)

3- 108 - (Table 300-50): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the table heading as follows:
1) Table 300-50. Minimum Cover Requirements (Cover is defined as the shortest distance in mm (inches) ~~inches~~ measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.)
2) Split Table 300-50 Columns 2, 3 & 4 (Direct Buried Cables, Rigid Nonmetallic Conduit Approved for Direct Burial and Rigid Metal Conduit Intermediate Metal Conduit) as follows:

Direct Buried Cables		Rigid Nonmetallic Conduit Approved for Direct		Rigid Metal Conduit and Intermediate Metal Conduit	
mm	Inches	mm	Inches	mm	Inches
750	30	450	18	150	6
900	36	600	24	150	6
1000	42	750	30	150	6

Revise the note below the Table as follows:

~~Note: For SI units, 1 in. = 25.4 mm.~~
*** Listed by a qualified testing agency as suitable for direct burial without encasement. All other nonmetallic systems shall require ~~2 in. (50.8 mm)~~ 50 mm (2 in) of concrete or equivalent above conduit in addition to above depth.**

SUBSTANTIATION: The proposed revisions are intended to comply with the NFPA No. 1M Manual of Style, Section 4.1 with respect to the placement of units The existing Table 300-50 columns for the appropriate wiring methods have been split into two columns, one for burial depth in mm, the other for burial depth in inches. NFPA editorial staff may format the information in the most suitable format for inclusion in Table 300-50
PANEL ACTION: Accept in Principle.
Insert "Burial" and asterisk in title to column 3.
PANEL STATEMENT: The panel understands that the remainder of the table will remain as is. Editorial correction indicating the addition of the word "Burial" and asterik in the third column.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2846)

3- 109 - (Table 300-50): Accept in Principle
Note: The Technical Correlating Committee directs the Panel to clarify the action on this Proposal. The relationship of the Exceptions to the Table Columns is not clear. The Technical Correlating Committee also directs the Code-Making Panel to revise the title of the table to move the definition of "cover" into a Table Note. This action will be considered by the Panel as a Public Comment
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Revise Table 300-50 as shown. (Leave the present text located above and below the table as in the 1999 Edition of the NEC.)

Circuit Voltage	Buried Direct-Cables	Rigid Nonmetallic Conduit Approved for Direct Burial*	Rigid Metal Conduit and Intermediate Metal Conduit					
			All locations not otherwise specified	In trench below 2-in. thick concrete or equivalent	Under a building	Under minimum of 4-in. thick concrete exterior slab with no vehicular traffic and the slab extending not less than 6 in. beyond the underground installation	Under streets, highways, roads, alleys, driveways, and parking lots	In or under airport runways, including adjacent areas where trespassing prohibited
Over 600 V through 22 kV	30	18	6	6	0	4	24	18
Over 22 kV through 40 kV	36	24	6	6	0	4	24	18

SUBSTANTIATION: To be consistent with Table 300-5, and acknowledge that burial depths for airport locations are to be 18-inches minimum due to FAA regulations.
PANEL ACTION: Accept in Principle.
Revise table as follows:

Table 300-50. Minimum Cover Requirements (Cover is defined as the shortest distance in inches measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.)

(1) Circuit Voltage	(2) Buried Direct-Cables	(3) Rigid Nonmetallic Conduit Approved for Direct Burial and not Under a Building*	(4) Rigid Metal Conduit and Intermediate Metal Conduit				
			(5) All locations not otherwise specified	(6) Under a building (including rigid nonmetallic conduit approved for direct burial)	(7) Under minimum of 4-in. thick concrete exterior slab with no vehicular traffic and the slab extending not less than 6-in. beyond the underground installation (including rigid nonmetallic conduit approved for direct burial)	(8) Under streets, highways, roads, alleys, driveways, and parking lots	(9) In or unde airport runways, including adjacent a where trespassing prohibited
Over 600 V through 22 kV	30	18	6	0	0	24	18
Over 22 kV through 40 kV	36	24	6	0	0	24	18
Over 40 kV	42	30	6	0	0	24	18

Note: For SI units, 1 in. = 25.4 mm.
*** Listed by a qualified testing agency as suitable for direct burial without encasement. All other nonmetallic systems shall require 2 in. (50.8 mm) of concrete or equivalent above conduit in addition to above depth.**

(8) *Exception No. 1: Areas subject to vehicular traffic, such as thoroughfares or commercial parking areas, shall have a minimum cover of 24 in. (610 mm).*

(2)(3) *Exception No. 2: The minimum cover requirements for other than rigid metal conduit and intermediate metal conduit shall be permitted to be reduced 6 in. (152 mm) for each 2 in. (50.8 mm) of concrete or equivalent protection placed in the trench over the underground installation.*

(3)(6)(7) ~~*Exception No. 3: The minimum cover requirements shall not apply to conduits or other raceways that are located under a building or exterior concrete slab not less than 4 in. (102 mm) in thickness and extending not less than 6 in. (152 mm) beyond the underground installation. A warning ribbon or other effective means suitable for the conditions shall be placed above the underground installation.*~~

(3)(6)(7) Exception No. 3: The minimum cover requirements for conduits shall not apply if the installation meets either one of the following conditions. A warning ribbon or other effective means suitable for the conditions shall be placed above the underground installation.

1. The minimum cover requirements shall not apply to conduits or other raceways that are located under a building; or

2. The minimum cover requirements shall not apply to conduits or other raceways that are located under an exterior concrete slab not less than 4 in. (102 mm) in thickness and extending not less than 6 in. (152 mm) beyond the underground installation.

Exception No. 4: Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.

(2) Exception No. 5: In or under airport runways, including adjacent defined areas where trespass is prohibited, cable shall be permitted to be buried not less than 18 in. (457 mm) deep and without raceways, concrete enclosement, or equivalent.

(9) Exception No. 6: In or under airport runways, including adjacent defined areas where trespass is prohibited, conduit shall be permitted to be buried not less than 18 in. (457 mm) deep and without concrete enclosement or equivalent.

Exception No. 7: Raceways installed in solid rock shall be permitted to be buried at lesser depth where covered by 2 in. (50.8 mm) of concrete, which shall be permitted to extend to the rock surface.

PANEL STATEMENT: The panel has met the submitter's intent and has provided some revisions to include information from some of the six existing exceptions to this table. The panel also added the 40Kv row which was missing in the original proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
BEILE: This proposal is for a new burial table for over 600V developed at the panel meeting. It is comprised of several sources of information (Table 300-5, existing Table 300-50, and some of the Exceptions). A finalized copy was not available at the panel meeting, and is not available for NEMA to review. The printed ROP is needed to properly evaluate this table, and acceptance should be delayed until the ROC stage.
GRUBER: This proposal is for a new burial Table for over 600V developed at the Panel meeting. It is comprised from several sources of information (Table 300-5, existing Table 300-50 and some Exceptions to Table 300-50). A finalized copy was not available at the Panel meeting and a printed ROP is needed to properly evaluate this Table and acceptance should be delayed until the ROC stage.
EXPLANATION OF ABSTENTION:
CASPARRO: Pending review of final document.

(Log #610)

3- 110 - (300-50(c)): Reject
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Change second sentence of this section to read:
The taps and splices shall be watertight and protected from mechanical damage and shall be made in accordance with Section 110-14(b).
SUBSTANTIATION: Maintain consistency with rulings set forth in 300-5(e).
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement is redundant since it is already addressed in 110-14(b) and 300-5(e).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #790)

3- 111 - (300-50(e)): Accept in Principle
Note: The Technical Correlating Committee directs the Panel to confirm the Technical Correlating Committee's assumption that the Panel intends that 300-50(e) remain as presently written in the 1999 NEC. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Raceway Seal. Where a raceway ~~enters~~ from an underground system ~~the end~~ terminates within a building or at an enclosure the end shall be sealed with an identified compound so as to ~~prevent~~ minimize the entrance of moisture or gases. ~~or it shall be arranged to prevent moisture from contacting live parts.~~
SUBSTANTIATION: A raceway terminating at an enclosure outside a building should be included since it may have live parts or allow gases to pass into connecting raceways. The word "minimize" is more realistic than "prevent". Explosion-prooof seals do not necessarily prevent passage of gases. The alternative "or arranged to prevent moisture from contacting live parts" voids the requirement of a seal for gases. Section 300-5(g) does not indicate an alternative to sealing and doesn't limit sealing to raceway ends within a building. Requirements in different sections ostensibly for the same safety reasons should correlate, for the benefit of code users.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on proposal 3-61. It is applicable because Part A is general and would apply.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
FORSBERG: See my Explanation of Negative Vote on Proposal 3-61.
GRUBER: See my Explanation of Negative Vote on Proposal 3-61.
PACE: The words "or it shall be arranged to prevent moisture from contacting live parts" should not be deleted. The substantiation states, "The alternative or arranged to prevent moisture from contacting live parts" voids the requirement of a seal for gases". 300-50(e) does not require seals exclusively, but offers seals as one alternative and the arrangement as another. Proper arrangement of raceways is an effective method of protection from moisture contacting live parts. The words "or arranged to prevent moisture from contacting live parts" should be left as they currently exist in the text. The substantiation also makes reference to 300-5(g), which talks about "conduits or raceways through which moisture may contact energized live parts shall be scaled or plugged at either or both ends". I agree with this statement and recognize this situation is different from that of 300-50(e) where the arrangement is such that contact is prevented. Both are correct for the specific situation they address, and they are not in conflict with each other.

ARTICLE 305 — TEMPORARY WIRING

(Log #2095)

3- 112 - (305): Reject
NOTE: The Technical Correlating Committee advises that article placement is the responsibility of the Technical Correlating Committee and accepts the Panel Action.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Move Article 305 to Chapter 7 such as New Article 710 which is now vacated.
SUBSTANTIATION: The problem leaving Article 305 here is that it appears to be in conflict with Section 90-3.
Section 90-3 states the arrangement of the Code.
Chapters 1 through 4 apply generally; chapters 5,6, and 7 apply to special occupancies, special equipment, or other special conditions.
Article 305 would fall under special conditions and does not apply generally to wiring methods.
Article 305 amends Chapters 1 through 4.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has accepted a TCC proposal to relocate Article 305 to a new Article 527. See panel statement on Proposal 3-141.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #793)

3- 113 - (305-1, FPN (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add a fine print note to read as follows:
FPN: It is not the intent of this article to prohibit suitable permanent type wiring methods permitted elsewhere in this code.
SUBSTANTIATION: Editorial. See panel statements for Proposals 3-154 and 3-156 in the 1998 ROP: "It is not the intent of this article to prohibit wiring methods which are elsewhere permitted by the code". Many code users may not be aware of this. In Proposal 3-142 of the 1995 ROP, the panel indicated permanent wiring methods need not be removed per (d) which infers they are not considered as temporary wiring. The proposal merely clarifies that permanent type wiring methods may be used but are subject to the time constraints of Section 305-3.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel disagrees that the proposed FPN would add clarity to the Scope of Article 305. Section 305-2 already states that "Except as specifically modified in this article, all other requirements of this Code for permanent wiring shall apply to temporary wiring installations."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2766)

3- 114 - (305-1-Temporary Wiring (New)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc
RECOMMENDATION: Add definition to read as follows:
Temporary Wiring. Approved wiring for power and lighting during a period of construction, remodeling, maintenance, repair, or demolition and decorative lighting, carnival power and lighting, and similar purposes.
SUBSTANTIATION: Seems like this definition belongs in the NEC. I found this in NFPA 1, 1997 edition of the Fire Prevention Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The scope and time constraints for temporary wiring methods in Article 305 primarily cover the information found in the proposed definition so a further definition is not necessary. Carnivals, fairs, and similar functions are covered in Article 525 which can supplement or modify any of the Chapters 1-4 requirements so the reference to carnivals in the proposed definition is also unnecessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2062)

3- 115 - (305-2, Exception (New)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a new Exception to read as follows:
Exception: Where Temporary Power is supplied during construction for Industrial installations Article 220 shall not apply to the feeder load calculations and the service load capacity shall be continuously monitored.
SUBSTANTIATION: Since the load calculation for sizing feeders are not exempted in this Article many inspectors are not allowing additional loads be connected if the Code load exceeds the capacity the feeder or service.
It appears that the only requirement that must be met is that overcurrent protection be provided to protect the equipment or conductors.
During construction the load on the Temporary Service or Feeder is constantly changing or a lock-out tag-out system is employed, since the contractor can not afford to have the Electrical Power fail.
This Section as written does not give any relief to exceeding Article 220 requirements.
The panel should clarify this Section if the intent is to allow additional loads beyond the requirements Article 220.
Granted the Service shall not be overloaded but are installed with a single main, but if it is not then monitoring should be a must.
These projects may be under construction for longer than 90 days.
Section 305-4 does not help in resolving this issue.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not the intent of Article 305 to allow temporary overloading of services or feeders. The proposal does not state the maximum potential load on a monitored system, only that it be monitored. Section 230-42 provides the maximum permitted ampacity on the service entrance conductors as the load determined by Article 220. Section 230-90(a) further states that the ungrounded service conductors shall be protected by an overcurrent protection device in series with each ungrounded service conductor having a rating or setting not higher than the allowable ampacity of the conductor, with some exceptions. The exceptions allow a higher rating or setting of overcurrent protection device under very significant conditions but never allows the calculated load to be higher than the allowable or actual ampacity of the conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2768)

3- 116 - (305-2(a)(1)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add new text:
"Each branch circuit that supplies receptacles or fixed equipment shall contain a separate equipment grounding conductor where run as an open conductor."
SUBSTANTIATION: This was found in NFPA 241, 1996 edition, Standard for Safeguarding Construction, Alterations, and Demolition Operations. This rule should be added as per Section 90-3 and added to Appendix A.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 305-2(a) already states that the temporary installation must comply with all permanent wiring method requirements unless modified by Article 305. That would include compliance with Article 250. Open wiring has been restricted in use by the 1999 Code as covered in Section 305-4(c), second paragraph, to a very limited application. Messenger supported wiring must comply with Article 250, and specifically with Section 250-86 for connection to the messenger. Additional text is not required to cover grounding requirements for temporary wiring. This should have been submitted to Section 305-4(c) covering branch circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2769)

3- 117 - (305-2(a)(2)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc
RECOMMENDATION: Add new text:
Temporary lights shall be equipped with guards to prevent accidental contact with the bulb, unless the construction of a reflector is used where the bulb is deeply recessed.
SUBSTANTIATION: Extracted text modified, should be in the NEC for 2002 NEC. See NFPA 241, 1996 Edition.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 305-4(f) already requires guards be installed around lamps. No further text is necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2770)

3- 118 - (305-2(a)(3)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add new text as follows:
No extension cords or other temporary wiring shall be permitted within 25 ft of any stored consumer fireworks.
SUBSTANTIATION: See NFPA 1124, 1998 edition. This rule should be mentioned in the 2002 NEC as an extract.
PANEL ACTION: Reject.
PANEL STATEMENT: There doesn't seem to be any technical substantiation to restrict the use of extension cords or temporary wiring from around fireworks. Obviously, arcs and sparks should be minimized but any other restrictions should not be of concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #359)

3- 119 - (305-2(c) (New)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action in Chapter 5. The Technical Correlating Committee notes that by the action on Proposal 15-147, Article 702 will now apply to optional stand-by systems that utilize portable generators.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
(c) GENERATORS. Where temporary power is provided by a portable or vehicle-mounted generator(s) and is connected to the permanent wiring system, a suitable means of transfer shall be provided to prevent the inadvertent interconnection of normal and temporary power sources. Where a motor base inlet type of plug is used to receive power from the generator, all circuit conductors, including the grounded conductor, attached to the inlet plug shall be disconnected while normal power is supplied. The generator(s) shall have an adequate capacity and rating for the supply of all equipment to be operated at one time. The installation shall comply with other applicable provisions of this code.
SUBSTANTIATION: The use of portable generators connected to permanent wiring at services, panelboards, switches, etc., is common as a means to provide temporary power. They are commonly connected to permanent wiring by a flexible cord with permanent connection or by a cord connector body and motor base inlet type of plug on the permanent wiring equipment.
This type of installation is different from the portable and vehicle mounted generators described in the grounding requirements of Section 250-34 and is not covered by Article 702 which relates to permanent installations. There doesn't seem to be specific code requirements to fully cover this type of installation.
The reference to inadvertent interconnection would not prohibit deliberate interconnection of grounded conductors where Code requirements are met. Such interconnection was tacitly approved by Section 230-83 in the 1996 NEC.
The requirement for disconnection of all conductors from an inlet plug complies with Section 410-56(g) and prevents a backfeed potential from the normal system.
While many of these type installations are made by unqualified persons or without the benefit of inspection, the proposal provides guidelines for safety.

PANEL ACTION: Accept in Principle.
In the second sentence of the recommendation, change "motor base" type to "flanged" type inlet of plug.
Revise (c) to read as follows:
"(c) Generators. Where temporary power is provided by a portable or vehicle-mounted generator(s) and is connected to the permanent wiring system, a suitable means of transfer or isolation shall be provided to prevent the inadvertent interconnection of normal and temporary power sources. Where a flanged inlet type of plug is used to receive power from the generator, all circuit conductors, including the grounded conductor, where provided, attached to the inlet plug, shall be disconnected while normal power is supplied. The generator(s) shall have an adequate capacity and rating for the supply of all equipment to be operated at the same time."
PANEL STATEMENT: Industry terminology uses the flanged inlet to describe the type of unit used for connection of cord caps into a system. On smaller portable generators there may not be a grounded conductor. Therefore CMP-3 has added the term "where provided".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #792)

3- 120 - (305-2(c) (New)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action in Chapter 5. The Technical Correlating Committee notes that by the action on Proposal 15-147, Article 702 will now apply to optional stand-by systems that utilize portable generators.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add new paragraph (c) to read as follows:
(c) Generators. Where temporary power is provided by a portable or vehicle-mounted generator(s), and is connected to the permanent wiring system, a suitable means of transfer shall be provided to prevent the inadvertent interconnection of normal and temporary power sources. Where a motor base inlet type of plug is used to receive power from the generator, all circuit conductors, including the grounded conductor, attached to the inlet plug shall be disconnected while normal power is supplied. The generator(s) shall have adequate capacity and rating for the supply of all equipment to be operated at the same time. The installation shall comply with other applicable provisions of this code.
SUBSTANTIATION: The use of portable generators connected to permanent wiring at switches, panelboards, services, etc., is common as a means to provide temporary power. They are usually connected to permanent wiring by a flexible cord with permanent type connections or by a cord connector body and motor base inlet type of plug on the permanent wiring equipment. This type of installation is different than the portable and vehicle-mounted generators described in the grounding requirements of Section 250-34 and is not covered by Article 702 which relates to permanent installations. There doesn't seem to be specific code requirements to fully cover this type installation.
The reference to inadvertent interconnection would not prohibit deliberate interconnection of grounded conductors where code requirements are met. Such interconnection was tacitly approved by Section 230-83 in the 1996 NEC.
The requirement for disconnection of all conductors from an inlet plug would be in compliance with Section 410-56(g) and prevent a backfeed potential to a grounded conductor prong or blade from the normal system.
While many of these type installations are made by unqualified persons, or without the benefit of inspection, the proposal provides guidelines for safety.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-119.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2061)

3- 121 - (305-2(c) (New)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a new section to read as follows:
(c) Load Calculations. Temporary power used for construction purposes shall not be required to comply with Article 220 where the service has a single main service disconnecting means and all feeder overcurrent devices comply with Article 240.
SUBSTANTIATION: Where the service entrance equipment is installed for construction purposes complying with the load calculations of Article 220 will cause the installation of many additional temporary services to be installed. This is caused by the requirement to test many pieces of electrical equipment which is run on and off during the testing cycles for each of the many loads. Relief must be given for large complex electrical installations.
Since the service and feeders are protected as required by Article 240 no electrical shock or fire hazard can occur during this stage. If the overcurrent device trips safety is assured and alerts the installing contractor to tag and lock out loads so that the testing can continue for other equipment or remove the load.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not the intent of Article 305 to allow temporary overloading of services or feeders. Minimum calculations must be provided based upon the usage of the particular services or feeders for the site. These circuits could be installed for temporary heating units at a site or some other known load. Section 230-42 provides the maximum permitted ampacity on the service entrance conductors as the load determined by Article 220. Section 215-2(a) also uses Article 220 for calculating the load on a feeder. Conditions at many sites are not necessarily going to be the best to begin with and to knowingly allow overloads would not be a safe practice.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2767)

3- 122 - (305-2(c)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add new text:
(c) Not Permitted. No bare conductors or earth returns shall be used for the wiring of any temporary circuit.
SUBSTANTIATION: This rule, found in NFPA 70E, should be included in the NEC also for 2002.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation to not allow earth returns is already very adequately covered in Article 250 (Sections 250-2(d) and 250-54) and to require all insulated equipment grounding conductors for a temporary installation has not been provided with any technical substantiation for the suggested change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3776)

3- 123 - (305-3(b)): Reject
SUBMITTER: Ellis A. Schmidt, Schmidts' Tree Farm/Rep. Nat'l Christmas Tree Assn.
RECOMMENDATION: Revise text to read as follows:
305.3(b) 90 Days. Temporary electrical power and lighting installations shall be permitted for a period not to exceed 90 days. ~~for~~ Christmas decorative lighting and similar ~~purposes.~~ seasonal lighting shall be considered as festoon lighting.
SUBSTANTIATION: In the 1993 and previous codes, lighting at Christmas tree lots was treated as festoon lighting. The 1996 code required drastic changes to the wiring systems allowed. The 1999 code allowed some relief but still considers Christmas decorative lighting as temporary lighting under Section 305.3(b). The section requires conductors be supported at intervals not greater than 10 ft and that lamp guards be used. In contrast, festoon lighting requires support at a maximum of 40 ft and does not require lamp guards.
To the best of our knowledge, there were no problems with lighting at Christmas tree lots or other seasonal installations when they were considered as festoon lighting. Outdoor cafes and

automobile lots operate as festoon lighting and it seems consistent to allow seasonal lighting to be installed and operate unde the same code requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: The scope of Article 305 very clearly indicates that the provisions required in Article 305 may be of a class less than would be required for a permanent installation but the provisions for a permanent installation could be utilized in the case of festoon lighting for Christmas tree lots. Section 225-6 would apply to this type of lighting. The festoon lighting used on Christmas tree lots would not be considered to be the Christmas decorative lighting referred to in Section 305-3(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4393)

3- 124 - (305-3(b)): Accept in Principle
Note: The Technical Correlating Committee directs the Panel to review this Proposal in light of the Scope of Article 305. This action will be considered by the Panel as a Public Comment. In addition, the Technical Correlating Committee directs that this Proposal be forwarded to Code-Making Panels 2 and 18 for information.
SUBMITTER: Monte R. Ewing, State of Wisconsin
RECOMMENDATION: Revise text to read as follows:
"90 Days. Temporary electrical power and lighting installations shall be permitted for a period not to exceed 90 days for Christmas decorative lighting and similar purposes where not provided with arc-fault circuit-interrupter protection."
SUBSTANTIATION: Fire inspectors are having a loosing battle trying to limit the use of Christmas lighting in retail establishments to 90 days. Some of these uses never get removed for inspection, they merely unplug the lighting string and call it disconnected. Since we can't get rid of it I feel that this is a possible safe alternative to a 90-day code that is too difficult to enforce.
PANEL ACTION: Accept in Principle.
Change the proposed added phrase to "unless provided with arc-fault circuit-interrupter protection." To read as follows:
"Temporary electrical power and lighting installations shall be permitted for a period not to exceed 90 days for holiday decorative lighting and similar purposes, unless provided with arc-fault circuit-interrupter protection."
PANEL STATEMENT: The amended text provides a more positive text than the one in the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
CASPARRO: This proposal should be rejected.
Section 305-3(b) limits the use of temporary wiring to a period not to exceed 90 days. Section 305-3(d) requires removal of all temporary wiring upon completion of the purpose for which the wiring was installed. The submitter has not provided any technical substantiation as to the use of arc-fault circuit interrupters for this application. The Panel discussion referenced how would inspectors police the holiday lights to be taken down. The Panel discussion referenced how would inspectors police the holiday lights to be taken down. I'm wondering how are they going to police the holiday lights to be protected by arc fault?
KREINER: Adoption of this proposal aimed at allowing seasonal products to be installed for periods exceeding 90 days, was recommended to address the unenforceable nature of these installations. While, if properly employed, are fault circuit interrupters (AFCIs) would certainly make the products safer, it is unlkely there would be sufficient motivation to employ these devices. These devices would add considerable expense to the product or the installation. Since many commercial and residential installations already transcent the 90 day limit without adverse consequences and the proposed change doesn't address the enforceability of the Code requiement, what would motivate the consumer to spend considerable more to AFCI protect the product?
UL 588 - The Standard for Christmas-Tree and Decorative-Lighting Outfits, specifically restricts use of these products to 90 days through a marking on the product or the packaging for the product. Requirements in the Standard, although beefed up to address the length of installation misuse of these products, were developed with the temporary use of the product as a fundamental premise. Therefore, no Listed products exist that have been evaluated for long term product use.
Employing the AFCI protector would certainly begin to address the potential fire hazard associated with the product misuse. However, shock hazard has not been adequately addressed if we make long term installation a normal use. The verbiage of the propoal leads users to believe that employing an AFCI protector somehow eliminates any safety concerns with product misuse.
Lastly, the proposed verbiage is too general to be effective. Five diffenent AFCI configurations have either been developed or theorized. Branch/feeder AFCIs are installed at the origin of the circuit and are intended to protect branch/feeder circuit wiring and additionally provide limited protection for branch circuit extension wiring. Outlet circuit AFCIs are installed at the outlet and are intended to protect cord sets and power supply cords connected to that outlet. Combination AFCIs are intended to protect branch/feeder circuit and extension wiring. Cord AFCIs would plug into a receptacle outlet and would only protect the power supply cord connected to it. Portable AFCIs would plug into a receptacle and would provide multiple outlets intended to protect cord sets plugged into them. To adequately protect seasonal cord sets, an AFCI product designed to protect extension wiring would need to be employed and therfore specified in the code.

(Log #2487)

3- 125 - (305-3(d)): Reject
SUBMITTER: James M. Imlah, City of Hillsboro, OR
RECOMMENDATION: Revise as follows:
(d) Removal. All temporary electrical wiring shall be removed in its entirety, immediately upon competition of construction or purpose for which the wiring was installed.
SUBSTANTIATION: Temporary wiring methods can be of lesser rating than would be normally used for occupancies operating conditions. There are possible hazards from unqualified individuals who may attempt to use, repair, or make adaptations to existing temporary wiring methods. There have been times when the temporary has been used at a later time for normal wiring when it is not suitable for the conditions. If temporary wiring is not removed in its entirety, others may attempt to use it again, not knowing if it is a safe and intact system which can create additional hazards to person(s) or property from fire or shock hazards.
PANEL ACTION: Reject.
PANEL STATEMENT: The extra text being suggested is not necessary since the existing text already requires removal of temporary wiring, not just disconnection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4195)

3- 126 - (305-4(b)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
"Feeders shall be protected as provided in Article 240. They shall originate in an approved distribution center. Conductors shall be permitted within cable assemblies, or within multiconductor cords or cables of a type identified in Table 400-4 for hard usage or extra-hard usage. For the purpose of this section, Type NM and Type NMC cables shall be permitted to be used in any dwelling, building, or structure without any height limitation."
SUBSTANTIATION: When the allowance for single conductors was removed from this subsection and the one following after the construction site electrocution, the intent was clear, no single conductors. However, the final language of this section differs from Section 305-4(c) in that it literally does allow single conductor cord if of the hard or extra-hard usage type. This does not appear to have been the intent. It is becoming a major issue in exhibition halls which must abide by these provisions via Section 518-3(b).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1273)

3- 127 - (305-4(c)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the second paragraph of Section 305-4(c) to read as follows:
Branch circuits installed for the purposes specified in Sections 305-3(b) or (c) shall be permitted to be run as single insulated conductors. Where the wiring is installed in accordance with Section 305-3(b), the voltage to ground shall not exceed 150 volts, the wiring shall not be subject to physical damage, and the conductors shall be supported on insulators at intervals of not more than ~~10 ft (3.05 m)~~ 3.0 m (10 ft); or, for festoon lighting, the conductors shall be arranged so that excessive strain is not transmitted to the lampholders.
SUBSTANTIATION: The proposed revisions are intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2841)

3- 128 - (305-4(c)): Reject
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Revise the second paragraph, second sentence by changing the reference 305-3(b) to 305-3(a).
SUBSTANTIATION: The change proposed for the 1999 cycle was for the long second sentence to cover wiring during the period of construction, not for the wiring supplying Christmas decorative lighting and similar purposes.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation in Proposal 3-162 stated that it was for emergencies, tests, and Christmas lighting and similar purposes. It was not to cover construction sites as stated in this proposal substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4196)

3- 129 - (305-4(c)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
(c) Branch Circuits. All branch circuits shall originate in an approved power outlet or panelboard. Conductors shall be permitted within cable assemblies, or within multiconductor cord or cable of a type identified in Table 400-4 for hard usage or extra-hard usage. All conductors shall be protected as provided in Article 240. For the purposes of this section, Type NM and Type NMC cables shall be permitted to be used in any dwelling, building, or structure without any height limitation.
Exception: Branch circuits installed for the purposes specified in Sections 305-3(b) or (c) shall be permitted to be run as single insulated conductors. Where the wiring is installed in accordance with Section 305-3(b), the voltage to ground shall not exceed 150 volts, the wiring shall not be subject to physical damage, and the conductors shall be supported on insulators at intervals of not more than 10 ft (3.05 m); or, for festoon lighting, the conductors shall be arranged so that excessive strain is not transmitted to the lampholders.

SUBSTANTIATION: This is an exception to the general rule requiring multiconductor cable assemblies. That's what it is, a seasonal use exception for certain circuits under certain conditions, along with the emergencies and tests allowance folded in. The original proposal used the exception format. When the panel changed the typeface (and essentially nothing else) they created what we now have: an orphaned, uncitable second paragraph in conflict with the first paragraph. This is a perfect example of the get rid of exceptions movement run amok.
PANEL ACTION: Accept.
PANEL STATEMENT: Section 3.1.4 of the Style Manual states that while exceptions should be used sparingly, they should be used to convey alternatives or differences to a basic Code rule. In addition, the Style Manual states that exceptions need to be evaluated by the CMP to see if the principle is expressed more clearly as an exception to the rule. The panel believes that the requirement in this Section can best be conveyed by an exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CASPARRO: Section 3.1.4 of the Style Manual states that that while exceptions should be used sparingly, they should be used to convey alternatives or differences to a Basic Code rule. In addition, the Style Manual states that exceptions need t o be evaluated by the CMP to see if the principal is expressed more clearly as an exception to the rule. The Panel believes that the requirement in this section can be best conveyed by an exception.

(Log #2873)

3- 130 - (305-4(d)): Reject
SUBMITTER: Patrick Trujillo, Wrangler Electric
RECOMMENDATION: Delete the following text:
Receptacles shall not be connected to the same ungrounded conductor of multiwire circuits that supply temporary lighting.
Add the following text:
Multiwire branch circuits cannot supply lighting and receptacle loads.

SUBSTANTIATION: Multiwire branch circuits shall be provided with a means to disconnect simultaneously all ungrounded conductors at the power outlet or panelboard where the branch circuit originated. This article would cause lighting loss if an outlet load tripped the breaker.
PANEL ACTION: Reject.
PANEL STATEMENT: The effects of this proposed change would be to require individual (non multi-wire) branch circuits to all lighting and receptacle loads but would allow receptacle loads on the same circuit as the lighting loads. Multiwire branch circuits are all right as long as the receptacles are connected to the other overcurrent protection device on the multiwire branch circuit. If the receptacle circuit is overloaded (the load least likely to be a fixed known load), at least lighting, and thus safety, won't be compromised. The requirement for a simultaneous disconnect is applicable to dwelling use only per 210-4(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #794)

3- 131 - (305-4(g), (i)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(g) Splices. ~~On construction sites a~~ A box or other enclosure shall not be required for splices or junction connections where the circuit conductors are multi-conductor flexible cord or cable assemblies other than metal-armored type. See Sections 110-14(b) and 400-9. A box, conduit body, or terminal fitting having a separately bushed hole for each conductor shall be used wherever a change is made ~~to~~ from a conduit or tubing system or a metal sheathed cable system to a different wiring method.
(i) Termination(s) ~~at Devices.~~ Flexible cords and cables entering enclosures ~~containing devices requiring termination~~ shall be secured to the ~~box~~ enclosure with fittings designed for the purpose.
SUBSTANTIATION: A construction site is probably more hazardous and conducive to physical damage than Christmas decorative lighting sites and other temporary wiring areas, but present wording does not exempt the box requirement for such other sites. Enclosure other than boxes may be used for splices and should be included.
The box exemption should not include metal-armored cable assemblies where grounding continuity is involved. A requirement for a box or other enclosure would then invoke the requirements of (i). The last sentence of (g) is revised for clarity.
Present wording of (i) appears to exempt securement to a box or other enclosure which contains no devices (assuming the intent is not to include wire connectors as devices). While the requirement would relieve strain on conductors terminating at receptacles, switches, circuit breakers, etc., the same strain relief should be provided at conductor splice terminations. This would correlate with Section 400-10.

PANEL ACTION: Accept in Principle in Part.

Revise first sentence of the proposal to read as follows:
"On construction sites, a box shall not be required for splices or junction connections where the circuit conductors are multiconductor cord or cable assemblies provided the equipment grounding continuity is maintained with or without the box."
The remainder of the proposal is rejected.
PANEL STATEMENT: The panel disagrees with the submitter's substantiation that all locations where temporary wiring is used should not require a box for splices where the equipment grounding continuity is maintained. The panel believes that the inclusion of the term "enclosure" is unnecessary. The panel accepts in principle a revision to the third sentence to clarify that the exception for the requirement for a box does not apply to metal armored type cable assemblies. The panel accepts the editorial revisions to the fourth sentence but rejects the revisions to paragraph (i). The panel does not believe that adequate technical substantiation has been provided to warrant changing this requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2147)

3- 132 - (305-4(j)): Reject
Note: The Technical Correlating Committee directs that this Proposal be sent to Code-Making Panel 4 for information. The Technical Correlating Committee notes that the responsibility for support of temporary wiring is under the purview of Code-Making Panel 3. From the Panel Statement, Code-Making Panel 3 would appear to disagree with allowing temporary wiring to be supported to vegetation. Presently, Code-Making Panel 4 does allow vegetation to be used for an outside feeder or branch circuit, where that circuit is installed for Article 305 applications. The Technical Correlating Committee encourages public comment on this issue and directs that Code-Making Panel 3 arrive at a determination as to acceptance of vegetation for support of temporary wiring after reviewing the Public Comments. Should the final determination of Code-Making Panel 3 be that vegetation is not permitted, the Technical Correlating Committee will direct that Code-Making Panel 4 take action to delete the permission in 225-26.
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add the following sentence to this section:
"The support may be attached either to vegetation such as trees, or to temporary or permanent structures which are structurally sound."
SUBSTANTIATION: Section 225-56, exception; allows attaching to vegetation "in accordance with Article 305", however, there is no permission for attaching to vegetation in Article 305. This proposal rectifies that situation. Attaching temporary circuits to trees is a common practice and is often the safest installation of other alternatives.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes the submitter's Code reference should be to Section 225-26, Exception. The panel disagrees that vegetation should be permitted as a support means for overhead cables assemblies or flexible cords and cables. The panel is unaware of any current provisions in Article 305 which prohibit the attachment to temporary or permanent structures provided the provisions of Section 305-4(j) are met. This section just addresses the support of cable assemblies and flexible cords to protect them from physical damage. In some cases supporting them to vegetation may actually be more harmful to the cable. For example, in areas where there are high wind capabilities, attaching the cables or cords to vegetation may subject them to insulation and jacket damage.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
PACE: I agree with the Panel in that 305-4(j) does not prohibit use of vegetation provided the provisions of 305-4(j) are met. I also feel the reference to 305 in 225-26, Exception, should be removed.

(Log #795)

3- 133 - (305-4(j), Exception (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception: Flexible cords approved for hard usage shall be permitted to be run on the ground or floor where they are not likely to be damaged and where there is no available structure to provide support, or where they are suitably protected against damage.
SUBSTANTIATION: This proposal simply reflects the real world use, and provides for the period when there is no available structure to provide support or where no actual structure is erected. It allows for judgement and is in line with the panel statement for Comment 3-149 in the 1998 ROC that the text of Section 305-4(h) does not prohibit cords run on the floor provided they are adequately protected. It would be helpful to Code users to be aware of that. Protection can be afforded by location or physical means. Section 525-13(f) doesn't prohibit flexible cords run on the ground and only requires physical protection where accessible to the public.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no restriction on the use of hard usage flexible cords where they are not likely to be damaged so the exception is not necessary. If they are temporarily run on the floor and not subject to physical abuse, they are supported by the floor and no further support is necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
CASPARRO: Section 305-4(h) requires that flexible cords and cables be protected from physical damage. I disagree with the Panel Statement that cords can be supported by the floor. It is difficult to understand how laying conductors on the floor would not be subjected to physical damage. OSHA 1926.405(a)(2)(ii)(B) prohibits branch circuit conductors from being installed on the floor.

(Log #1447)

3- 134 - (305-4(k) (New)): Reject
Note: See the Technical Correlating Committee action on Proposal 3-132.
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Add the following new section:
(k) Outdoor Support. Vegetation such as trees shall be permitted to be used for support of temporary overhead service drop conductors and feeders.
SUBSTANTIATION: This proposal is to make legal a long standing practice in the industry of using existing trees as support in order to get the cables off from the ground. It would be an unnecessary expense to require us to set utility poles for temporary work. This provision is already in the exception of Section 225-26, and it should be here to avoid a conflict.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and panel statement on Proposal 3-132.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2819)

3- 135 - (305-6): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
RECOMMENDATION: Add:
(c) Electrocution-proof cord and plug grounding system. Receptacles of all voltages shall be protected in accordance with (1) and (2).
(1) Cords and cordsets shall be redundantly grounded, with two insulated copper conductors. The grounding conductors shall be installed in cords and cordsets with the branch circuit conductors supplying the unfixed equipment. Attachment plugs and connector bodies shall be hospital grade type.
(2) Grounding poles. Cord connectors, attachment plug, and the internal terminals of multiple outlet boxes shall be provided with two separate wiring sites at the grounding pole. The cord connectors, attachment plugs, and internal wiring terminals shall be designed so that only the grounding pole can be wired with two conductors.

This proposal is related to proposals 250-114 and 410-58 seeking the adoption of an electrocution-proof and fire-proof cord and plug connected grounding system for all areas of our nation.
SUBSTANTIATION: The April 1995 issue of the IBEW Journal reported that 106 workers were electrocuted on construction sites in 1992.
They died despite the use of GFCIs and elaborate assured grounding programs adopted by our nation in the late 1970's. It was mandated by OSHA because 70 workers died on construction sites during a period from 1970 to 1975.
The program, despite the use of qualified and well supervised personnel, failed miserably in its attempt to reduce, or eliminate, the average of 14 electrocutions that occurred each year during that period. Instead the annual rate of electrocutions has increased 8 fold, from 14 deaths to 109.
The article went on to state that painful shock, from as little as 3 milliamperes, has also caused many indirect serious injuries.
The construction workers will continue to die, or suffer serious indirect injury from shock, unless NEMA and the NFPA corrects the hazardous design defects in all line and extension cords. (See section/paragraph 305-6(a)).
The program failed because no amount of testing can assure a single, undersized, grounding conductor will not fail even hours of testing.
ONLY TWO CONDUCTOR REDUNDANCY CAN ASSURE THE GROUNDING CONDUCTOR WILL NOT OPEN PRIOR TO THE CIRCUIT CONDUCTORS.
And no GFCI or testing program can assure against line drop or provide the compensation required in the code for line drop.
ONLY TWO CONDUCTOR GROUNDING REDUNDANCY WILL PROVIDE THE NECESSARY COMPENSATION TO PREVENT THE LINE DROP RESPONSIBLE FOR THE 3 MILLIAMPERE SHOCKS ALLUDED TO BY OSHA.
And using qualified, and well supervised personnel, is no assurance that wiring errors cannot be made. A patient was electrocuted March 15, 1956 by qualified personnel.
A qualified electrician, his qualified supervisor, a qualified electrical inspector, a qualified factory worker, and his qualified supervisor, all contributed to the electrocution.
Many times, I have caught myself wiring cords improperly. And I've repaired many line and extension cords with used components where the green paint, identifying the grounding terminal, was rusted, or worn out.
To prevent any further electrocutions, especially after dealing with the homicide division, I immediately replaced three conductor cords with four conductor cords to provide an electrocution-proof grounding system for all patients.
Here is an excellent opportunity to try out an electrocution-proof grounding system on a small scale. Contractors will welcome a fool-proof method of providing safety without the costly testing program and the use of GFCIs.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel finds the technical substantiation to support such a major change to be inadequate.
Redundant (two conductor) grounding does not make a cord and plug system "electrocution-proof".
The submitter provides no evidence that the cause of the mentioned electrocutions are related to wiring or grounding problems involving cord and plug sets or connected equipment. Other causes such as personnel error or other kinds of equipment could have been the cause.
Redundancy of grounding conductors is not the only effective way to achieve enhanced protection against electric shock. Use of GFCIs, double insulation, and assured equipment grounding programs are other ways.
GFCI protection provides protection even if the equipment grounding conductor is lost in the branch circuit or at the equipment. Redundancy of grounding conductors will not make GFCI's trip faster, or at a lesser current value.
The construction requirements of flexible cord are not within the jurisdiction of CMP-3. Article 400 is under the jurisdiction of CMP-6.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2253)

3- 136 - (305-6(a)): Reject
SUBMITTER: Tim Quigley, Rome Electric Corp.
RECOMMENDATION: Revise second sentence text as follows:
"If a receptacle(s) ... shall be provided by the user."
SUBSTANTIATION: On large construction projects when temporary power is removed by an electrical contractor under the owners request they expect us to provide the ground-fault circuit-interrupter protection.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not the purview of CMP-3 to dictate who provides the GFCI protection, only that the protection shall be provided.
The last sentence of this section allows cord sets or devices incorporating GFCI protection and identified for portable use.
There are many times where power has been switched from temporary to permanent power and portable devices must be used since trying to GFCI protect all permanently installed devices during the remainder of construction, remodel, or repair would be extremely difficult.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3326)

3- 137 - (305-6(a)): Reject
SUBMITTER: Edward A. Schiff, Technology Research Corp.
RECOMMENDATION: Revise 1st sentence of 305-6(a) to read as follows:
(a) Receptacle Outlets. All 125-volt 250 volts or less, single phase, 15-, 20-, and 30-ampere receptacle outlets that are not a part of the permanent wiring of the building or structure and that are in use by personnel shall have approved ground-fault circuit interrupter protection for personnel with open neutral protection.
SUBSTANTIATION: The same hazard exists on 250 volt applications. Although the available power at most new construction sites is 125-volt, this article applies to remodeling, maintenance, and repair, where 250 volt power is frequently utilized. UL listed products are available from multiple manufacturers for 250 volt applications.
The addition of the word approved will eliminate the use of nontested/certified field constructed units (often made by nonqualified personnel). Although the majority of inspectors do not want these units, some feel the lack of clarity of the code allows for them. This also matches the wording in Part 1926 Subpart K of OSHA's construction appendix on safety and health regulations.
The clarification on providing open neutral protection matches with UL standard 943A requirement for portable GFCIs. If the input neutral opens due to a broken conductor or loose connection (an event which occurs in temporary wiring situations), the protective device circuitry would not receive power and therefore would not operate to provide protection from shock or electrocution. Open neutral protection consists of the opening of the line contacts of the protective device, thus interrupting the output potential, unless the circuit interrupter has sufficient input power to provide shock hazard protection. Since this article deals with temporary wiring, clearly defining this requirement will eliminate any ambiguity in the interpretation of this safety requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 305-6(b) already requires receptacles other than 15-, 20-, and 30-amp, 125-volt receptacles, to be either protected by GFCIs or by a written assured equipment grounding conductor program. This would include those receptacles that are being operated at 250-volts so it is not necessary to add this requirement to (a). It is not necessary to require approval of GFCI protection devices since Section 110-2 already requires approval of all electrical conductors and equipment. The open neutral protection should stay as a product standard requirement since UL 943A only requires this protection for portable GFCIs and the technology may only be able to apply to portable devices.
The submitter did not provide data to support such a substantial change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #796)

3- 138 - (305-6(a) Exception No. 1): Accept

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for action. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete Exception No. 1.

SUBSTANTIATION: Editorial. Section 250-34 does not permit a 2-wire single-phase portable or vehicle mounted generator to have all circuit conductors insulated from the frame if system grounding is required, which is the case where supplying the receptacles of (a).

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 1

ABSTENTION: 1

EXPLANATION OF NEGATIVE:

HORMAN: This proposal should be rejected. The submitter did not provide sufficient technical substantiation to justify the deletion of 305-6(a) Exception No. 1.

EXPLANATION OF ABSTENTION:

CASPARRO: Pending Task Group recommendation.

(Log #CP302)

3- 138a - (305-6(a) Exception No. 2): Accept

SUBMITTER: CMP 3

RECOMMENDATION: Delete 305-6(a) Exception No. 2 in its entirety.

SUBSTANTIATION: The sufficent availablity of GFCI protection and proven safety record eliminates the need for this exception.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

ANDREWS: This proposal should be rejected. Although the use of the assured equipment grounding conductor program (AEGCP) is dwindling, there are still some applications in industry where the program is justified for 125 volt, 15-, 20-, and 30-ampere receptacle outlets that are not part of the permanent wiring of a building and are used for temporary wiring purposes. One example is use in classified hazardous areas.

There was no substantiation provided by the submitter to prove that the program is inadequate when performed properly. And, there was no documentation to prove that the program was not being properly performed.

PACE: The Panel does not provide proper substantiation to delete this exception. A proven safety record for one method of protection does not subsequently disprove the safety record of another. In industrial establishments, reliability of electrical circuits is a very critical part of safely operating the facility. Thus, both safety and reliability must be maximized. Nuisance trips of GFCI circuits can create additional safety hazards. Examples of this are loss of power to magnetic-based drill operations where loss of power would cause the drill(s) to fall, loss of power to confined-space entry lighting and associated life protective monitoring equipment, and loss of power to other forms of lighting used for the safe egress for personnel. These require the highest degree of reliability to ensure personnel safety.

This exception was originally included to allow industrial establishments the choice, under controlled conditions, of using the assured equipment grounding conductor program (AEGCP), in order to maximize reliability without compromising safety. OSHA 29CFR1926.404 and NEC 305-6 recognize the AEGCP as an acceptable method of personnel protection and therefore Exception 2, under NEC 305-6(a) should be retained.

The issues surfaced here involve enforcement of the rule, not the validity of the rule itself. No matter how many examples there are of violation, lack of compliance with the AEGCP requirements and lack of enforcement of the requirements does not change the fact that if done correctly, the AEGCP is effective in providing protection for personnel. The GFCI method is also not affective in protecting personnel if its requirements are not enforced. If the requirements of the AEGCP are not being enforced, certainly the authority having jurisdiction should make adjustments necessary to ensure protection for personnel, just as they should for any other safety concern. This alternative should not be removed as an approved method for those who apply and administer the AEGCP correctly.

COMMENT ON AFFIRMATIVE:

CASPARRO: This was a proposal submitted by CMP-3 at the proposal stage. It was overwhelmingly supported by CMP-3 at the Panel Meeting.

I believe the Panel recognized that the removal of this exception was long overdue. As indicated in the Panel substantiation, the sufficient availability and proven safety record of GFCI protection eliminates the need for this exception.

(Log #4006)

3- 139 - (305-6(a) Exception No. 2): Reject

SUBMITTER: Robert B. Alexander, Fluor Daniel

RECOMMENDATION: Delete: "In industrial establishments only,"

SUBSTANTIATION: The origin of the Assured Equipment Grounding Conductor Program (AEGCP) is OSHA 29CFR1926.404(b)(1)(iii) which is a construction safety document; but, under the current wording of 2-2.4.3, [because of the current wording of 305(6)(a) Exception No. 2] the original beneficiaries of AEGCP, are now excluded.

This situation was caused by the combination of two unrelated proposals to the 1996 NEC, for the parallel Section 305-6(b) to (1) [3-151] expand the benefits of ground fault protection in temporary wiring and (2) [3-160] eliminate AEGCP altogether. While CMP 3 stated they accepted the second proposal "in principle" they actually rejected it because they left AEGCP in the NEC.

It was the broad consensus of the 70E Technical Committee that AEGCP is a safe and effective system. Any user capable of implementing the program should be permitted to use it.

Additional Substantiation:

Note in my affirmative comment to the original ballot circulation to Comment 70E-5, I agreed that 70E could not properly contradict the NEC. However, as I also pointed out in the comment, a motion to specifically reject the substantiation statement; "It was the broad consensus of the 70E Technical Committee that AEGCP is a safe and effective system." failed for lack of a second. My affirmative comment was intentionally included in the original circulation of the ballot to allow any other committee member to route this. I further note that none did.

I have had the opportunity to visit four construction sites as a consultant since the initial 70E issue arose. I intended to ask three questions: (1) Do you use GFCI or AEGCP? (2) If GFCI, do you test them regularly? (3) Do you have a record of those tests? I never needed to ask question 3, since not one site regularly tested their GFCIs. All four sites used 42 circuit GFCI panels. Two sites had a single panel, one had two the other had four. I found one panel wired improperly, and it was repaired immediately. I found two GFCIs that didn't work properly and they were replaced.

While requiring testing is certainly enforceable through 110-3(b), most users are simply unaware of product standards. And there is still no requirement to document it even if they do test regularly.

I believe both systems are functionally safe. Any user capable of appropriate installation and maintenance should be allowed to use either or both systems.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Over the course of the past several Code cycles, CMP 3 has reaffirmed its position that GFCI protection affords a higher level of protection for all workers. OSHA inspection & citation data clearly indicates the many problems associated with the lack of implementation of the ASEGCP. This exception was added only for industrial establishments because it was understood that they have better control over and better implementation of this program at their facilities than is commonly encountered on construction sites.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

CASPARRO: The attempt to remove "In Industrial Establishments Only," from this exception would have been a major step backwards for worker safety. It would have opened up the door for assured tape color change for temporary wiring.

(Log #2821)

3- 140 - (305-6(a) Exception No. 3 (New)): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
RECOMMENDATION: Add: Exception No. 3. In all industrial establishments, a self monitoring, redundantly grounded, electrocution-proof, grounding system shall be permitted to be utilized for all outlets.

This proposal is related to proposals 250-114 and 410-58 seeking the adoption of an electrocution-proof and fireproof and plug connected grounding system for all areas of our nation.
SUBSTANTIATION:

The April 1995 issue of the IBEW Journal reported that 106 workers were electrocuted on construction sites in 1992. They died despite the use of GFCIs and elaborate assured grounding programs adopted by our nation in the late 1970's. It was mandated by OSHA because 70 workers died on construction sites during a period from 1970 to 1975. The program, despite the use of qualified and well supervised personnel, failed miserably in its attempt to reduce, or eliminate, the average of 14 electrocutions that occurred each year during that period. Instead the annual rate of electrocutions has increased 8 fold, from 14 deaths to 109. The article went on to state that painful shock, from as little as 3 milliamperes, has also caused many indirect serious injuries. The construction workers will continue to die, or suffer serious indirect injury from shock, unless NEMA and NFPA corrects the hazardous design defects in all line and extension cords. The adoption of my proposal will prevent the many electrocutions and serious injuries that occur in all in other workplaces each year without the need for ineffective assured grounding programs or GFCIs. No amount of testing can assure the integrity of the grounding conductor, especially undersized ones. Only redundancy, resorted to by every responsible engineer whenever lives are at stake, can provide true grounding assurance. And only a second grounding conductor can prevent the line drop that is causing the 3 milliampere shocks responsible for serious injuries in the workplace. And the 109 deaths are proof that even qualified and well supervised personnel can make mistakes. Mistakes caused the electrocution of a patient on my watch on March 15, 1956. A qualified, well supervised, electrician, installed an outlet with reversed black and white conductors. The patient died because a qualified, and well supervised, factory worker, wired a replacement plug on a Bovie surgical unit with reversed green and white conductors.

The patient died because a qualified electrical inspector inspected and Okayed the installation.

The patient died because qualified personnel in the Underwriters Laboratories approved a grounding system for our nation whereby 4 or 6 ways to wire cord components can electrocute or cause fiery deaths.

My proposal will prevent shock, or electrocutions due to wiring errors.

My proposal, if adopted by our nation, will also eliminate the 600 electrocutions that occur in homes, as reported in the same IBEW Journal. And my cord standard will also reduce, or eliminate, the 5000 covered up electrocutions that occur in hospitals each year, as reported by Ralph Nader in the June 18, 1986 issue of the Star.

It will minimize, or eliminate, relying on, after the fact, GFCIs with tripping currents that can cause serious, indirect, injuries, and possible cardiac arrest.

The proposal provides a standard that will make all line and extension cords electrocution-proof, and fire-proof, by correcting their hazardous design defects.

The standard requires no physical component changes except to provide a second, no cost, wiring site at the gorund pole.

The extra conductor in all cords is the only cost, a small price to pay to eliminate the following design defects:

1ST DESIGN DEFECT: This defect defies conventional wisdom and practice. Instead of the redundancy resorted to by every other federal agency whenever lives are at stake, the protective equipment grounding conductor used on practically all electrical devices has been reduced almost 66%.

This reduction is a clear violation of the electrical code itself. Table 250-122 distinctly states that equipment grounding shall be provided with a No. 12, 20 ampacity, copper conductor for 20 ampere branch circuits, not the No. 18, 7 ampacity, conductor that powers practically all electrical devices. Reduction of copper size, and durability, increases the chances of protective grounding loss.

Compounding the chances of a discontinuous, or missing grounding path, is the extensive use of lengthy, interconnected, extension cords with protective equipment grounding conductors also sized less than required in table 250-122(a) of the NEC.

The same design defect can cause a voltage drop in the protective equipment grounding conductor, during minor ground faults, insufficient enough to trip GFCIs but painful enough to cause the indirect serious injuries on construction sites as mentioned above.

Compounding the chances of line drop is the total lack of compensation for voltage drop as required in article 250-122(b) of the NEC. Even properly sized equipment grounding conductors may require such adjustment. The assured grounding programs do not address this major cause of serious injury from painful shock.

Two grounding conductors will provide the compensation required to prevent equipment grounding voltage drop in lengthy, interconnected, extension cords. Only two conductor grounding redundancy will provide the grounding assurance OSHA is seeking. Qualified personnel and existing cords cannot compensate for line drop in lengthy extension cords.

2ND DESIGN DEFECT: This defect results from sizing cord, and cordset, equipment grounding conductors the same as the circuit conductors (3#18, 3#16, 3#14, etc). The equipment grounding conductor must, at all times, assure that it will withstand fault currents for the length of time it takes fuses or circuit breakers to clear a fault. A 20 ampere circuit breaker, for example, can cause spite currents that could burn open the equipment grounding conductor, instead of the circuit conductor, leaving the metal exposed parts of an appliance energized.

Two equipment grounding conductors in all cords, regardless of wire size, will assure that the circuit conductors will always burn open first during massive ground faults.

3RD DESIGN DEFECT: This cord design defect permits miswired devices to operate safely until they are plugged into an outlet, or extension cord, with reversed polarity.

The drill in figure 1 operates safely when used with a properly wired outlet, or extension cord, even though improperly wired with reversed green and white conductors.

However, the moment the drill is plugged into an outlet, or extension cord, wired with reversed polarity, the case of the drill becomes energized with a full 120 volt potential, figure 2.

Figure 3 illustrates how my electrocution-proof grounding system will correct this "Russian Roulette" type hazard even though the outlet remains improperly wired.

The two grounding conductors needed to correct the two pervious design defects will make possible a wiring scheme that absolutely prevents miswired cords from causing shock or electrocution regardless of whether, or not, a wall outlet, or extension cord remains wired with reversed polarity.

If all cord components, and device terminals, are designed according to the specification in my proposal, there is no possible way to miswire a cord without at least one of the three grounded conductors (two green and one white) attached to the grounding pole of components and exposed metal parts of electrical devices or extension cords.

Acceptance of my proposal will eliminate the cord design defect that permits wiring errors to shock or electrocute.

4TH DESIGN DEFECT: No provision is provided in existing cords to activate branch circuit ground fault current interrupters when miswiring energizes the metal parts of electrical devices. A ground fault causing current to flow through people cannot trip circuit breakers or blow fuses.

Accepting my proposal will assure that an equipment grounding conductor is ALWAYS attached to the metal exposed parts of electrical devices, despite wiring errors, to provide the necessary impedance required to activate branch circuit ground fault current interrupters.

The adoption of my proposal will convert branch circuit ground fault current interrupters into people GFCIs whenever miswiring causes metal parts of electrical devices to become energized; a much safer method since workers need not sustain the severe shock required to trip people GFCIs; shock that can cause serious indirect injuries or electrocution. See how the second grounded conductor in figure 3 prevents shock, or electrocution, providing the low resistance path required to activate branch circuit ground fault devices.

5TH DESIGN DEFECT: No provision is provided in existing cords to prevent miswiring from causing metal raceways to carry current. A heater, or extension cord, miswired with reversed green and white conductors, can cause raceway heating, or arcing, at metal raceway connections sufficient enough to cause "unseen" raging fires inside walls; fires that cannot be detected by

smoke alarms until too late to save occupants; fires that flashover into rooms and consume workers, or firemen, within seconds.

If my proposal is accepted, the second grounding conductor will prevent raging "unseen" fires inside of walls by shunting metal raceway current back to the proper circuit conductor.

Current flowing through metal raceways, instead of the white conductor, causes the ground poles of all downstream outlets to become energized, a hazard also eliminated by the second grounding conductor and the properly designed cord components I propose.

6TH DESIGN DEFECT: Molded cords have similarly colored branch circuit conductors instead of the usual black and white ones, a violation of the National Electrical Code. When they are damaged, and require component replacements, there is no way to prevent them from being wired with reversed polarity. Even manufacturers, despite inspection by qualified personnel, are shipping extension cords with reversed polarity. I can corroborate this by producing such an extension cord, inadvertently wired with reversed green and white conductors.

Accepting my proposal will permit the SAFE repair of molded cords even if all conductors are colored the same.

7TH DESIGN DEFECT: Providing only one equipment grounding conductor for up to 6 extension outlets. Accepting my proposal will ameliorate this defect.

8TH DESIGN DEFECT: Molded cord components cannot be examined or repaired at the strain relief. Accepting my proposal will provide true assurance that the protective equipment grounding conductors will never open prior to the circuit conductors.

9TH DESIGN DEFECT: The lack of wiring safeguards. Experienced electricians, including myself, have admitted catching themselves wiring outlets and cords improperly. If four of six ways to wire an attachment plug can cause an immediate or future "Russian Roulette" type of electrocution, it becomes imperative that they be designed to at least assure the proper attachment of the equipment grounding conductor.

Accepting my proposal will absolutely assure that the grounding pole of cord components and the internal wiring terminals of electrical devices always has a grounded conductor attached to it regardless of any amount of wiring errors.

It will also assure that the ground pole of cord components are always wired with two green conductors. A green and white, green and black, or black and white conductor attached to the ground pole clamp will be immediately noticed and corrected.

Conclusion: 109 workers were electrocuted on construction sites during 1992. Many other workers were seriously injured from currents as small as 3 milliamperes. And they could also become seriously injured from the .5 milliamperes required to trip GFCIs. They died, or were seriously injured, despite extensive assured grounding programs initiated by OSHA and conducted by well supervised, qualified workers.

They will continue to die, or become seriously injured, unless the above 9 design defects in cords are corrected. This proposal relates only to extension cords as they represent the greatest hazard to workers, especially when interconnected.

NOTE: Supporting material is available upon request at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: No definition or equipment specification is provided to completely describe the term "self monitoring, redundantly grounded, electrocution-proof grounding system".

A double redundant ground does not make a cord set "electrocution-proof ". Receptacle cord caps are very well marked to indicate which conductors must be terminated on each terminal. But, adding an additional equipment grounding conductor to terminate at the cap will not keep someone from wiring the cap wrong if they are not paying attention to the installation.

The submitter does not break down the deaths as they relate to cord and plug sets versus other causes.

The requirement in this proposal for providing redundant grounding in all cords used for all outlets in an industrial facility would not assure that any damage to the equipment grounding system in the cord and plug would not involve both equipment grounding conductors.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

ARTICLE 310 — CONDUCTORS FOR GENERAL WIRING

(Log #1677)

6- 4 - (310): Reject

SUBMITTER: Terry L. Carlson, Nebraska State Electrical Board

RECOMMENDATION: Article 310, Conductors For General Wiring

New: Article 310, Part A

New: Article 310, Part B

Add the following "A. General Requirements" after the title to Article 310 as follows:

Article 310 - Conductors for General Wiring

A. General Requirements

Add the following "B. Conduit Fill Tables" at the end of the current Article 310 as follows:

B. Conduit Fill Tables

Move the "Conduit and Tubing Fill Tables for Conductors and Fixture Wires of the Same Size" from Appendix C to new Part B of Article 310 as follows:

B. Conduit Fill Tables

Conduit and Tubing Fill Tables for Conductors and Fixture Wires of the Same Size.

SUBSTANTIATION: It is common knowledge in the industry that the Appendix to the Code is for informational purposes only, and it is not part of the Code requirements.

Conduit fill tables should be part of the requirements of the Code, and not located as an informational recommendation in the Code appendix.

PANEL ACTION: Reject.

PANEL STATEMENT: Conduit fill requirements are defined in Chapter 9, which is an enforceable part of the Code in accordance with 90-3. Conduit fill tables in Appendix C are based on these requirements for specific set of design requirements. Other design possibilities, where an equipment grounding conductor may be bare, are not covered by Appendix C.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

Note: The sequence nos. 6-5 and 6-6 have been moved to follow 6-222.

(Log #1058)

6- 7 - (310-3): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise Article 310 as follows:

310-3 - change "No. 8" to "8 AWG"

310-4 - change "No. 1/0" to "1/0 AWG"

310-4, Exception No. 2 - change "No. 1/0" to "1/0 AWG"

310-4, Exception No. 3 - change "No. 1/0" to "1/0 AWG"

310-4, Exception No. 4 - change "No. 2" to "2 AWG"

Table 310-13, Note 4 - change "Nos. 14-12" to "14-12 AWG"

310-14 - change:

"No. 8, 10, and 12" to "8, 10, and 12 AWG"

"No. 8" to "8 AWG"

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel does not have knowledge of the phrase "specifically authorized for use with the SI system of units in North America" in substantiation. The panel also recognizes that the present industry practice is to use AWG or kcmil designators.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #800)

6- 8 - (310-4): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Conductors in Parallel. Aluminum, copper-clad aluminum, or copper conductors of size No. 1/0 and larger, comprising each phase of ac circuits, each polarity of dc circuits, and each neutral or grounded circuit conductor shall be permitted to be connected in parallel (electrically joined at both ends to form the equivalent of a single conductor).
Exception No. 1 through 3: No change.
Exception No. 4: Under engineering supervision, grounded neutral conductors ~~in sizes No. 2 and larger~~ shall be permitted to be run in parallel ~~for~~ with an existing ~~installation~~ No. 2 or No. 1 neutral conductor of a three-phase 4-wire wye-connected circuit where overheating of the existing neutral occurs due to high content of triplen harmonic currents.
FPN: Delete.
The parallel conductors ~~in~~ comprising each phase, polarity, neutral, or grounded conductor shall:
(1) No change.
(2) No change.
(3) No change.
(4) No change.
(5) No change.
(6) Be interconnected at the point of connection of tap conductors at each load supply point except as otherwise permitted in Section 450-6(a)(4)(b) for transformer secondary ties.
Where run in separate raceways, ~~or~~ cables, auxiliary gutters, cablebus, cable trays or other enclosures, the raceways, ~~or~~ cables, auxiliary gutters, cablebus framework, cable trays, or other enclosures for alternating-current circuits shall have the same physical characteristics. (remainder - no change)
SUBSTANTIATION: The word "phase" infers alternating-current to many. The word "polarity" should not be confusing to trained persons, as the proposed first paragraph states "polarity of dc circuits". Many of the requirements of this section should be clearly indicated to apply to dc circuits. Direct-current circuits are amenable to paralleling (see Articles 668, 669, e.g.)
The word "equivalent" is editorial; two or more conductors don't literally make one conductor.
Exception No. 4 is revised to avoid any confusion that existing No. 1/0 or larger conductors need engineering supervision in order to parallel another No. 1/0 or larger conductor. Present wording permits this exception to apply to single-phase and dc circuits (or any circuit). I believe it was intended to apply to three-phase 4-wire wye-connected circuits. The fine print note is incorporated into the rule as a condition, since it is presently information which doesn't impose a condition for utilizing Exception No. 4.
Condition (6) is proposed since there is no similar requirement in this section. Where paralleled conductors are run in wireways and auxiliary gutters, or raceways or cables with intermediate pull or junction boxes (common to all runs or in each individual run) it is easy to tap one set of paralleled conductors and upset current balance of the paralleled conductors. Section 450-6(a)(4)(a) has a similar requirement for paralleled tie conductors.
The requirement for physical characteristics should be extended to other metal enclosures where inductive reactance may be a factor, which are not encompassed by "raceways or cables". Additionally, there does not seem to be a reason not to limit this requirement to ac circuits. Section 300-20 is limited to alternating-current.
PANEL ACTION: Reject.
PANEL STATEMENT: The present text of 310-4 is adequate. Paralleling of conductors is permitted for both ac and dc circuits. Word "form" in "....to form a single conductor" is self explanatory that two or more conductors do not make one conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2179)

6- 9 - (310-4): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
~~Aluminum, copper-clad aluminum, or copper~~ conductors of size No. 1/0 and larger,...
SUBSTANTIATION: The deleted text of conductor materials is redundant and not needed. They are stated in 310-2(b) and apply to "this article... unless otherwise specified. There is nothing new specified in this section; therefore, it does not need to be repeated.
PANEL ACTION: Reject.
PANEL STATEMENT: Deletion of materials could create a conflict with 110-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2191)

6- 10 - (310-4): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise fifth paragraph as follows:
Where conductors are used in parallel, space in enclosures shall comply with applicable provisions of Articles 370 and 373. ~~be given consideration (see Articles 370 and 373).~~
SUBSTANTIATION: The paragraph, as originally written is unenforceable. The NEC Style Manual 3.2.1 states, "The NEC shall not contain references or requirements that are unenforceable or vague," and the word "consideration" is listed as a "possibly unenforceable term." It is rewritten to be enforceable. It is also rewritten to remove the reference which should have been a fine print note the way it was written.
PANEL ACTION: Accept in Principle.
Delete the fifth paragraph.
PANEL STATEMENT: Delete the fifth paragraph because it is a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2334)

6- 11 - (310-4 Exception No. 5 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add the following Exception:
Exception No. 5: For non-linear loads, only on 3 phase wye systems, grounded conductors smaller than 1/0 shall be permitted to run in parallel when run to the following equipment/systems, provided the ampacity of a single conductor will not be exceeded if one or more of the parallel conductors become inadvertently disconnected.
(a) Branch circuits to modular furniture/office systems.
(b) Transformer secondaries.
SUBSTANTIATION: Substantiation for (a)
(a) There are a number of office furniture manufacturers that produce systems utilizing parallel grounded conductors. An example of this would be on a 20 ampere circuit, the manufacturer has run 2 No. 12 conductors for the grounded conductor of the multiwire circuit. These manufacturers are doing this to address the possibility of harmonics that may be encountered in the office environment. Presently this section will not permit this installation even though the single conductor is fully sized for the code loads. This article is in fact penalizing designers, manufacturers and installers for providing a superior system.
Substantiation for (b)
(b) A designer is not permitted to run multiple grounded conductors in parallel (sizes smaller than 1/0) from transformers were harmonics are present. This is true even if a single conductor is sized to carry the calculated load per chapter 2 of the NEC. Again we are penalizing the designers by not allowing this installation. It is permissible for the designer to increase the size of the conductors to address the non-linear loads, but not double the conductors. The NEC is not supposed to be a design manual, but here it seems to be mandating a particular design.
PANEL ACTION: Reject.

PANEL STATEMENT: Size requirement for conductors in parallel is a well established fact in the Code. It is not permissible to increase the size of the grounded conductors to address the non-linear loads by simply adding the conductors if they are smaller than the permissible size for the purpose.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2875)

6- 12 - (Table 310-5): Reject
SUBMITTER: Greg Stinebeck, Colorado Dept. of Transportation
RECOMMENDATION: Revise text to read as follows:
0 through 2000 volts; change minimum conductor size from #14 copper to #12 copper.
SUBSTANTIATION: A lot of the residential circuits already require #12 copper. The price difference will soon be paid out through energy savings, and upgrade to 20 amp circuits in old work would be a lot cheaper.
PANEL ACTION: Reject.
PANEL STATEMENT: The Code does not restrict the use of larger conductors for energy savings.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
ZIMNOCH: The Copper Development Association has substantiation that increasing conductor size enhances safety in high temperature environments like residential attics.

(Log #798)

6- 13 - (310-5 Exception No. 2): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception No. 2: ~~Fixture~~ For fixture wire ~~as permitted by Section 410-24, FPN~~ the minimum size shall not be smaller than No. 18.
SUBSTANTIATION: Editorial. A fine print note is for information and not enforceable, per Section 90-5(c).
PANEL ACTION: Accept in Principle.
Revise the exception to read as follows:
"Exception No.2: For fixture wire as permitted by 402-6."
PANEL STATEMENT: This action satisfies submitter's recommendation more directly.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #802)

6- 14 - (310-5 Exception No. 10 (New)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception No. 10: For signs and outline lighting as permitted in Sections 600-31(b) and 600-32(b).
SUBSTANTIATION: Editorial. Since some of the exceptions reference sections outside Chapters 1 through 4, the proposal sections should also be noted. A partial incomplete listing is not beneficial to code users.
PANEL ACTION: Accept in Principle.
Add word "electric" between words "for" and "signs". Delete word "Sections".
PANEL STATEMENT: This action satisfies submitter's recommendation more directly.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP603)

6- 14a - (310-8): Accept
SUBMITTER: CMP 6
RECOMMENDATION: Revised text:
"(d) Locations Exposed to Direct Sunlight. Insulated conductors and cables used where exposed to direct rays of the sun shall be of a type listed for sunlight resistance or listed and marked for ~~"~~sunlight resistant~~ce~~."
SUBSTANTIATION: The proposal clarifies that the conductors and cables must be either listed as sunlight resistant or both listed and marked as sunlight resistant.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: Panel's Action will result in proper clarification of the requirement for products "Listed for Sunlight Resistance" and "Listed and Marked Sunlight Resistant" in the applicable product standards. This will ensure that the products exposed to sunlight meet the requirement for sunlight resistance so that there are no confusions in the field.

(Log #799)

6- 15 - (310-8(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) ~~Dry and~~ Damp Locations. Insulated conductors and cable used in ~~dry and~~ damp locations shall be Types FEP, FEPB, ~~MTW,~~ PFA, RH, RHH, ~~RHW, RHW-2,~~ SA, THHN, ~~THW, THW-2, THHW, THHW-2, THWN, THWN-2, TW,~~ XHH, ~~XHHW, XHHW-2,~~ Z, or ZW, or of a type listed for use in wet locations.
SUBSTANTIATION: Editorial. (a) specifies conductors for dry locations, (b) also covers dry locations and limits conductor types to fewer than would be permitted by (a). In lieu of specifying wet location types such as fixture wires which are suitable for dry or damp locations, the added phrase would include those types, including Type UF which is not noted as suitable.
PANEL ACTION: Reject.
PANEL STATEMENT: The Code does not prohibit the listed conductors in a dry location. The panel does not agree with the proposed editorial change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3102)

6- 16 - (310-8(b)): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete reference to Type RH insulated conductors.
310-8(b) Dry and Damp Locations. Insulated conductors and cables used in dry and damp locations shall be Types FEP, FEPB, MTW, PFA, ~~RH,~~ RHH, RHW, RHW-2, SA, THHN, THW, THW-2, THHW, THHW-2, THWN, THWN-2, TW, XHH, XHHW, XHHW-2, Z, or ZW.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2593)

6- 17 - (310-8(d)): Reject
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise text to read as follows:
(d) Locations Exposed to Direct Sunlight. Insulated conductors and cables over 5 ft used where exposed to direct rays of the sun shall be of a type listed or marked "sunlight resistant."
SUBSTANTIATION: There have been no problems with insulated conductors under 5 ft. Only on insulated conductors of longer lengths. This also would eliminate the problem of conductors in a service cable and conduits when the insulated conductor exits the weather head.
PANEL ACTION: Reject.
PANEL STATEMENT: Sunlight deterioration is not a function of exposed cable length.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
BURNS: The statement given by CMP-6, "Sunlight deterioration is not a function of exposed cable length", is a correct statement. However the Panel's action should be to accept one of these proposals. UL has two different test procedures for sunlight resistance of wire and cable, a 300 hour test and a 720 hour test. Each of these tests use carbon arcs and water spray around the specimen to determine if the insulation of the conductor maintains 85 percent, 80 percent of its original values, respectively, to obtain a sunlight resistance rating. Thus, there exist two standards for one to achieve a sunlight resistance rating. Time-honored tradition concludes that insulated conductors having a carbon black base insulation do not deteriorate when exposed to sunlight. Thus allowing the portion of a wire or cable, comprising a drip loop, to be exposed to sunlight, should be permitted.
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-14a.

(Log #4077)

6- 18 - (310-8(d)): Reject
SUBMITTER: C. David Mercier, Southwire Co.
RECOMMENDATION: Revise text to read as follows:
(d) Locations Exposed to Direct Sunlight. Insulated conductors and cables used where exposed to direct rays of the sun shall be
1. Types MI, SE, USE, PLTC, or ITC;
2. Flexible cords and cables marked with "W";
3. Cables with an overall metallic covering; or
4. Conductors and cables listed or marked "sunlight resistant".
SUBSTANTIATION: The addition of 310-8(d) to the 1999 Code has caused much confusion over which conductors are listed and which conductors must be marked for use exposed to direct sunlight. Also many people have interpreted 310-8(d) as requiring all conductors and cables exposed to direct sunlight to be marked. This proposal uses the same format as used in 310-8(c) to help determine which insulated conductors and cables meet the requirements for locations exposed to direct sunlight.
PANEL ACTION: Reject.
PANEL STATEMENT: The list proposed in the recommendation does not include all products that may be sunlight resistant. The panel action on Proposal 6-14a clarifies the listing and marking requirements for products exposed to sunlight.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-14a.

(Log #4476)

6- 19 - (310-8(d)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(d) Locations Exposed to Direct Sunlight. Insulated conductors and cables over 5 ft used where exposed to direct rays of the sun shall be of a type listed or marked "sunlight resistant."
SUBSTANTIATION: There have been no problems with insulated conductors under 5 ft. Only on insulated conductors of longer lengths. This also would eliminate the problem of conductors in a service cable and conduits when the insulated conductor exits the weather head.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement for Proposal 6-17.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-14a.

(Log #385)

6- 20 - (310-8(d), Exception (New)): Reject
SUBMITTER: Anthony E. Jarosz, Premier Elec./Rep. Local 292, IBEW
RECOMMENDATION: Add an exception to 310-8(d) to read as follows:
Exception: Where used for temporary wiring in accordance with Article 305 in this code.
SUBSTANTIATION: When running NM-B cable for temporary heaters, I was made to wrap the cable with poly and duct tape. I personally don't think the insulation of the sheath and of the conductor will break down if exposed to direct sunlight for 90 days.
PANEL ACTION: Reject.
PANEL STATEMENT: Type NM Cable is not permitted to be used outdoors for temporary wiring in accordance with Article 305. This proposal is forwarded to Panel 7 because it deals with specific applications of Type NM cable for temporary wiring in Article 305.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1926)

6- 21 - (310-8(d), Exception (New)): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
RECOMMENDATION: Add a new exception to read as follows:
Exception: Drip loops extended from a cable or raceway to service drop conductors.
SUBSTANTIATION: The "what if" approach of the Panel in response to Comment 6-7 on Proposal 6-18 on page 299 of the 1998 ROC is no way to write code. It has been noted that white insulation may be difficult to make sunlight resistant. So what? These drip loops are short, well separated in open air, and in the case of the white wire, could be bare.
PANEL ACTION: Reject.
PANEL STATEMENT: Sunlight deterioration is not a function of exposed cable length.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-14a.

(Log #4197)

6- 22 - (310-8(d), Exception (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add an Exception as follows:
Exception: For drip loops installed to comply with Section 230-54(f), or for similar drip loops formed in branch-circuit or feeder conductors, conductors extending not more than 3 ft (914 mm) from a cable sheath or from a raceway shall not be required to be sunlight resistant.
SUBSTANTIATION: The blanket prohibition against nonsunlight-resistant conductors threatens to make raceway-type service entrances obsolete, unless, perhaps, they are on the north side of a building. Although UL has revised its guide card restrictions on SE cable to give relief where that is the wiring method, they cannot provide relief for building wire generally. Wire manufacturers will be reluctant to reformulate and retest entire product lines for the sake of a few feet of wire coming out of a weatherhead. This is particularly true for small conductors that usually aren't uniformly black with colored tape applied afterwards.
For example, a 60A service might well have a No. 6 grounded circuit conductor (neutral or otherwise), and that conductor would need to be entirely white. Although white wires can be made sunlight resistant, it is much more difficult and expensive than black wire, and therefore we aren't likely to see much of it. Relief is needed for installers. The general rule is appropriate, however, for long lengths of conductors exposed to sunlight, such as outdoor installations of single conductors in cable tray or open wiring on insulators.
PANEL ACTION: Reject.
PANEL STATEMENT: Sunlight deterioration is not a function of exposed cable length.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BURNS: See my Explanation of Negative Vote on Proposal 6-17 (Log #2593).
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-14a.

(Log #1815)

6- 23 - (310-10): Reject
SUBMITTER: James Tente, Tente Electric
RECOMMENDATION: Revise as follows:
No conductor shall be used in such a manner that its operating temperature will exceed that designated for the type of insulated conductor involved. In no case shall conductors be associated together in a raceway in such a way with respect to type of circuit, the wiring method employed, or the number of conductors that the limiting temperature of any conductor is exceeded.
SUBSTANTIATION: Some confusion has arisen as to whether or not this section applies to conductors installed in gutters of panelboards.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement is not limited to conductors in raceways.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3718)

6- 24 - (310-10 and 310-16): Reject
SUBMITTER: Jerry M. Turner, Asarco, Inc.
RECOMMENDATION: In Table 310.16, change the heading "Correction Factors" to read: "Correction Factors - See Section 310.10."
and
In the first paragraph of Section 310.10 FPN, change the text to read:
(1) Ambient temperature - ambient temperature may vary along the conductor length as well as from time to time. As a minimum, the ambient temperature shall be regarded as the average of annual extreme maximum temperatures for the location.
SUBSTANTIATION: There is need for the National Electrical Code to clarify the meaning of ambient temperature as it relates to the sizing electrical conductors. The various engineers, electricians, electrical supervisors, contractors, vendors, and others who use the Code to size conductors often lack sufficient familiarity with the Code and either ignore or misunderstand ambient correction factors. While many simply read directly from Table 310.16, there are relatively few locations in the United States having an ambient temperature that remains consistently below 30°C. Accordingly, conductors are being undersized.
This proposal would clarify the need to use the ambient correction factors, and would establish minimum ambient temperature values for each geographical location based on local weather conditions.
The recommended minimum standard, the average of annual extreme maximum temperatures, is a condition analogous to the three-hour definition of continuous load. That average would be close to the maximum three-hour maximum temperature that could be reasonably expected. Its value remains consistent over time, and it is more reasonable than the use of an all-time record high temperature.
PANEL ACTION: Reject.
PANEL STATEMENT: The cross reference is redundant. The proposed change to 310-10(1) specifies a method for the determination of ambient temperatures for a given location. Regardless of its validity, the proposed method is a specific design criterion and as such is beyond the scope of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4064)

6- 25 - (310-11(a)(1)): Accept in Principle
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.
RECOMMENDATION: Revise text to read as follows:
(1) The maximum rated voltage for which the conductor was listed or, if above 600 volts, the maximum rated voltage at which the conductor was tested according to applicable industry standards.
SUBSTANTIATION: When the premise owner changes their service from secondary rate to primary rate by purchasing the cable and transformer from the utility and accepts service at a voltage above 600 volts, the addition to this rule will permit the owner to continue to use the cable and transformer, which are in all likelihood not listed but tested in accordance with applicable industry standards.
PANEL ACTION: Accept in Principle.
Revise text to read as follows:
"(1) The maximum rated voltage."
PANEL STATEMENT: This change would accomplish the intent of the proposal in a more direct way. The tested voltage in many cases is higher than the rated voltage. This panel action does not change the requirements for listed products.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
POST: I vote to reject; I am not comfortable accepting equipment that is not listed or labeled.

(Log #4105)

6- 26 - (310-11(a)(1)): Accept in Principle
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Revise text to read as follows:
(1) The maximum rated voltage for which the conductor was listed or the maximum rated voltage at which the conductor was tested according to applicable industry standards.
SUBSTANTIATION: When the premise owner changes their service from secondary rate to primary rate by purchasing the cable and transformer from the utility and accepts service at a voltage above 600 volts, the addition to this rule will permit the owner to continue to use the cable and transformer, which are in all likelihood not listed but tested in accordance with applicable industry standards.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel statement on Proposal 6-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1231)

6- 27 - (310-11(a)(4), FPN (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a fine print note to 310-11(a)(4) to read:
FPN: See Conductor Properties, Table 8 of Chapter 9, for conductor area expressed in SI units for conductor sizes specified in AWG or circular mil area.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice. A reference is identified in this fine print note to provide useful "soft" conversion information for conductor size to the users of the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1232)

6- 28 - (310-11(b)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "24 in. (610 mm)" to "610 mm (24 in.)" and "40 in. (1.02 m)" to "1.0 m (40 in.)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice for 610 mm (24 in.) requirement. The SI units for "610 mm (24 in.)" are not rounded since the measurement is product specific and 610 mm may be required to complete the legend, 600 mm may be too short.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2379)

6- 29 - (310-11(b)(1)): Reject
SUBMITTER: William H. Patterson, B/P Electric
RECOMMENDATION: Revise text to read:
"The following conductors and cable shall be durably marked on the surface with the identification markings a different color than the overall covering.
The AWG size or circular MIL area shall be repeated at intervals not exceeding 24 in. (610 mm). All other markings shall be repeated at intervals not exceeding 40 in. (1.02 m)."
SUBSTANTIATION: To quickly identify the required information on the cable. There is some nonmetallic-sheathed cable manufactured with the same color identification markings as with the overall covering color. White on white.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC is not a design manual. The section specifies "what" needs to be marked and "how" is covered by applicable product standards. Metric conflicts are covered in other parts of the Code and other proposals.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3157)

6- 30 - (310-11(b)(1)): Reject
SUBMITTER: William H. Patterson, B/P Electric
RECOMMENDATION: Revise text as follows:
The following conductors and cable shall be durably marked on the surface <u>with the identification markings a different color than the overall covering.</u>
The AWG size or circular mil area shall be repeated at intervals not exceeding 24 in. (610 mm). All other markings shall be repeated at intervals not exceeding 40 in. (1.02 m).
SUBSTANTIATION: To quickly identify the required information on the cable. There is some nonmetallic-sheathed cable manufactured with the same color identification markings as with the overall covering color. White on white.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1233)

6- 31 - (310-11(b)(2) Exception No. 3): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "40 in. (1.02 m)" to "1.0 m (40 in.)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1234)

6- 32 - (310-11(b)(2) Exception No. 4): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "40 in. (1.02 m)" to "1.0 m (40 in.)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2026)

6- 33 - (310-11(b)(3)(d)): Accept in Principle
SUBMITTER: Siegfried A. Schauffele, Superior Essex
RECOMMENDATION: Revise text to read:
"Conductors that have an outer surface of glass or other suitable braid material".
SUBSTANTIATION: Asbestos coverings are no longer in use for conductors covered by Table 310-13. UL Standard 83 for type FEP and FEPB does not include asbestos coverings.
PANEL ACTION: Accept in Principle.
Delete 310.11 (b) (3) (d).
PANEL STATEMENT: Asbestos coverings are no longer in use and glass braid can be marked.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2823)

6- 34 - (310-11(d), FPN): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise the FPN to 310-11(d) as follows:
FPN: Examples of these markings include but are not limited to <u>markings suitable for limited smoke, sunlight resistant, etc.</u> <u>~~"LS" for limited smoke and markings such as "sunlight resistant."~~</u>
SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).
Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.
Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.
The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.
PANEL ACTION: Accept in Principle.
Add the following text to 310-11 (d).
"These markings include, but are not limited to, markings for limited smoke, sunlight resistance, etc."
Delete FPN.
PANEL STATEMENT: The panel is implementing a requirement of the NEC Style Manual to delete FPNs and make them Code text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2516)

6- 35 - (310-12(c)): Accept in Principle
NOTE: The Technical Correlating Committee directs the panel to revise the Exception to form a complete sentence in accordance with the Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(c) Ungrounded Conductors. Conductors that are intended for use as ungrounded conductors, whether used as a single conductor or in multiconductor cables, shall be finished to be clearly distinguishable from grounded and grounding conductors. Ungrounded conductors shall be distinguished by colors other than white, ~~natural gray,~~ or green; or by a combination of color plus distinguishing marking. Distinguishing markings shall also be in a color other than white ~~natural gray,~~ or green, and shall consist of a stripe or stripes or a regularly spaced seris of identical marks. Distinguishing markings shall not conflict in any manner with the surface markings required by Section 310-11(b)(1).
Exception: As permitted by Section 200-7.

SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.

There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.

PANEL ACTION: Accept in Principle.

Revise as follows:

(c) Ungrounded Conductors. Conductors that are intended for use as ungrounded conductors, whether used as a single conductor or in multiconductor cables, shall be finished to be clearly distinguishable from grounded and grounding conductors. Distinguishing markings shall not conflict in any manner with the surface markings required by Section 310-11(b)(1).

Exception: As permitted by Section 200-7.

PANEL STATEMENT: Panel action, without making a determination on removal of "natural", satisfies the submitter's recommendation. Specific requirements for the identification of grounded and grounding conductors are specified in Article 250.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4296)

6- 36 - (310-12(c)): Accept in Principle

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Revise text to read as follows:

(c) Ungrounded Conductors. Conductors that are intended for use as ungrounded conductors, whether used as single conductors or in multiconductor cables, shall be finished to be clearly distinguishable from grounded and grounding conductors. Ungrounded conductors shall be distinguished by colors other than white, ~~natural~~ gray, or green; or by a combination of color plus distinguishing marking. Distinguishing markings shall also be in a color other than white, ~~natural~~ gray, or green, and shall consist of a stripe or stripes or a regularly spaced series of identical marks. Distinguishing markings shall not conflict in any manner with the surface markings required by Section 310-11(b)(1).

Exception: As permitted by Section 200-7.

SUBSTANTIATION: Delete the word natural since the color natural gray is not defined and in fact does not exist as a specified color for wire insulation. This proposal goes with the definition of gray within a specified range of color per the Munsell color system as used by industry for wire color coding. The definition of the gray is provided in another proposal.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel statement on Proposal 6-35.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4434)

6- 37 - (310-12(c)): Reject

SUBMITTER: Michael L. Anklan, IBEW Local 595

RECOMMENDATION: Revise text to read as follows:

"Conductors that are intended for use as ungrounded conductors, whether used as single conductors or in multiconductor cables, shall be finished to be clearly distinguishable from grounded and grounding conductors. Ungrounded conductors 50v to 250v shall be identified with a continuous Black, Red or Blue outer finish. Ungrounded conductors 251v to 600v shall be identified with a continuous Brown, Orange or Yellow outer finish. Distinguishing markings shall not conflict in any manner with surface markings required by Section 310-11(b)(1).

SUBSTANTIATION: This will help is distinguishing between the Lower and Higher Voltage Systems, thus helping in the prevention of accidents, injuries and the damage of equipment.

PANEL ACTION: Reject.

PANEL STATEMENT: Wire color should not be used to determine voltage. See NFPA 70E.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #622)

6- 38 - (310-12(c), Exception, FPN (New)): Reject

SUBMITTER: Edward Sklarski, S. Hadley, MA

RECOMMENDATION: Add a fine print note to 310-12(c) Exception to read as follows:

575 Volt, three phase Brown w/violet; orange w/violet; yellow w/violet

SUBSTANTIATION: Instant identification of different voltage systems. There are a lot of switch rooms with a mix of different voltages in them.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Wire color should not be used to determine voltage. See NFPA 70E.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #801)

6- 39 - (310-13): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise second paragraph to read as follows:

These conductors shall be permitted for use in any of the wiring methods recognized in ~~Chapter 3~~ this Code and as specified in their respective tables.

SUBSTANTIATION: Editorial. To provide correlation with conductor use where wiring methods specified in Chapter 3 are apparently not required such as in Articles 225, 480, 650, 668, 669, and 690.

PANEL ACTION: Reject.

PANEL STATEMENT: Where needed, Articles 225, 480, 650, 668, 669, and 690 modify the requirements for wiring requirements specified in Chapter 3.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1413)

6- 39a - (310-13): Accept

SUBMITTER: Denis E. Paddock, NYC-DCAS

RECOMMENDATION: Revise to read as follows:

In the paragraph that begins with "FPN: Thermoplastic..." replace "Temperatures colder than" with "termperatures lower than."

SUBSTANTIATION: The reason this change should be made is that a temperature cannot be hotter, warmer, cooler or colder than another temperature because a temperature is only a number; it is not something physical, and only something physical can be warmer or cooler than, etc.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1757)

6- 40 - (310-13 Table 310-61): Reject

SUBMITTER: Herbert Moulton, Masters Technology Inc.

RECOMMENDATION: Add an additional type of conductor to this Table 310-61.

Table 310-61. Conductor Application and Insulation

Trade Name	Type Letter	Maximum Operating Temperature	Application Provision	Insulation	Outer Covering
Gas Tube and Ignition Cable	GTO**	105°C	Dry or wet locations rated 2001 volts and higher	Thermoplastic	None or Jacket Sheath

**Type GTO cable shall be restricted to a maximum ampacity of 300 milli-amperes where installed for the secondary circuit conductors as required by Section 600-23(d).

(Log #1235)

Remainder of this section to remain as now shown in this table.
SUBSTANTIATION: Problem: Article 600 refers to a GTO Type of cable that has no reference in Article 310 and no one really knows what this conductor is.
Substantiation: This type conductor which is a high voltage application cable is and has been used by the sign industry for many years.
This conductor is and has been listed by NRTLs for many years under UL standard 814.
The code has never defined Type GTO cable in Article 310 leaving confusion within the inspection community.
PANEL ACTION: Reject.
PANEL STATEMENT: The product is not for general wiring and should not be included in the table.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

6- 41 - (Table 310-13): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add SI units for insulation thicknesses using the following conversion table.
Under "Thickness of Insulation" add a new column entitled "mm" between "AWG or kcmil" and "Mils" and insert the SI equivalents for the insulation thickness based on the table submitted.
Change insulation thickness value in Superscript Note 4 for Type RHH #14-12 AWG in Tables 310-13 as follows:
Change "45 mils" to "1.14 mm (45 mil)".
Change insulation thickness value in Superscript Note 9 for Type USE 213-500 kcmil in Table 310-13 as follows: Change "80 mils" to "2.03 mm (80 mils)".

Conversion Table for Insulation Thickness Values in Tables 310-13, -62, -63 and -64 of 1999 NEC

mm	Mils	mm	Mils	mm	Mils	mm	Mils	mm	Mils
		2.67	105	5.33	210	8.00	315	10.67	420
0.36	14	2.79	110	5.46	215	8.13	320	10.80	425
0.38	15	2.92	115	5.59	220	8.26	325	10.92	430
		3.05	120	5.72	225	8.38	330	11.05	435
0.51	20	3.18	125	5.84	230	8.51	335	11.18	440
0.58	23	3.30	130	5.97	235	8.64	340	11.30	445
0.76	30	3.43	135	6.10	240	8.76	345	11.43	450
0.91	36	3.56	140	6.22	245	8.89	350	11.56	455
1.02	40	3.68	145	6.35	250	9.02	355	11.68	460
1.14	45	3.81	150	6.48	255	9.14	360	11.81	465
1.27	50	3.94	155	6.60	260	9.27	365	11.94	470
1.40	55	4.06	160	6.73	265	9.40	370	12.07	475
1.52	60	4.19	165	6.86	270	9.53	375	12.19	480
1.65	65	4.32	170	6.99	275	9.65	380	12.32	485
1.78	70	4.45	175	7.11	280	9.78	385	12.45	490
1.91	75	4.57	180	7.24	285	9.91	390	12.57	495
2.03	80	4.70	185	7.37	290	10.03	395	12.70	500
2.16	85	4.83	190	7.49	295	10.16	400	12.83	505
2.29	90	4.95	195	7.62	300	10.29	405	12.95	510
2.41	95	5.08	200	7.75	305	10.41	410	13.08	515
2.54	100	5.21	205	7.87	310	10.54	415	13.21	520

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform o U.S. industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2027)

6- 42 - (Table 310-13): Accept
SUBMITTER: Siegfried A. Schauffele, Superior Essex
RECOMMENDATION: For types FEP or FEPB change the description of the outer covering to:
"Glass or other suitable braid material."
SUBSTANTIATION: Asbestos coverings are no longer in use for types FEP or FEPB, and are not included in UL Standard 83 for these types. [See related proposal to 310-11(b)(3)(d)].
PANEL ACTION: Accept.
PANEL STATEMENT: This change should be for size range 6 to 2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2150)

6- 43 - (Table 310-13): Accept
SUBMITTER: George A. Straniero, AFC Cable Systems, Inc.
RECOMMENDATION: Table 310-13, fourth column beside RHW, delete:
~~"Where over 2000 volts insulation, shall be ozone resistant"~~
SUBSTANTIATION: This is housekeeping matter. Type RHW over 2kV was changed to Type MV in the 1978 NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2240)

6- 44 - (Table 310-13): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: In Table 310-13: change the phrase "flame-retardant" (or "flame retardant") to "flame tested" in thirteen (13) places in column titled "Insulation," in four (4) places in column titled "Outer Covering," and in one (1) place in "Note 9."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: Cables are listed for their flame retardant properties and some of their applications are referenced in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GANATRA: See my Explanation of Negative Vote on Proposal 6-3.

(Log #3103)

6- 45 - (Table 310-13): Accept in Principle
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete reference to Type RH insulated conductors from table.
~~Thermoset RH75°C Dry and damp locations 167°F~~
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept in Principle.
In addition to the recommendation, the following changes shall be made:
Line one shall be deleted and 10 changed to 14-10 on the second line in column 6. Superscript four shall be removed and the remaining superscripts shall be appropriately renumbered.
PANEL STATEMENT: The 30 mil wall thickness associated with 14-12 only applied to RH. The superscript change is an editorial clarification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4430)

6- 46 - (Table 310-13): Reject
SUBMITTER: Joel Sandler, Lera Electric/Rep. IBEW Local 595
RECOMMENDATION: Designate suffix to indicate which type of wire is sunlight resistant/add to Table 310-13.
SUBSTANTIATION: The only way to know if wire is sunlight resistant is to look at sample or call supplier and ask/adding suffix to wire and table will rectify this lack of information.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement is adequately covered under 310-8(d).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2803)

6- 47 - (310-14): Accept in Principle
SUBMITTER: Terry L. Carlson, Nebraska State Electrical Board
RECOMMENDATION: Revise text to include Type RH, RHH, and RHW conductor insulation in those required to be made of an AA-8000 series electrical grade aluminum alloy conductor material.
SUBSTANTIATION: Present language requires that Type XHHW, THW, THHW, THWN, THHN, service-entrance Type SE Style U (flat) and SE Style R (round) be made of AA-8000 series aluminum.
Underground Service Entrance (USE) cable must be terminated outside of a building according to NEC Section 338-2. However, dual rated USE cable is available as USE / RH, RHH, RHW. The dual rating of RH, RHH, and RHW allows it to be used and terminated inside of a building. Therefore, the requirement for AA-8000 series aluminum alloy should apply to Type RH, RHH, and RHW as used in dual rated Type USE cable. Dual rated Type USE / RH, RHH, RHW cable is currently available made from the 1350 series aluminum which does not meet the safety standard of AA-8000 series. Revising the text of Section 310-14 to include Type RH, RHH and RHW will require the dual rated Type USE / RH, RHH, RHW aluminum conductors to be made from AA-8000 series aluminum.
PANEL ACTION: Accept in Principle.
Delete "RH" from the recommendation.
PANEL STATEMENT: RH is being deleted from the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #18)

6- 48 - (310-15(a)): Reject
NOTE: The following proposal consists of Comment 6-32 on Proposal 6-52 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-52 was:

Add the following sentence at the end of the first paragraph in Section 310-15(a):
"Select the ampacity table by using the matrix tables 310-15A through D." Add the following four tables:

Table 310-15A Selection Matrix for Ampacity Tables -- 0-2000 Volts Above Ground

Application	Table 310					Table B-310*			
	16	17	18	19	NT3	1	2	3	4
Not more than 3 current carrying conductors rated 60-90° in raceway or cable	x								
Single insulated conductors rated 60-90°C in free air		x							
Three single insulated conductors rated 150-250°C in raceway or cable			x						
Single insulated conductor rated 150-250°C in free air				x					
Multiconductor cables in cable trays -- See Section 318-11(a) for details	x		x						
Single insulated conductor cables in cable trays -- See Section (318-11(b) for details		x		x					
120/240 Volt, Single phase, dwelling services and feeders					x				
Multiconductor cable with 2 or 3 conductors in raceway in free air						x			
Two or three single insulated conductors supported on a messenger or installed in cable tray -- See 318-11(b)(4)							x		
Multiconductor cables with not more than 3 insulated conductors in free air or in cable tray -- See 318-11(a)Ex.2								x	
Bare or covered conductors									x

Table 310-15B Selection Matrix for Ampacity Tables -- 0-2000 Volts Directly Buried or in Electrical Ducts

Application	b.3	Table B-310*						Fig.B310*	
	16	5	6	7	8	9	10	1	2
Not more than 3 current carrying conductors rated 60-90°C directly buried	x								
Single insulated conductors in nonmagnetic ducts (one conductor per duct)		x							
Three insulated conductors within an overall covering (3/C cable) in ducts (1 cable per duct			x						
Three single insulated conductors in electrical ducts (three conductors per duct)				x					
Two or three insulated conductors cabled within an overall covering (2/C or 3/C directly buried in earth					x				
Three triplexed single insulated conductors directly buried in earth						x			
Three single insulated conductors directly buried in earth							x		
Interpolation chart for cables in a duct bank based on Load Factor and Rho								x	
Cable installation dimensions for use with Tables B-5 through B-10									x

*See Section 310-15(b) and Appendix B310-15(b)(1)to(7)
For adjustment factors -- more than 3 current-carrying conductors in a raceway or cable -- see Table 310 Note 8
For adjustment factors -- more than 3 current-carrying conductors in a raceway or cable with load diversity -- see Table B-310-11

Table 310-15C Selection Matrix for Ampacity Tables -- 2000-35,000 Volts

Application	Table 310										Table B-310 4*
Copper>	67	69	71	73	75	77	79	81	83	85	
Aluminum>	68	70	72	74	76	78	80	82	84	86	
Insulated single conductor cables triplexed in air	x										
Insulated single conductor isolated in air		x									
Insulated three conductor cable isolated in air			x								
Insulated triplexed or 3 single conductor cables in isolated conductor in air				x							
Insulated 3/C cable in isolated conduit in air					x						
Insulated single conductor cables in cable tray per Section 318-13(a)	x	x									
Multiconductor cables in cable tray per Section 318-13(b)			x		x						
Three single insulated conductors in underground ducts (3 conductors per duct)						x					
Three insulated conductors within an overall covering (3/C cable) in underground ducts							x				
Single insulated conductors directly buried in earth								x			
Three insulated conductors within an overall covering (3/C) directly buried in earth									x		
Three triplexed single insulated conductors directly buried in earth										x	
Bare or covered conductors											x
For ampacity adjustments to 2,000 to 35,000 volt cables, see Notes to Tables 310-69 through 310-86											

Table 310-15D Selection Matrix for Ampacity Tables -- 0-5000 volts

Single Insulated Conductors in Underground Electrical Ducts

Application	Fig B-310*		
	3	4	5
Three conductors per duct, 9 single-conductor cables per phase	x		
Nonmagnetic ducts, 1 conductor per duct, 4 single-conductor cables per phase		x	
Nonmagnetic ducts, 1 conductor per duct, 5 single-conductor cables per phase			x

***See Section 310-15(b) and Appendix B310-15(b)(1)to(7)**
For adjustment factors -- more than 3 current-carrying conductors in a raceway or cable -- see Table 310, Note 8
For adjustment factors -- more than 3 current-carrying conductors in a raceway or cable with load diversity -- See Table B-310-11

SUBMITTER: Morton L. Mullins, Chemical Manufacturers Assn.
RECOMMENDATION: Remove Appendix B references from original proposal and substitute the following tables 310-15A, 310-15B, 310-15C and 310-15D.

Table 310-15A Selection Matrix for Ampacity Tables -- 0-2000 Volts Above Ground

Application	Reference
Not more than 3 current carrying conductors rated 60-90C° in raceway or cable	Table 310-16
Single insulated conductors rated 60-90°C in free air	Table 310-17
Three single insulated conductors rated 150-250°C in raceway or cable	Table 310-18
Single insulated conductor rated 150-250°C in free air	Table 310-19
Multiconductor cables in cable trays -- See Section 318-11(a) for details	Table 310-16 & 18
Single insulated conductor cables in cable trays -- See Section 318-11(b) for details	Table 310-17 & 19
120/240 Volt, Single phase, dwelling services and feeders	Tables 310-16 to 19 Note 3
Multiconductor cable with 2 or 3 conductors in raceway in free air	Table B-310-1
Two or three single insulated conductors supported on a messenger	Table B-310-2
Multiconductor cables with not more than 3 insulated conductors in free air	Table B-310-3
Bare or covered conductors	Table B-310-4

Table 310-15B Selection Matrix for Ampacity Tables -- 0-2000 Volts Directly Buried or in Electrical Ducts

Application	Reference
Not more than 3 current carrying conductors rated 60-90°C directly buried	Table 310-16
Single insulated conductors in nonmagnetic ducts (one conductor per duct)	Table B-310-5
Three insulated conductors within an overall covering (3/C cable) in ducts (1 cable per duct)	Table B-310-6
Three single insulated conductors in electrical ducts (three conductors per duct)	Table B-310-7
Two or three insulated conductors cabled within an overall covering directly buried in earth	Table B-310-8
Three triplexed single insulated conductors directly buried in earth	Table B-310-9
Three single insulated conductors directly buried in earth	Table B-310-10
Interpolation chart for cables in a duct bank based on Load Factor and Rho	Figure B-310-1
Cable installation dimensions for use with Tables B-5 through B-10	Figure B-310-2

Table B...and Fig. B...are in Appendix B. See also Section 310-15(b) and Appendix B310-15(b)(1)to (7)
For adjustment factors -- more than 3 current-carrying conductors in a raceway or cable -- see Table 310 Note 8
For adjustment factors -- more than 3 current-carrying conductors in a raceway or cable with load diversity -- see Table B-310-11

Table 310-15C Selection Matrix for Ampacity Tables -- 2000-35,000 Volts

Application	Reference
Insulated single conductor cables triplexed in air	Table 310-67 & 68
Insulated single conductor isolated in air	Table 310-69 & 70
Insulated three conductor cable isolated in air	Table 310-71 & 72
Insulated triplexed or 3 single conductor cables in isolated conduit in air	Table 310-73 & 74
Insulated 3-C cable in isolated conduit in air	Table 310-75 & 76
Insulated single conductor cables in cable tray per Section 318-13(a)	Table 310-67, 68, 69, & 70
Multiconductor cables in cable tray per Section 318-13(b)	Table 310-71, 72, 75, & 76
Three single insulated conductors in underground ducts (3 conductors per duct)	Table 310-77 & 78
Three insulated conductors cabled within an overall covering (3/C cable) in underground ducts	Table 310-79 & 80
Single insulated conductors directly buried in earth	Table 310-81 & 82
Three insulated conductors cabled within an overall covering (3/C) directly buried in earth	Table 310-83 & 84
Three triplexed single insulated conductors directly buried in earth	Table 310-85 & 86
Bare or covered conductors	Table B-310-4
For adjustment factors see Notes to Tables 310-69 through 86	

Table 310-15D Selection Matrix for Ampacity Tables -- 0-5000 volts
Single Insulated Conductors in Underground Electrical Ducts

Application	Reference
Three conductors per duct, 9 single-conductor cables per phase	Figure B-310-3
Nonmagnetic ducts, 1 conductor per duct, 4 single-conductor cables per phase	Figure B-310-4
Nonmagnetic ducts, 1 conductor per duct, 5 single-conductor cables per phase	Figure B-310-5

Figure B...is in Appendix b. See also Section 310-15(b) and Appendix B310-15(b)(1) to (7)
For adjustment factors -- more than 3 current-carrying conductors in a raceway or cable -- see Table 310, Note 8
For adjustment factors -- more than 3 current-carrying conductors in a raceway or cable with load diversity -- See Table B-310-1

SUBSTANTIATION: The following tables have been revised to remove references to Appendix B in accordance with comments from the Technical Correlating Committee. The proposed table format has also been revised to provide additional clarity.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed recommendation does not add to the usability of the various ampacity tables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PETTIGREW: I disagree with the Panel Statement. Providing cross-reference tables will add to the usability of the NEC. These tables would assist users in selecting the correct ampacity table. The number of ampacity tables included in the mandatory portion of the NEC has increased and so has the probability of error. The goal of the Code panels should be to reduce the margin of error in using the NEC.

(Log #19)

6- 49 - (310-15(a)): Reject
NOTE: The following proposal consists of Comment 6-33 on Proposal 6-52 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-52 was:
(See Proposal 6-48 (Log #18)
SUBMITTER: Craig M. Wellman, Newark, DE
RECOMMENDATION: Relocate the portions of the tables deleted by the Technical Correlating Committee to Appendix B. The new Appendix B tables will then be as shown following.

Table B-310-15(b)(2)A Selection of Ampacity Tables — 0-2000 Volts Above Ground	
Application	**Reference**
Multiconductor cable with 2 or 3 conductors in raceway in free air	Table B-310-1
Multiconductor cables with not more than 3 insulated conductors in free air	Table B-310-3
Table B-310-15(b)(2)B Selection of Ampacity Tables — 0-35,000 Volts Above Ground	
Application	**References**
Bare or covered conductors	Table B-310-4
Table B-310-15(b)(2)C Selection of Ampacity Tables — 0-2000 Volts Directly Buried or in Electrical Ducts	
Application	**Reference**
Single insulated conductors in nonmagnetic ducts (one conductor per duct)	Table B-310-5
Three insulated conductors within an overall covering (3/C cable) in ducts (1 cable per duct)	Table B-310-6
Three single insulated conductors in electrical ducts (three conductors per duct)	Table B-310-7
Two or three insulated conductors cabled within an overall covering directly buried in earth	Table B-310-8
Three triplexed single insulated conductors directly buried in earth	Table B-310-9
Three single insulated conductors directly buried in earth	Table B-310-10
Interpolation chart for cables in a duct bank based on load factor and rho	Figure B-310-1
Cable installation dimensions for use with Tables B-5 through B-10	Figure B-310-2
Table B-310-15(b)(2)D Selection of Ampacity Tables — 0-5000 volts Single Insulated Conductors in Underground Electrical Ducts	
Application	**Reference**
Three conductors per duct, 9 single-conductor cables per phase	Figure B-310-3
Nonmagnetic ducts, 1 conductor per duct, 4 single-conductor cables per phase	Figure B-310-4
Nonmagnetic ducts, 1 conductor per duct, 5 single-conductor cables per phase	Figure B-310-5

See also Section 310-15(b) and Appendix B-310-15(b)(1) to (7)

For adjustment factors — more than 3 current carrying conductors in a raceway or cable — see Table 310 Note 8

For adjustment factors — more than 3 current-carrying conductors in a raceway or cable with load diversity — see Table B-310-11

Add the sentence:
"Select the ampacity table by using Tables B-310-15(b)(2)A to D" as the third sentence in the first paragraph of Section B-310-15(b)(2). The remaining table in Section 310 will then look as shown below.

Table B-310-15A Selection of Ampacity Tables — 0-2000 Volts Above Ground	
Application	**Reference**
Not more than 3 current carrying conductors rated 60-90°C in raceway or cable	Table B-310-16
Single insulated conductors rated 60-90°C in free air	Table 310-17
Three single insulated conductors rated 150-250°C in raceway or cable	Table 310-18
Single insulated conductors rated 150-250°C in free air	Table 310-19
Two or three single insulated conductors supported on a messenger	Table 310-20
Multiconductor cables in cable trays — See Section 318-11(a) for details	Tables 310-16 & 18
Single insulated conductor cables in cable trays — See Section 318-11(b) for details	Tables 310-17 & 19
120/240 Volt, single phase, dwelling services and feeders	Tables 310-16 to 19 Note 3
Table B-310-15B Selection of Ampacity Tables — 0-2000 Volts Directly Buried or in Electrical Ducts	
Application	**References**
Not more than 3 current carrying conductors rated 60-90°C directly buried	Table 310-16

For adjustment factors — more than 3 current carrying conductors in a raceway or cable — see Table 310 Note 8

Table B-310-60A Selection of Ampacity Tables — 2000-35,000 Volts	
Application	**Reference**
Insulated single conductor cables triplexed in air	Tables 310-67 & 68
Insulated single conductor isolated in air	Tables 310-69 & 70
Insulated three conductor cable isolated in air	Tables 310-71 & 72
Insulated triplexed or 3 single conductor cables in isolated conduit in air	Tables 310-73 & 74
Insulated 3-C cable in isolated conduit in air	Tables 310-75 & 76
Insulated single conductor cables in cable tray per Section 318-13(a)	Tables 310-67, 68, 69, & 70
Multiconductor cables in cable tray per Section 318-13(b)	Tables 310-71, 72, 75, & 76
Three single insulated conductors in underground ducts (3 conductors per duct)	Tables 310-77 & 78
Three insulated conductors cabled within an overall covering (3/C cable) in underground ducts	Tables 310-79 & 80
Single insulated conductors directly buried in earth	Tables 310-81 & 82
Three insulated conductors cabled within an overall covering, (3/C cable) directly buried in earth	Tables 310-83 & 84
Three triplexed single insulated conductors directly buried in earth	Tables 310-85 & 86

For adjustment factors see Notes to Tables 310-69 through 86

SUBSTANTIATION: The proposed change is needed to meet the concerns expressed by the Technical Correlating Committee and still provide the guidance needed in the field.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed recommendation does not add to the usability of the various ampacity tables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PETTIGREW: See my Explanation of Negative Vote on Proposal 6-48.

(Log #20)

6- 50 - (Table 310-15(a)): Reject
NOTE: The following proposal consists of Comment 6-34 on Proposal 6-52 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-52 was:
(See Proposal 6- (Log #18)
SUBMITTER: Ronald P. O'Riley, Innovative Education, Inc.
RECOMMENDATION: Add to table:
120/208 Volts, Three phase dwelling services and Feeders 310-15(b)(6).
SUBSTANTIATION: Section 310-15(b)(6) now permits 120/208 3-phase service and feeders to be derated as per Table 310-15(b)(6).
PANEL ACTION: Reject.
PANEL STATEMENT: 310.15(b)(6) does not permit the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2063)

6- 51 - (310-15(a), Exception (New)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add an Exception to read as follows:
Exception "xx": Where Nonmetallic Sheathed Cables are installed in a one-family dwelling unit are bundled longer than 24 in. (610 mm) and not installed in a raceway need not comply with the derating factors of Table 310-15(b)(2)(a).
SUBSTANTIATION: Nonmetallic Sheathed Cables including Type SE cables bundled together for lengths longer than 24 inches have been tested by UL and found to not exceed the temperature rating of the conductors.
These tests where conducted during a product LISTING for a manufacture and this information was not made available for this submittal. The manufacture is still trying to obtain this test report.
Over 40 No. 14 Type NM cables each drawing 12.5 amperes where included in this test and the termperture of the conductors was well below the 90 degree requirement of type NM-B cables.
This information will be forwarded if UL will release this data.
Also due to the high diversity in dwelling units it is very unlikely that more than 4 cables bundled will be carrying the required maximum current.
Cables installed in raceways shall not be included in this exception because tests have shown that the conductors do exceed the conductor temperatures even in short raceway runs.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel can only act on data submitted with the proposal. No data was submitted with this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4436)

6- 52 - (310-15(a)(1)): Reject
SUBMITTER: Vinson Owyoung
RECOMMENDATION: Revise text to read as follows:
"Ampacities for conductors shall be permitted to be determined by tables or under <u>electrical</u> engineering supervision, as provided in (b) and (c)."
SUBSTANTIATION: There are all kinds of engineers, for electrical work you should specify electrical in this section.
PANEL ACTION: Reject.
PANEL STATEMENT: Heat transfer technology is not limited to electrical engineering.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #803)

6- 53 - (310-15(a)(2) and Exception): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(2) Selection of Ampacity. Where more than one calculated or tabulated ampacity could apply for <u>the length of</u> a given <u>set of</u> circuit <u>conductors,</u> the lowest value shall be used.
Exception: Where two different ampacities apply to adjacent portions of a <u>given set of</u> circuit <u>conductors,</u> the higher ampacity shall be permitted to be used beyond the point of transition, a distance ~~equal to~~ <u>not more than</u> 10 ft (3.05 m) or 10 percent of the circuit <u>conductor</u> length figured at the highest ampacity, whichever is less.
SUBSTANTIATION: Editorial. Circuit conductors include those designated as service, feeder, branch circuit, and tap. Literal wording of this section and the exception results in more than apparently intended.
For example, a given circuit length includes a feeder and tap conductors connected to it, (definition of feeder includes tap conductors up to the final branch-circuit overcurrent device). The rule indicates a feeder with an ampacity of 400, to which a set of 20-ampere rated No. 12 conductors are tapped, in accordance with Section 240-21(b)(5), would have an ampacity of 20 assigned to the entire assembly of conductors.
Conversely, the present exception literally permits the opposite; the higher rated ampacity (400) could be applied to 10 ft or 10 percent of the No. 12 conductors.
The proposed phrase "given set of circuit conductors" is intended to provide distinguishment of feeder, branch circuit, and tap conductor portions of circuits.
If this proposal is accepted, Section 310-60(b)(1) should be revisited.
PANEL ACTION: Reject.
PANEL STATEMENT: Regardless of the nature of the circuit, this section deals with the requirements for the selection of ampacity, either tabulated or calculated, that need to be followed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1236)

6- 54 - (310-15(a)(2), Exception): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "10 ft (3.05 m)" to "3.0 m (10 ft)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2426)

6- 55 - (310-15(a)(2), Exception): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Could somebody please write this to a clear meaning. I have asked several people and have been given several different meanings.
SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not make a specific recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3138)

6- 56 - (310-15(a)(2), Exception): Reject
SUBMITTER: Joel Norton, RR 1 Box 1662
RECOMMENDATION: Delete the exception to 310-15(a)(2).
SUBSTANTIATION: Testing has shown that the conductor ampacity can be determined using the 90°C column right up to a panelboard within a few inches of a termination rated at a lower temperature. This 10 foot or 10 percent rule is no longer needed.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no test data to substantiate the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #797)

6- 57 - (310-15(b), Table 310-15(b)(6)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
For dwelling units, conductors and cables, as listed in Table 310-15(b)(6), shall be permitted as 120/240 volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to a dwelling unit. ~~and are installed in raceway or cable with or without an equipment grounding conductor.~~
(remainder of text unchanged)
Add:
FPN No. 1: See Section 310-8(c) for conductors in wet locations.
FPN No. 2: See Section 338-3 for Type SE cable use as a feeder.
Revise Table 310-15(b)(6) Conductor and Cable Types and Sizes for 120/240-volt, 3-wire, Single-phase Dwelling Services and Feeders. Conductor Types, RH, RHH, RHW, RHW-2, THHN, THHW, THW, THW-2, THWN, THWN-2, XHHW, XHHW-2, cable types SE, USE, USE-2, MC with conductors rated not less than 75°C (167°F) and MI.
SUBSTANTIATION: Editorial. Type SE, USE, and USE-2 indicated in the table are not conductor types, per se, but cable types. Type MC and MI cables are suitable for service and feeder conductors and should be included for this application.
The portion proposed to be deleted seems irrelevant to the provisions of this section. All cables and raceways are not suitable for services or feeders, and the wording suggests an equipment grounding conductor is optional. Those provisions are adequately covered in other Code sections. When the panel added the phrase "with or without an equipment grounding conductor" in the revision for Proposal 6-83 in the 1989 ROP no reason was given.
The proposal would clarify that other pertinent code sections re: wiring methods, grounding, insulation type in wet locations, are not modified by this section, and that only usually required wire sizes are modified. A modifying section may be seen to modify all that is noted.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not clarify the issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
ZIMNOCH: Section 334-3(1) permits Type MC cable for services already. Inclusion of Type MC in Table 310-15(b)(6) coordinates it permitted uses as done for Type SE and USE.

(Log #4421)

6- 58 - (310-15(b)): Reject
SUBMITTER: Craig M. Wellman, Newark, DE
RECOMMENDATION: Revise paragraph as marked:
"(b) Tables. Ampacities for conductors rated 0-2000 volts shall be as specified in the Allowable Ampacity Tables 310-15(b) and 310-16 through 310-19..."
Insert new table as follows:

Table 310-15(b) Selection of Ampacity Tables 0-2000 Volts Abov Ground Except as Noted

Not more than 3 current carrying conductors rated 60-90°C in raceway or cable, above ground, directly buried or in electrical ducts	310-16
Single insulated conductors rated 60-90°C in free air	310-17
Three single insulated conductors rated 150-250°C in raceway or cable	310-18
Single insulated conductors rated 150-250°C in free air	310-19
Two or three single insulated conductors supported on a messenger	310-20
Multiconductor cables in cable trays – See Section 318-11(a) for details	310-16 and 310-
Single insulated conductor cables in cable trays – See Section 318-11(b) for details	310-17 and 310-
120/240 volt, single phase, dwelling service and feeders	310-16 to 310-19 Note 3

For adjustment factors on more than 3 current carrying conductors in a raceway or cable see Table 310- Note 8

SUBSTANTIATION: Finding the correct table consistently is difficult. The proposed change will reduce code application errors by improving usability of the code.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed recommendation does not add to the usability of the various ampacity tables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PETTIGREW: See my Explanation of Negative Vote on Proposal 6-48.

(Log #2915)

6- 59 - (310-15(b)(2)): Reject
SUBMITTER: Donald A. Ganiere, Ottawa, IL
RECOMMENDATION: Add text as follows:
a. More than Three Current-Carrying Conductors in a Raceway or Cable. Where the number of current-carrying conductors in a raceway or cable exceeds three, or where single conductors or multiconductor cables are stacked or bundled longer than 24 in. (610 mm) without maintaining spacing and are not installed in raceways, the allowable ampacity of each current-carrying conductor shall be reduced as shown in Table 310-15(b)(2)(a).
SUBSTANTIATION: The addition of the words "current-carrying" will make it clear that the size of the equipment grounding conductor does not have to be adjusted when there are multiple current-carrying conductors in the raceway or cable. Some inspectors are requiring that the equipment grounding conductor be increased in size along with the current-carrying conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: This requirement does not deal with the sizing of equipment grounding conductors. Size of the equipment grounding conductors is established in accordance with Article 250 for a given application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1237)

6- 60 - (310-15(b)(2)a): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "24 in. (610 mm)" to "600 mm (24 in.)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4198)

6- 61 - (Table 310-15(b)(2)(a): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:

Number of Current-Carrying Conductors	Percent of Values in Tables 310-16, 310-17, 310-18, 310-19, as Adjusted for Ambient Temperature if Necessary
4 through 6	80
7 through 24	70
25 through 42	60
43 and above	50

(FPN): Overheating may occur where continuous, fully loaded conductor diversity is less than 50 percent and the number of current-carrying conductors exceeds nine. See Section 310-10.
SUBSTANTIATION: Electricians are not installing conductors so as not to energize them, or load them to only half of their normal ampacity. From the 1993 NEC forward the NEC has effectively disallowed any raceway fill with 10 or more conductors. The data on which the panel relied does not translate well into real world experience. A circuit is never 100 percent loaded for continuous periods due to listing restrictions on overcurrent protective devices. Because conductor heating is proportional to the current squared, a very small reduction from maximum current values produces a great reduction in heating. This is why no loss experience has ever been produced stemming from the 50 or more years the 1984 language was in the Code.
CMP 6 should reconsider this issue. By this proposal the Advisory Committee advises CMP 6 that after four code cycles in which the State of Massachusetts has retained in this location the traditional derating factors now exiled into NEC Appendix B-310-11, we have yet to hear of a single failure related to mutual conductor heating in an installation that complied with the traditional factors. Section 310-10 adequately addressees those bizarre instances where a problem could be demonstrated.
PANEL ACTION: Reject.
PANEL STATEMENT: User is not restricted from using information in Appendix B under engineering supervision. Table 310-15(b)(2)(a) is applicable for conditions where no diversity is established while the information provided in Appendix B is utilized for conditions where diversity is established under engineering supervision.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
POST: I vote to accept, this proposal duplicates Table 5C in the Canadian code, and there have been many meetings to harmonize the NEC and the CEC ampacity tables.

(Log #2045)

6- 62 - (310-15(b)(2)(a), FPN No. 2): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Add new text to read:
"See Sections 352-4 and 362-5 for adjustment factors for surface metal raceways and metal wireways."
SUBSTANTIATION: These raceways may permit up to 30 current-carrying conductors without adjustment to ampacity.
PANEL ACTION: Reject.
PANEL STATEMENT: This recommendation would be a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1238)

6- 63 - (310-15(b)(2)a Exception No. 3): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "24 in. (610 mm)" to "600 mm (24 in.)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1822)

6- 64 - (310-15(b)(2)(a)Exception No. 3): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, In
RECOMMENDATION: Add the following words before the word "nipples".
"Conduit or tubing".
SUBSTANTIATION: Nipples are not otherwise defined. This revision will show the same information found in Note 4 in Chapter 9.
This simple change will make the NEC user friendly.
PANEL ACTION: Reject.
PANEL STATEMENT: The additional wording does not add any clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #804)

6- 65 - (310-15(b)(2)(a) Exception No. 4): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception No. 4: Derating factors shall not apply ~~to underground conductors entering or leaving an outdoor trench if those conductors have physical protection in the form of rigid metal conduit, intermediate metal conduit, or rigid nonmetallic conduit having a length not exceeding 10 ft (3.05 m) and the number of conductors does not exceed 4~~ under the conditions specified in the exception for Section 310-15(c).
SUBSTANTIATION: Editorial. The exception for Section 310-15(c) can also apply to derating factors. Which section applies? The exception for Section 310-15(c) applies to conductors in raceways or cables, does not limit the number of conductors, limits conductor length, is not limited to conductors in trenches, and has a fine print note which presumably applies to this exception also.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation is not related to the proposal. The exception in the recommendation deals with time honored requirements while the exception in 310-15(c) deals with calculations under engineering supervision.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1239)

6- 66 - (310-15(b)(2)a Exception No. 4): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "10 ft (3.05 m)" to "3.05 m (10 ft)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3298)

6- 67 - (310-15(b)(2)(a) Exception No. 5 (New)): Accept in Principle in Part
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn.
RECOMMENDATION: Add a new Exception to read:
Exception No. 5: Adjustment factors shall not apply to Type AC cable or to Type MC cable having interlocked armor without an overall outer jacket where:
a. each cable has not more than three current-carrying conductors,
b. the conductors are No. 12 copper, and
c. not more than 20 current carrying conductors are bundled, stacked, or supported on "bridle rings".

A 60 percent adjustment factor shall be applied where the current-carrying conductors in these cables that are stacked or bundled longer than 24 in. (610 mm) without maintaining spacing exceeds 20.
SUBSTANTIATION: This proposal is similar to Proposal ROP 6-90/ROC 6-68. The proposal has been altered to address the panel's comments concerning jacketed cables (jacketed cables have been specifically excluded) and to address the issue of conductor size (the size has been limited to No. 12 which is represented by the test report).
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle in Part.
Delete "having interlocked armor". Change "24 in. (610 mm)" to "600 mm (24 in.)". Change "No. 12" to "12 AWG".
PANEL STATEMENT: Type MC cable can be manufactured using interlocked or continuous armor. The second change was made to correlate with panel action on Proposal 6-27. The third change was made to correlate with panel action on Proposal 6-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
POST: I vote to reject. I am not convinced that bundling 20 current carrying conductors together will not cause excessive heating.

(Log #3299)

6- 68 - (310-15(b)(2)(a) Exception No. 5 (New)): Reject
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn.
RECOMMENDATION: Add a new Exception No. 5 to read:
Exception No. 5: Derating factors shall not apply to Type AC Armored Cable or non-jacketed interlocked Type MC Metal Clad Cables in air containing no more than three current-carrying conductors where bundled, stacked, or supported on "bridle rings" and where the total number of current-carrying conductors does not exceed twenty. A 60 percent derating factor shall apply to Type AC or non-jacketed Type MC cables containing twenty-one conductors or more.
SUBSTANTIATION: This proposal is similar to Proposal ROP 6-90/ROC 6-68. The proposal has been altered to address the panel's comments concerning jacketed cables. Jacketed cables have been specifically excluded from the proposal. The report I have provided addresses No. 12 only; however, the report is intended to demonstrate that the rate of heat dissipation for metal jacketed cables do not require the same derating as nonmetallic jacketed constructions. The exception should apply to all sizes. It should not be necessary to test every other size and number of conductors in order to apply the exception.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The report referenced in the substantiation addresses only 12 AWG conductor. Extrapolation cannot be made to other conductor sizes without additional information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3342)

6- 69 - (310-15(b)(2)(a) Exception No. 5 (New)): Reject
SUBMITTER: Michael R. Puckett, Puckett Engineering
RECOMMENDATION: Add an exception to read as follows:
Exception No. 5: Derating factors may not apply for up to 30 current-carrying conductors installed in wireways, under provisions of Section 362-5.
SUBSTANTIATION: Section 362-5 waives the derating requirement of 310-15(b)(2)(a). The proposed text addition is similar to Exception No. 2 for conductors installed in cable trays.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is redundant. The exception is covered under 362-5 and 374-6(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3397)

6- 70 - (310-15(b)(2)(a) Exception No. 5 (New)): Reject
SUBMITTER: Darrell Lombardi, Center Greenlake
RECOMMENDATION: Add a new Exception to read as follows:
Exception No. 5: Where heating load conductors and cooling load conductors are contained in the same raceway only the heating current carrying conductors or the cooling current carrying conductors shall be counted as current carrying conductors, whichever is larger, for purposes of applying adjustment factors.
SUBSTANTIATION: Heating and cooling load conductors are counted together when determining the adjustment factor for conductors in a raceway. Only one group of conductors will be current carrying depending on the temperature of the area being heated or cooled. The larger number of conductors in a group should be the only conductors counted when determining the adjustment factor.
PANEL ACTION: Reject.
PANEL STATEMENT: This recommendation would be redundant. Load diversity for noncoincidental loads as suggested in the recommendation is covered in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4199)

6- 71 - (310-15(b)(2)a Exception No. 5 (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add a new exception No. 5 as follows:
Exception No. 5: Derating factors shall not apply where 30 or fewer current-carrying conductors occupy no more than 20 percent of the interior cross sectional area of Underfloor Raceways, Article 354; Cellular Metal Floor Raceways, Article 356; and Cellular Concrete Floor Raceways, Article 358.
SUBSTANTIATION: For good reason, these raceway articles forbid the reinsulation of conductors at abandoned outlets. However, the present Code builds in a powerful economic incentive to violate these rules. This is because Note 8(a) complicates the simple solution to the problem. If this proposal is accepted, it will be a simple matter to use one pair of conductors for each outlet, spliced in a header duct of some kind. Then if an outlet is to be abandoned, the pair of wires can be simply withdrawn with a pull wire left in place for the future. Although this can be done now, the literal effect of Note 8(a) would be to require oversized conductors on many runs, which needlessly discourages the practice. In fact, with generally small loads split up over many pairs of wires, or even a large load using only one pair of wires in a group, there is no problem. These raceways are large in area and well embedded in an excellent "heat sink" medium. Massachusetts has made this exception for the last seven editions of the Code without incident.
This wording, in comparison to that submitted in 1990 (Proposal 6-112), adds restrictions comparable to metal wireways. This will provide a more technically correct basis for the existing rule in terms of preventing overheating. If these installations overheat, then the wireways would also. The panel objected to this substantiation in the previous cycle based on a lack of calculations. Let's try common sense instead. One of these metal raceways embedded in a concrete floor would be very unlikely to cause a problem for the enclosed conductors based on standard usage patterns and similarities with other raceways of comparable cross section.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's substantiation is not related to the recommendation. No data or calculation was given in the substantiation to support the technical change in the derating factor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4396)

6- 72 - (310-15(b)(2)a Exception No. 5 (New)): Reject
SUBMITTER: Monte R. Ewing, State of Wisconsin
RECOMMENDATION: Add a new Exception to read as follows:
Exception No. 5: The derating factors shown above do not apply to branch circuits supplying an individual dwelling unit.
SUBSTANTIATION: This exception has been incorporated into the State of Wisconsin Electrical Code for many years now. Because of the individual dwelling unit's load diversity and circuit design requirements from Article 220 Wisconsin does not see a need for additional derating. There has been no documented problems of overloading caused from bunding of the dwelling unit branch circuits to justify derating of these conductors. After more than 15 years of this exception being in the Wisconsin Code I feel it should be addressed in the National Electrical Code.
PANEL ACTION: Reject.
PANEL STATEMENT: No data, calculations, or testing was submitted to support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
KOMASSA: I agree with the submitter that having over 15 years of time honored experience without any overloads throughout the entire State of Winconsin is a sufficient reason to accept the proposed change.

(Log #2594)

6- 73 - (310-15(b)(2)(a) Exceptions No. 5 and No. 6 (New)): Reject
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Add a new Exception No. 5 and No. 6 to Section 310-15(b)(2)(a). The new Exceptions are to read as follows:
Exception No. 5: For conductors installed in metallic wireways.
Exception No. 6: For conductors installed in sheet metal auxiliary gutters.
SUBSTANTIATION: The derating of conductor ampacity for metal wireways and sheet metal auxiliary gutters is not applied the same as it is for other raceways. Sections 362-5, 374-5(a), and 374-6(a) provide conditions which would permit no ampacity derating. It is important that the Code user be alerted that Table 310-15(b)(2)(a) does not apply to all wireway and sheet metal auxiliary gutter installations.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is redundant. The exception is covered under 362-5 and 374-6(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3451)

6- 74 - (310-15(b)(2)(a) Exceptions No. 5 and No. 6 (New)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Add new Exception Nos. 5 and 6 to Section 310-15-(b)(2)(a). The new Exceptions are to read as follows:
Exception No. 5. For conductors installed in metallic wireways.
Exception No. 6. For conductors installed in sheet metal auxiliary gutters.
SUBSTANTIATION: The derating of conductor ampacity for metal wireways and sheet metal auxiliary gutters is not applied the same as it is for other raceways. Sections 362-5, 374-5(a), and 374-6(a) provide conditions which would permit no ampacity derating. It is important that the Code user be alerted that Table 310-15 (b)(2)(a) does not apply to all wireway and sheet metal auxiliary gutter installations.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is redundant. The exception is covered under 362-5 and 374-6(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3735)

6- 75 - (310-15(b)(2)(a) Exceptions No. 5 and No. 6 (New)): Reject
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Add new Exception No. 5 and No. 6 to Section 310.15(b)(2)(a). The new Exceptions are to read as follows:
Exception No. 5: For conductors installed in metallic wireways, the provisions of Section 362.5 shall apply.
Exception No. 6: For conductors installed in sheet metal auxiliary gutters, the provisions of Sections 374.5(a) and 374.6(a) shall apply.
SUBSTANTIATION: The derating of conductor ampacity for metal wireways and sheet metal auxiliary gutters is not applied the same as it is for other raceways. Sections 362.5, 374.5(a), and 374.6(a) provide conditions which would permit no ampacity derating. It is important that the Code user be alerted that Table 310.15(b)(2)(a) does not apply to all wireway and sheet metal auxiliary gutter installations.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is redundant. The exception is covered under 362-5 and 374-6(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #805)

6- 76 - (310-15(b)(3)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(3) Where bare or covered circuit conductors ~~are used~~ contained in a raceway, cable, auxiliary gutter, cable tray, cablebus, or direct-buried, in close proximity with insulated conductors, ~~their allowable ampacities shall be limited to those permitted for the adjacent insulated conductors.~~ they shall be considered to have insulation equal to the lowest insulation temperature rating of the adjacent insulated conductors, for the purpose of determining their allowable ampacity.
Exception: Uninsulated conductors of Type SE cable shall be considered to have the same ampacity as the insulated conductors.
SUBSTANTIATION: The phrase "insulated conductors" would apply this section to a bare grounded conductor used with insulated ungrounded conductors in an aerial span between poles or bare spans between poles where insulated conductors in raceway or cable are tapped to them and run down the pole, or they are tapped by insulated conductors for signs or fixtures. This section does not correlate with Table 310-21 and doesn't consider open single conductor spans where spacing and air renders this section somewhat irrelevant. The ampacity determined is more reasonably applied where bare conductors are run with circuit conductors as indicated in the proposal, which covers wiring methods used for perhaps the most common use of bare conductors aside from aerial wiring (services).
In accordance with present literal wording, a bare service neutral which is double the circular mil area of the largest insulated phase conductor, to compensate for harmonic currents, the allowable ampacity is limited to that of the insulated phase conductors.
Present wording does not address the size or material of bare conductors but allows an ampacity of the insulated conductors regardless of size or material of the bare or insulated conductors.
With no code tables indicating the ampacity of bare conductors in raceways or cables, the average code user cannot readily determine what the ampacity is for a particular size, in comparison to insulated conductors. This can be helped by assuming an insulation temperature rating.
The exception would correlate with UL listing which considers an uninsulated conductor of Type SE cable to have the same ampacity as the insulated conductors even where it is a smaller size.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wording does not add any clarification to the existing requirement. It would limit the requirement to branch circuits only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1526)

6- 77 - (310-15(b)(4)a): Reject
SUBMITTER: James A. Popma, Engineering Design Assoc., Inc.
RECOMMENDATION: Revise to read as follows:
(a) A neutral conductor that carries only the unbalanced current from other conductors of the same multi-wire branch circuit shall not be required to be counted when applying the provisions of Section 310-15(b)(2)(a).
SUBSTANTIATION: I know of contractors who are not counting the neutral of a 120V 2-wire circuit (when derating because of multiple conductors in the same raceway). I think the above change would help clarify their misunderstanding.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wording does not add any clarification to the existing requirement. It would limit the requirement to branch circuits only. Multi-wire usage does not change the unbalanced current concept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2865)

6- 78 - (310-15(b)(4)(b)): Reject
SUBMITTER: David Harmon, Barth Electric
RECOMMENDATION: Revise text to read as follows:
In any 3-wire circuit consisting of either one line-to-line circuit requiring a grounded conductor or two 2-wire circuits sharing a common neutral of a 4-wire, 3-phase wye connected system, a common conductor carries approximately the current... etc.
SUBSTANTIATION: The previous wording of "In a 3-wire circuit" seems to exclude the situation of two single-phase circuits sharing a common neutral.
PANEL ACTION: Reject.
PANEL STATEMENT: Present text does not exclude what the submitter has described in the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3415)

6- 79 - (310-15(b)(4)(c)): Reject
SUBMITTER: Nicholas T. Abbatiello, Spencerport, NY
RECOMMENDATION: Add the following sentence at the end:
"An additional adjustment factor shall be required where conductors, which are part of an overall assembly with an outer covering or sheath impeding heat flow, are installed in a raceway. Such assemblies shall include Power and Tray Cables (Type TC) installed within raceways such as conduits, tubing, wireways, etc."
SUBSTANTIATION: In many instances Variable Frequency Drives, which produce nonlinear currents, are being used for motor speed control. In order to maintain reflected waves within acceptable boundaries, many manufacturers specify that shielded type TC cable assemblies be used. As long as the type TC cable is placed in open trays according to the specific rule there is no problem. However, many cables are being installed within raceways, which are enclosed and restrict the free flow of air around the cable jacket causing the conductors to run at higher than normal temperatures even if only an 80 percent factor is applied. A second factor application would afford some additional protection against possible overheating. There is no empirical data to substantiate this at this time, but the requiring of an additional factor would not be unduly restrictive until evaluation and experience data is obtained which either substantiates or refutes the need.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide any data to substantiate the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #348)

6- 80 - (310-15(b)(5)a (New)): Reject
SUBMITTER: Robert Reed, Wood County Building Dept., OH
RECOMMENDATION: Add a new 310-15(b)(5)(a) to read as follows:
On a 4-wire, 3-phase wye circuit where the major portion of the load consists of nonlinear loads, harmonic currents can be present in the equipment grounding conductor also. See 310-15(b)(4)(c) and 310-4 (FPN).
SUBSTANTIATION: Awareness of the problems range from power company lines to burnt up neutral and expensive equipment. Also, the grounding conductors are sized to trip overcurrent devices, not to carry current from nonlinear loads.
PANEL ACTION: Reject.
PANEL STATEMENT: 310-15(b)(4) adequately addresses the situation relative to the harmonic current source described in the recommendation. The equipment grounding conductor must be sized in accordance with Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #364)

6- 81 - (310-15(b)(6)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence:
For application of this section, the main power feeder shall be the feeder(s) between the main disconnect and the lighting and appliance branch-circuit panelboard(s), and the feeder conductors to a dwelling unit shall not be required to ~~be larger than~~ have an ampere rating higher than their service-entrance conductors.
SUBSTANTIATION: Editorial. Where aluminum main power feeder conductors are required to have a (ampere) rating equal to copper service-entrance conductors, the feeder conductors should be larger than the service-entrance conductors. Present wording suggests No. 4 aluminum feeder conductors, for example, may have the same rating as No. 4 copper service-entrance conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: Present Code wording does not lead to the interpretation included in the substantiation provided by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #436)

6- 82 - (310-15(b)(6)): Accept
SUBMITTER: Mike Theisen, St. Cloud, MN
RECOMMENDATION: Break up the compound sentence into two sentences to read as follows:
For application of this section, the main power feeder shall be the feeder(s) between the main disconnect and the lighting and appliance branch-circuit panelboard(s) ~~and t~~ The feeder conductors to a dwelling unit shall not be required to be larger than their service-entrance conductors.
SUBSTANTIATION: When two sentences are used, the section is easier to read and understand the first time through. One sentence describes the "main power feeder" and the second sentence deals with the limitation on the required size of the feeder.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3677)

6- 83 - (310-15(b)(6)): Reject
SUBMITTER: Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL
RECOMMENDATION: Revise text to read as follows:
(6) 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. For dwelling units, and detached residential garages, conductors, as listed in Table 310-15(b)(6), shall be permitted as 120/240-volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to a dwelling unit, or detached residential garage, and are installed in raceway or cable with or without an equipment grounding conductor. For application of this section, the main power feeder shall be the feeder(s) between the main disconnect and the lighting and appliance branch-circuit panelboard(s), and the feeder conductors to a dwelling unit or detached residential garage shall not be required to be larger than their service-entrance conductors. The grounded conductor shall be permitted to be smaller than the ungrounded conductors, provided the requirements of Sections 215.2, 220.22, and 230.42 are met.

SUBSTANTIATION: By adding this text, it would put the garage in the same category as the dwelling. If the garage is attached to the dwelling and you had a panel located in the garage you would allow one to derate the feeder.
PANEL ACTION: Reject.
PANEL STATEMENT: A detached residential garage may include a workshop and thus would not provide the diversity similar to a dwelling unit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3908)

6- 84 - (310-15(b)(6)): Accept
SUBMITTER: Ronald E. Gnotke, Rep. Minnesota Board of Electricity
RECOMMENDATION: Revise text to read as follows:
310.15(b)(6) SE Cable from Article 338.4(a) installed as an indoor feeder shall comply with Parts A and B of Article 336, except Section 336.26. The grounded conductor shall be permitted to be smaller, than the ungrounded conductors, provided the requirements of Section 215.2, 220.22, and 230.42 are met.
SUBSTANTIATION: Recommend that the underlined sentence be added to Section 310.15(b)(6) to eliminate confusion in the field being created by Section 336.26 which requires that indoor installations of SE cable be restricted to the ampacity rating of 60°C, which conflicts with the first part of this paragraph.
PANEL ACTION: Accept.
PANEL STATEMENT: Panel recognizes that the submitter is not recommending deletion of the text of 310-15(b)(6) not shown in the proposal. Also, if Panel 7 accepts a similar proposal, then it is not necessary to accept this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
ZIMNOCH: Type SE cable is constructed from the same insulation and jacket materials as other wire types. Where imbedded in thermal insulation (fiberglass, rock wool, styrofoam, etc.) type SE cables are subjected to the same thermal degradation and rules of physics as other wire and cable types. There is no reason type SE should be subjected to less-stringent requirements.

(Log #4200)

6- 85 - (310-15(b)(6)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
(6) 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. For dwelling units, conductors, as listed in Table 310-15(b)(6), shall be permitted as 120/240-volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as ~~the main~~ a principal power feeder to a dwelling unit and are installed in raceway or cable with or without an equipment grounding conductor. For application of this section, ~~the main~~ a principal power feeder shall be ~~the~~ a feeder~~(s)~~ that supplies not less than 40 percent of the line-to-neutral load of a dwelling unit. ~~between the main disconnect and the lighting and appliance branch-circuit panelboard(s), and~~ The feeder conductors to a dwelling unit shall not be required to be larger than their service-entrance conductors. The grounded conductor shall be permitted to be smaller than the ungrounded conductors, provided the requirements of Sections 215-2, 220-22, and 230-42 are met.
SUBSTANTIATION: The wording of this section in the 1999 NEC is schizophrenic. It describes "the" main power feeder (emphasis on the singular) as being the "feeder(s)" to the lighting and appliance branch-circuit "panelboard(s)" (emphasis on the possible plural). Many, if not the majority of, dwelling unit 400A services are wired with two 200A panels. Which one is the main one? After three cycles of service on CMP 9 I can assure CMP 6 that almost invariably both panels would have enough small line-to-neutral circuits to qualify as lighting and appliance branch-circuit panelboards, so the distinction in the present Code is one without a difference. This proposal is a constructive attempt to provide more effective language that is consistent with the prior panel intent. The 40 percent parameter should be large enough to assure diversity and yet small enough that the load across two panels need not be balanced exactly.
PANEL ACTION: Reject.
PANEL STATEMENT: The present wording adequately describes the requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4311)

6- 86 - (310-15(b)(6)): Accept
SUBMITTER: J. Kevin Vogel, Crescent Electrical Supply
RECOMMENDATION: Delete the two commas in the last sentence of the text, the one between the words "smaller" and "than"; and the one between the words "conductors" and "provided".
SUBSTANTIATION: The present text with the offending commas is grammatically incorrect.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2895)

6- 87 - (Table 310-15(b)(6)): Reject
SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI
RECOMMENDATION: Revise Table 310-15(b)(6) as follows.

Table 310-15(b)(6). Conductor Types and Sizes for 120/240 Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. Conductor Types RH, RHH, RHW, RHW-2, THHN, THHW, THW, THW-2, THWN, THWN-2, XHHW, XHHW-2, SE, USE, USE-2

Conductor (AWG or kcmil)		Service or Feeder Rating in Amps	
Copper	Aluminum or Copper-Clad Aluminum	≤30°C (86°F)	>30°C (86°F)
4	2	100	—
3	1	110	—
2	1/0	125	100
1	2/0	150	125
1/0	3/0	175	150
2/0	4/0	200	175
3/0	250 kcmil	225	200
4/0	300 kcmil	250	225
250 kcmil	350 kcmil	300	250
350 kcmil	500 kcmil	350	300
400 kcmil	600 kcmil	400	350
500 kcmil	750 kcmil	—	400

SUBSTANTIATION: This table needs to include amperages for feeders being used in greater than 30 degree C areas. This table was developed by a professional engineer about 8 years ago for the Maricopa Association of Governments NEC Amendments. To leave this section the way it is does not address areas with higher ambient temperatures.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has provided no technical substantiation for changing the table.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2417)

6- 88 - (310-15(b)(7)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 for information.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete the second sentence in 310-15(b)(7) which reads:
"Termination fittings incorporating unimpregnated, organic, insulating materials shall be limited to 90°C (194°F) operation."
SUBSTANTIATION: This is an installation requirement and, therefore should be in 330-15 rather than 310.
A companion proposal has been submitted to add to 330-15 the requirement not to exceed the listed temperature rating of the end seal termination.
PANEL ACTION: Accept in Principle.
See panel action on Proposal 6-91.
PANEL STATEMENT: See panel statement on Proposal 6-91. This proposal is forwarded to Panel 7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-91.

(Log #2418)

6- 89 - (310-15(b)(7)): Accept in Principle in Part
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 for information.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise as follows:
(7) Mineral-Insulated, Metal-Sheathed Cable. The temperature limitations on which the ampacities of mineral-insulated, metal-sheathed cable are based shall be determined by the insulating materials used in the end seal <u>termination</u>. ~~Termination fittings incorporating unimpregnated, organic, insulating materials shall be limited to 90°C (194°F) operation.~~ The operating temperature of the end seal termination shall not exceed its listed operating temperature.
SUBSTANTIATION: While the temperature limitation is currently 90°C for end seal terminations that incorporate unimpregnated, organic, insulating materials, the listing temperature may be higher or lower than 90°C based on the materials used.
PANEL ACTION: Accept in Principle in Part.
Change the word "termination" to "fitting" in the first sentence of the recommendation. Accept the deleted text in the recommendation and delete the last sentence of the recommendation.
PANEL STATEMENT: See panel action and statement on Proposal on 6-91. The proposal is forwarded to Panel 7 in addition to Proposal 6-90.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-91.

(Log #2441)

6- 90 - (310-15(b)(7)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 for information.
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
RECOMMENDATION: Delete Section 310-15(b)(7).
SUBSTANTIATION: Section 310-15(b)(7) first appeared as Note 5 in the 1959 NEC and has remained, essentially, the same since. Section 310-15(b) addresses ampacities for conductors rated 0 to 2000 volts as specified in the Allowable Ampacity Tables 310-16 through 310-19 and Ampacity Tables 310-20 and 310-21 as modified by (b)(1) through (b)(7).
Subsection (b)(7) is not "user friendly" and in its present location offers very little, if anything, to the provisions for determining the allowable ampacities of conductors. The text of subsection (b)(7) relates more to the provisions of Section 330-15 (Terminal Seals) and is better suited and should be relocated to be included in Section 330-15. See companion proposal for the relocation of the text of (b)(7) to Section 330-15.
PANEL ACTION: Accept in Principle.
Panel 6 accepts this recommendation provided that the text of 310-15(b)(7) in its entirety is relocated to Article 330.
PANEL STATEMENT: The relocation of text is appropriate because it deals with installation and uses of Type MI Cable. This text modifies the general requirements for ampacity in Article 310 for specific installation criteria for Type MI Cables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-91.

(Log #4306)

6- 91 - (310-15(b)(7)): Accept in Principle in Part
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 1 and 7 for information.
SUBMITTER: L. James Milne, BICCGeneral
RECOMMENDATION: Revise text to read as follows:
(7) Mineral-Insulated, Metal-Sheathed Cable. The temperature limitations on which the ampacities of mineral-insulated, metal-sheathed cable are based shall be determined by the insulating materials used in the end seal. ~~Termination fittings incorporating unimpregnated, organic, insulating materials shall be limited to 90°C (194°F) operation.~~ <u>The conductor temperature at the termination shall not exceed the listed temperature rating of the end seal termination. When mineral insulated cable is bundled in accordance with Section 330-16, ampacities from either Table 310-16 or 310-17 can be used providing the temperature limit of the cable's end termination is not exceeded.</u>
SUBSTANTIATION: This section, essentially unchanged through the 1999 edition, has been in the National Electrical Code since MI cable made its first appearance in the 1953 edition. The substantiating fact finding study performed by Underwriters Laboratories on January 15, 1951 states "The end terminations limit the cable to use in dry locations at 85°C. The end terminations also limit the cable to use in wet locations at 60°C. The cable itself, exclusive of the end terminations, is rated 250°C". Since this inclusion, the temperature rating of the standard terminations has been raised to 90°C, reflecting advances in the materials used in the terminations. This proposal recommends elimination of any reference to the actual temperature limit since, depending on components used, the end seal termination could have a higher or lower temperature limit." The study further states "No long time aging tests were considered necessary to determine the effects a temperature of 250°C would have on the physical properties of the magnesium oxide since this material is produced under a temperature of 1450° to 1500°C. ...Reference to technical literature indicates that up to a temperature of 232°C (450°F) oxidation of copper is not considered a problem. Oxidation above this temperature becomes more serious but at 250°C (482°F) it is generally considered as a superficial tarnish. For these reasons no long time tests on the copper at 250°C were included in the investigation." The relevant page of the fact finding study has been submitted with this proposal.

Since its recognition in the 1953 NEC, there have been literally thousands of installations of single conductor mineral insulated cable sized in accordance with Table 310-17, or its equivalent from the past. The cables have always been bundled, each bundle containing one of each phase conductors and, when required, a neutral. When parallel runs have been necessary, the same bundling has been applied with 2.15 cable diameters between bundles which is consistent with Section 318-11(b)(4).

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle in Part.

Revise text to read as follows:

"(7) Mineral-Insulated, Metal-Sheathed Cable. The temperature limitations on which the ampacities of mineral-insulated, metal-sheathed cable are based shall be determined by the insulating materials used in the end seal fitting. The conductor temperature at the termination shall not exceed the listed temperature rating of the end seal fitting. When mineral insulated cable is bundled in accordance with 330-16, ampacities from applicable ampacity tables can be used in accordance with 110-14 provided the temperature limit of the cable's end seal fitting is not exceeded."

PANEL STATEMENT: The panel accepts the deleted text in the recommendation. Panel modified the proposed new text to include permitted applications of MI Cables in accordance with various ampacity tables, including tables 310-16 and 310-17. The Panel changed "end seal terminations" to "end seal fittings" and included a reference to 110-14 for added clarity. This proposal is forwarded to Panel 7 in addition to proposal 6-90.

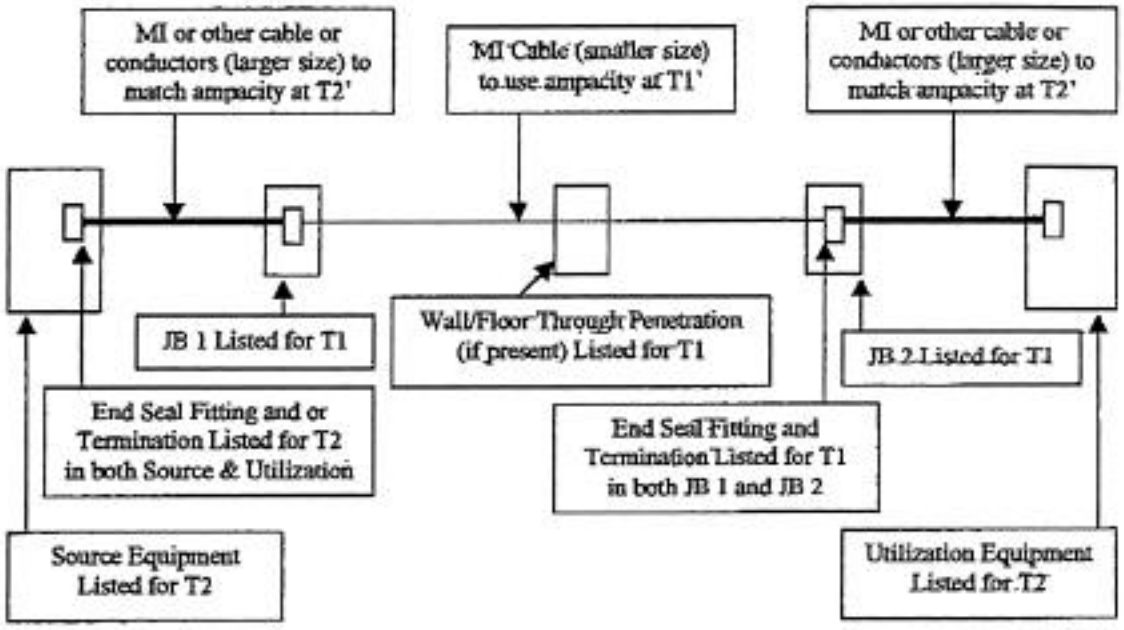
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

GANATRA: We believe that the schematic [1] I have provided provides an explanation of the actions by CMP 6, in particular, and by CMP 7 on Proposals, 6-88, 6-89, 6-90, 6-92, 6-93, 6-94, 6-106, 6-113, and 7-82, 7-83, 7-86, and 7-88 for 2002 NEC. Panel Actions by CMP 6 and CMP 7 should be reviewed to avoid an erroneous interpretation that can create confusion regarding the use of excellent thermal properties of MI Cable. Also, at the same time compliance with the requirements of 110-14 shall not be compromised. (See Proposal 1-227).



Ampacity of MI Cable or permitted arrangement of MI Cable (single conductor) between JB 1 and JB 2.

Ampacity shall not exceed, after permitted derating the corresponding ampacity at T1 to comply with the listing requirement of terminations in JB 1 or JB 2 and associated MI Cable End Seal Fittings and any wall or floor through penetrating products, if present, in accordance with 110-14.

Ampacity of MI Cable or permitted arrangement of MI Cable (single conductor) or other conductors or cables between source and JB 1 and JB 2 and utilization:

Ampacity of connected conductors, after permitted derating shall not exceed the corresponding values in Table 310-16 to comply with the requirements of 110-14.

[1] The above schematic is based on "Wire Temperature Termination Requirements Can Be Your Terminator If You Don't Know All the Rules" by Jim Pauley - Square D Company (August 1995 Publication 1001H09301R7/95)

(Log #1987)

6- 92 - (310-15(c)): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Substitute "scientific" for "conductor" in the second line.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions. The word conductor is redundant because ampacities apply only for conductors by definition.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-91.

(Log #3191)

6- 93 - (310-15(c)): Reject
SUBMITTER: William J. Miner, Saginaw, MI
RECOMMENDATION: In the second line of 310-15(c), add the words "determined using the tables of Appendix B or" before the word calculated so it should read "... ampacities shall be permitted to be determined using the tables of Appendix B or calculated by...
SUBSTANTIATION: This section only makes references to the calculations in Appendix B but there are also ampacity tables in Appendix B available to be used by engineers.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation would use nonmandatory text from the appendix as mandatory requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-91.

(Log #4122)

6- 94 - (310-15(c)): Reject
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: In the second line before the word "calculated", add the following new words: determined using the tables in Appendix B, or. The section will then read:
"...ampacities shall be permitted to be determined using the tables in Appendix B, or calculated by means of...".
SUBSTANTIATION: There are tables in Appendix B for determining the allowable ampacity of conductors. Section 310-15(c) only makes reference to use of the formula for calculating the ampacity. There is no reason to include these tables in Appendix B if they cannot be used by engineers.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-93.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-91.

(Log #412)

6- 95 - (Table 310-16): Accept in Principle
SUBMITTER: Jerry Richardson, TFE, Inc.
RECOMMENDATION: Revise as follows:

60°C (140°F)	75°C (167°F)	90°C (194°F)
Types TW, UF	Types ~~FEPW~~ RH, RHW	Types TBS, SA

SUBSTANTIATION: FEPW is not defined in Table 310-13.
PANEL ACTION: Accept in Principle.
In addition to the recommendation delete Type RH in accordance with the panel action on Proposal 6-5.
PANEL STATEMENT: See panel action on Proposal 6-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #806)

6- 96 - (Table 310-16): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise ampacity figures for No. 14, 12, and 10 conductors to values shown in the 1978 code.
SUBSTANTIATION: Table 310-16 ampacities for No. 14, 12, and 10 conductors were revised in the 1981 code with an obelisk note indicating load current rating and overcurrent protection shall not exceed 15, 20, and 30-amperes, respectively for copper, and 15 and 25-amperes, respectively, for aluminum (now Section 240-3(d)). The apparent benefit or result was to allow the increased ampacities to offset derating factors while maintaining previous allowable load currents. Higher ampacities only for derating purposes are not provided for other conductor sizes, and if these smaller sizes of conductors are only suitable for lower currents as limited by Section 240-3(d) without any derating, how can they be suitable for the same current where derating is required?

Proposal 6-81 in the 1986 TCR resulted in the addition of "unless otherwise specifically permitted elsewhere in this code" to the note presumably to allow for higher overcurrent protection ratings, such as permitted for motors. Article 430 is not "specific" relating to these conductor sizes, but indirect, by requiring minimum conductor ampacity and maximum overcurrent device ratings. "Specifically permitted" appears to apply only to sections such as 240-3(a); 240-21; 460-8; and 668-30(d); Article 630 and the like.

Proposal is based on the premise that overcurrent protection (overload, short-circuit, ground-fault) protection is technically only achieved where the overcurrent device is located at the point of supply for conductors.

No. 14 copper supply conductors to a building, supplied from an outside panelboard and with overcurrent protection rated at 15 amperes could supply a 15-ampere load; the same conductors tapped from an outside feeder or transformer secondary (any rating) without overcurrent protection at the tap, could terminate at a single overcurrent device rated 20-amperes and supply a 20-ampere load, an increase of 33-1/2 percent (the No. 14 conductors are a feeder size not governed by Section 215-21(a)). This scenario could be applied to similar installations where the higher ampacity is permitted.

The added hazards of conductors without overcurrent protection at their point of supply is exacerbated where higher ampacities are also permitted without length restrictions or conductor size/ampacity ratios.

The present Section 240-3(d) in effect negates any slight ampacity increase permitted by an ambient temperature of 21°-25°C. The small increases, whereby Section 240-3(b) could be used, is in conflict with Section 240-3(d). Those could be critical factors in borderline installations underground or in controlled temperature environments judged to be 21°C - 25°C.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide any data or technical information to substantiate a change in the existing requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1533)

6- 97 - (Table 310-16): Reject
SUBMITTER: William J. Tipton, I.B.E.W. Local 575
RECOMMENDATION: Return Table 310-16 to its 1996 format.
SUBSTANTIATION: In the 1996 Code the obelisk (†) beside the ampacities rating for 14, 12, and 10 was referenced at the bottom of page where most people read the information. In the 1999 Code the use of an asterisk and only an article reference at the bottom of the page, and even the reference is not specific it should read 240-3D, some people will not look it up and therefore conductors will not be properly protected.
PANEL ACTION: Reject.
PANEL STATEMENT: The present Code has the requirements in the correct location.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1710)

6- 98 - (Table 310-16): Reject
SUBMITTER: Ray C. Mullin, Ray C. Mullin Books
RECOMMENDATION: In the 75°C column, change the ampacity of 500 kcmil from ~~380~~ amperes to 400 amperes.
SUBSTANTIATION: Some inspectors have been accepting 500 kcmil copper conductors as 400 ampere conductors for years. For example, a 1,200 ampere service would consist of three 500 kcmil copper conductors per phase...a 1,600 ampere service would consist of four 500 kcmil copper conductors per phase.
In Table 310-16:

Conductor Size	Circular Mils	Ampacity	Comments
3	52,620	100	
3/0	167,800	200	2X the ampacity of a No. 3 and 3≠X the circular mil area.
500 kcmil	500,000	380	Not quite 4X the ampacity of a No. 3 and approximately 10X the circular mil area.

Because of the great load diversity in services and feeders, I sincerely believe that changing the allowable ampacity of a 500 kcmil from 380 to 400 would not compromise the current carrying ability of a service or feeder.
The multiple of 400 would make it extremely easy to determine conductor sizes for 1,200, 1,600, 2,000, and larger ampere rated services.
A precedent is already in place in Section 310-15(b)(6) for single-phase, residential services.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide any data to substantiate the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2251)

6- 99 - (Table 310-16): Reject
SUBMITTER: Philip Meyer, Ohio Valley General Hospital
RECOMMENDATION: Add statement "See 110-14(c) 1 and 2" in the heading at the top of Table 310-16 after (140°F through 194°F) and before, not more than three current carrying conductors.
SUBSTANTIATION: To be sure that people understand the provisions of the Code having to do with temperature limitations and the use of the 90°C column in 310-16.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is a redundant cross reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2491)

6- 100 - (Table 310-16): Reject
SUBMITTER: Lynn Adams, Escambia County, FL
RECOMMENDATION: Restore the wording contained in 240-3(d), relating to the overcurrent protection for conductors sized #14, #12, #10, to the actual footnote with the table.
SUBSTANTIATION: This table is often reproduced in chart form and posted in supply houses, hardware stores, and home centers. The table, without the referenced Section 240-3(d), gives incorrect or incomplete information. Even with the referenced section, the information is buried and difficult to find. Placing the information with the table will aid in the correct wire size selection.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 6-97.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3106)

6- 101 - (Table 310-16): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the third and sixth columns of the table heading.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3422)

6- 102 - (Table 310-16): Accept in Part
SUBMITTER: Steven R. Musial, II, Pittsburgh, PA
RECOMMENDATION: At the bottom of the Table revise to read:
See Section 240-3<u>(d)</u>.
Also, the vertical bar indicating a code change should extend from #14 to #10, <u>not</u> from #14 to #8 to the left of Table 310-16.
SUBSTANTIATION: Article 240-3 is rather long. Zero in on part (d) immediately, rather than require the novice reader to read all of 240-3 before finding the appropriate part.
I like the obelisks better. At least everything was on the same page.
PANEL ACTION: Accept in Part.
The panel accepts the addition of the reference to 240-3(d). The panel does not act on the vertical bar location.
PANEL STATEMENT: The vertical bar changes automatically with each Code revision.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

6- 103 - (Table 310-16): Reject
SUBMITTER: Joel Sandler, Lera Electric/Rep. IBEW Local 595
RECOMMENDATION: Add text to read:
"Temperature rating of conductor [see Table 310-13 <u>and 310-2(b) FPN, and 310-15(2)(b)</u>]."
SUBSTANTIATION: Significant inattention given to mitigating factors in determining temperature rating of conductors, especially with regard to derating due to connection points.
PANEL ACTION: Reject.
PANEL STATEMENT: The text referred to in the recommendation does not exist in the Code. Assuming that the recommendation addresses temperature limitations of conductors and terminations, the determination of temperature rating of conductors and terminations is adequately addressed in 110-14.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3822)

6- 104 - (Table 310-16(f)): Reject
SUBMITTER: Danial Osvold, Riviera Electric
RECOMMENDATION: Move some more useful information to the back 3 or 4 pages and the back cover. Move the information that exists on these pages elsewhere in the code book. Some possible ideas for more useful information is T310-16.
SUBSTANTIATION: Back 3 or 4 pages and cover are the most convenient pages and they have information that could be located in the front.
PANEL ACTION: Reject.
PANEL STATEMENT: No specific recommendation was made by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP604)

6- 104a - (Table 310-17): Accept
SUBMITTER: CMP 6
RECOMMENDATION: Delete "FEPW" from column three and change footnote to state "See 240-3(d)".
SUBSTANTIATION: Type FEPW is no longer produced. To be consistent with the format of other ampacity tables.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1531)

6- 105 - (Table 310-17): Reject
SUBMITTER: William J. Tipton, I.B.E.W. Local 575
RECOMMENDATION: Return Table 310-17 to its 1996 format.
SUBSTANTIATION: In the 1996 Code the obelisk (†) beside the ampacities rating for 14, 12, and 10 was referenced at the bottom of the page where most people read the information. In the 1999 Code the use of an asterisk and only an article reference at the bottom of the page, and even the reference is not specific it should read 240-3D, some people will not look it up and, therefore, conductors will not be properly protected.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-97.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2442)

6- 106 - (Table 310-17): Reject
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
RECOMMENDATION: Delete "MI" from the 90°C (copper) column of Table 310-17.
SUBSTANTIATION: According to the provisions of Section 330-16, "Where single conductor (Type MI) cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together to minimize induced voltage on the sheath." Though it is common practice to space polymeric single-conductor cables, it is not acceptable to space Type MI/MS single-conductor cables. They must be grouped (i.e., without spacing); and, according to the provisions of Section 330-12(1), they shall be "securely supported at intervals not exceeding 6 ft by straps, staples, hangers, or similar fittings." Grouped and securely supported every 6 ft do not qualify a single conductor in free air.
As MI presently appears in Table 310-17 would tend to lead users of the Code to believe that Type MI single-conductor cable can be run in free air without being grouped or supported and used at the Table 310-17 ampacities. Type MI cable is presently listed in the 90°C (copper) column of Table 310-16, and rightfully so.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements for grouping and other installation limitations are addressed in the Code. This proposal should be forwarded Panel 7 for reference only. See panel action on Proposal 6-91 for further information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-91.

(Log #3107)

6- 107 - (Table 310-17): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the third and sixth columns of the table heading.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #807)

6- 108 - (Table 310-18): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise heading to read as follows:
Allowable Ampacities of Three Single Insulated Conductors Rated 0 through 2000 Volts, 150°C to 250°C (302° to 482°F). Not more Than Three Current-Carrying Conductors in Raceway or Cable Based on Ambient Air Temperature of 40°C (104°F).
SUBSTANTIATION: Editorial. Present wording does not provide a distinction for neutral conductors which may be exempted by virtue of Section 310-15(b)(4). This distinction is provided in Table 310-16, which omission in this table may infer that section does not apply.
PANEL ACTION: Accept in Principle.
Revise title to read as follows:
"Table 310-18. Allowable Ampacities of Insulated Conductors Rated 0 Through 2000 Volts, 150°C Through 250°C (302°F Through 482°F). Not More than Three Current-Carrying Conductors in Raceway or Cable, Based on Ambient Air Temperature of 40°C (104°F)."
PANEL STATEMENT: The heading would be consistent with other table headings.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3726)

6- 109 - (310-19 Note): Reject
SUBMITTER: Anthony Bartolomeo, A&L Electric
RECOMMENDATION: Revise text to read:
"Based on the sizes of some residential 1 family dwellings this chart should be increased to show conductor sizes for up to 800 amp service.
To include both separate conductors, and paralleled conductors."
SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: No data was submitted to substantiate the recommendation. Additionally, the recommendation did not refer to a specific part of the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #21)

6- 110 - (Table 310-20): Accept in Principle
NOTE: The following proposal consists of Comment 6-54 on Proposal 6-50 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-50 was:
The Technical Correlating Committee has agreed that this proposal be submitted to the Panel as a public proposal.
Revise as follows:
310-15. Ampacities for Conductors Rated 0–2000 Volts.
(a) General.

(1) Tables or Engineering Supervision. Ampacities for conductors shall be permitted to be determined by tables or under engineering supervision, as provided in (b) and (c) below.

(FPN No. 1): Ampacities provided by this section do not take voltage drop into consideration. See Section 210-19(a), FPN No. 4, for branch circuits and Section 215-2(b), FPN No. 2, for feeders.

(FPN No. 2): For the allowable ampacities of Type MTW wire, see Table 11 in the Electrical Standard for Industrial Machinery, NFPA 79-1994.

(2) Selection of Ampacity. Where more than one calculated or tabulated ampacity could apply for a given circuit length, the lowest value shall be used.

Exception: Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity shall be permitted to be used beyond the point of transition, a distance equal to 10 ft (3.05 m) or 10 percent of the circuit length figured at the higher ampacity, whichever is less.

(FPN): See Section 110-14(c) for conductor temperature limitations due to termination provisions.

(b) Tables. Ampacities for conductors rated 0 to 2000 volts shall be as specified in the Allowable Ampacity Tables 310-16 through 310-19 as modified by (1) through (7) below.

(FPN): Tables 310-16 through 310-19 are application tables for use in determining conductor sizes on loads calculated in accordance with Article 220. Allowable ampacities result from consideration of one or more of the following:

1. Temperature compatibility with connected equipment, especially at the connection points
2. Coordination with circuit and system overcurrent protection
3. Compliance with the requirements of product listings or certifications. See Section 110-3(b)
4. Preservation of the safety benefits of established industry practices and standardized procedures

(1) General. For explanation of type letters used in tables and for recognized sizes of conductors for the various conductor insulations, see Section 310-13. For installation requirements, see Sections 310-1 through 310-10 and the various articles of this Code. For flexible cords, see Tables 400-4, 400-5(A), and 400-5(B).

(2) Adjustment Factors.

a. More than Three Current-Carrying Conductors in a Raceway or Cable. Where the number of current-carrying conductors in a raceway or cable exceeds three, or where single conductors or multiconductor cables are stacked or bundled longer than 24 in. (610 mm) without maintaining spacing and are not installed in raceways, the allowable ampacity of each conductor shall be reduced as shown in Table 310-15(b)(2).

Table 310-15(b)(2). Adjustment Factors for More than Three Current-Carrying Conductors in a Raceway or Cable.

Number of Current-Carrying Conductors	Percent of Values in Tables 310-16 through 310-19 as Adjusted for Ambient Temperature if Necessary
4 through 6	80
7 through 9	70
10 through 20	50
21 through 30	45
31 through 40	40
41 and above	35

(FPN): See Appendix B, Table B-310-11, for adjustment factors for more than three current-carrying conductors in a raceway or cable with load diversity.

Exception No. 1: Where conductors of different systems, as provided in Section 300-3, are installed in a common raceway or cable, the derating factors shown in Table 310-20 shall apply to the number of power and lighting (Articles 210, 215, 220, and 230) conductors only.

Exception No. 2: For conductors installed in cable trays, the provisions of Section 318-11 shall apply.

Exception No. 3: Derating factors shall not apply to conductors in nipples having a length not exceeding 24 in. (610 mm).

Exception No. 4: Derating factors shall not apply to underground conductors entering or leaving an outdoor trench if those conductors have physical protection in the form of rigid metal conduit, intermediate metal conduit, or rigid nonmetallic conduit having a length not exceeding 10 ft (3.05 m) and the number of conductors does not exceed four.

b. More than One Conduit, Tube, or Raceway. Spacing between conduits, tubing, or raceways shall be maintained.

(3) Bare or Covered Conductors. Where bare or covered conductors are used with insulated conductors, their allowable ampacities shall be limited to those permitted for the adjacent insulated conductors.

(4) Neutral Conductor.

a. A neutral conductor that carries only the unbalanced current from other conductors of the same circuit ~~need not~~ shall not be required to be counted when applying the provisions of Section 310-15(b)(2). [minor editorial rewording]

b. In a 3-wire circuit consisting of two phase wires and the neutral of a 4-wire, 3-phase wye-connected system, a common conductor carries approximately the same current as the line-to-neutral load currents of the other conductors and shall be counted when applying the provisions of Section 310-15(b)(2).

c. On a 4-wire, 3-phase wye circuit where the major portion of the load consists of nonlinear loads, harmonic currents are present in the neutral conductor; the neutral shall therefore be considered a current-carrying conductor. [minor rewording for editorial clarity]

(5) Grounding or Bonding Conductor. A grounding or bonding conductor shall not be counted when applying the provisions of Section 310-15(b)(2).

(6) 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. For dwelling units, conductors, as listed in Table 310-15(b)(6), shall be permitted as 120/240-volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to a dwelling unit and are installed in raceway or cable with or without an equipment grounding conductor. For purposes of this section, the feeder conductors to a dwelling unit shall not be required to be larger than its service-entrance conductors. The grounded conductor shall be permitted to be smaller than the ungrounded conductors, provided the requirements of Sections 215-2, 220-22, and 230-42 are met.

Table 310-15(b)(6). Conductor Types and Sizes for 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. RH-RHH-RHW-THHW-THW-THWN-THHN-XHHW-USE

Copper AWG	Aluminum or Copper-Clad Aluminum AWG	Service or Feeder Rating Amperes
4	2	100
3	1	110
2	1/0	125
1	2/0	150
1/0	3/0	175
2/0	4/0	200
3/0	250 kcmil	225
4/0	300 kcmil	250
250 kcmil	350 kcmil	300
350 kcmil	500 kcmil	350
400 kcmil	600 kcmil	400

(7) Mineral-Insulated, Metal-Sheathed Cable. The temperature limitations on which the ampacities of mineral-insulated, metal-sheathed cable are based ~~is~~ shall be determined by the insulating materials used in the end seal. Termination fittings incorporating unimpregnated, organic, insulating materials ~~are~~ shall be limited to 90°C (194°F) operation. [minor editorial rewording]

(c) Engineering Supervision. Under engineering supervision, conductor ampacities shall be permitted to be calculated by means of the following general formula:

$$I = \sqrt{\frac{TC - (TA + DELTA\ \ TD)}{RDC(1 + YC)RCA}}$$

Where:
TC = Conductor temperature in degrees C
TA = Ambient temperature in degrees C
DELTA TD = Dielectric loss temperature rise
RDC = DC resistance of conductor at temperature TC
YC = Component ac resistance resulting from skin effect and proximity effect
RCA = Effective thermal resistance between conductor and surrounding ambient

(FPN): See Appendix B for examples of formula applications

TABLES 310-16 THROUGH 310-19 HERE
to be inserted here

The only modifications to the tables are as follows:

1. Remove the text after the obelisk note at the bottom of Table 310-16 and 310-17 and replace with "See Section 240-3". Apply the obelisk symbol to the #14, #12 and #10 in both Column 1 and Column 8 in Table 310-16 and 17. The proposal for 240-3 would place the overcurrent limitations presently in the obelisk to all #14, #12 and #10 conductors except as permitted in the balance of Section 240-3.

2. Remove the obelisk symbol on all of the conductor insulations in Tables 310-16 and 310-17. The rational for this change is that the rule needs to be applicable to all of the insulation types for #14, #12 and #10. Attempting to spare a few insulations like ZW-2, SA, SIS and TBS is leading to more confusion than help.

310-60. Conductors Rated 2001–35,000 Volts.

(a) Definitions

Electrical Ducts: As used in Article 310, electrical ducts shall include any of the electrical conduits recognized in Chapter 3 as suitable for use underground; and other raceways round in cross section, listed for underground use, embedded in earth or concrete.

Thermal Resistivity: As used in this Code, refers to the heat transfer capability through a substance by conduction. It is the reciprocal of thermal conductivity and is designated Rho and expressed in the units °C-cm/watt.

TABLES 310-61 THROUGH 310-64 TO BE INSERTED HERE
THESE TABLES ARE NOT MODIFIED

(b) Ampacities of Conductors Rated 2,001-35,000 volts. Ampacities for solid dielectric-insulated conductors shall be permitted to be determined by tables or under engineering supervision, as provided in (c) and (d) below.

(1) Selection of Ampacity. Where more than one calculated or tabulated ampacity could apply for a given circuit length, the lowest value shall be used.

Exception: Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity shall be permitted to be used beyond the point of transition, a distance equal to 10 ft (3.05 m) or 10 percent of the circuit length figured at the higher ampacity, whichever is less.

(FPN): See Section 110-40 ~~110-14(c)~~ for conductor temperature limitations due to termination provisions.

(c) Tables. Ampacities for conductors rated 2,001 to 35,000 volts shall be as specified in the Allowable Ampacity Tables 310-67 ~~310-69~~ through 310-86. Ampacities at ambient temperatures other than those shown in the tables shall be determined by the formula in (4) below.

(FPN No. 1): For ampacities calculated in accordance with Section 310-15(a), reference IEEE/ICEA "Power Cable Ampacities," Vol. I and II (IPCEA Pub. No. P-46-426) and the "References" therein for availability of all factors and constants.

(FPN No. 2): Ampacities provided by this section do not take voltage drop into consideration. See Section 210-19(a), FPN No. 4, for branch circuits and Section 215-2(b), FPN No. 2, for feeders.

(1) Grounded Shields. Ampacities shown in Tables 310-69, 310-70, 310-81, and 310-82 are for cable with shields grounded at one point only. Where shields are grounded at more than one point, ampacities shall be adjusted to take into consideration the heating due to shield currents.

(2) Burial Depth of Underground Circuits. Where the burial depth of direct burial or electrical duct bank circuits is modified from the values shown in a figure or table, ampacities shall be permitted to be modified as indicated in a. and b. below.

a. Where burial depths are increased in part(s) of an electrical duct run, no decrease in ampacity of the conductors is needed, provided the total length of parts of the duct run increased in depth to avoid obstructions is less than 25 percent of the total run length.

b. Where burial depths are deeper than shown in a specific underground ampacity table or figure, an ampacity derating factor of 6 percent per increased ft (305 mm) of depth for all values of Rho ~~can~~ shall be permitted ~~to be utilized~~. [editorial change]

No rating change is needed where the burial depth is decreased.

(3) Electrical Ducts in Figure 310-60 ~~310-1~~.

~~Spacings between electrical ducts (raceways) as shown in Figure 310-1 shall be permitted to be less than as specified in Figure 310-1, where ducts (raceways) enter equipment enclosures from underground, without reducing the ampacity of conductors contained within such ducts (raceways).~~ [remove this text and reword as shown below. The term (raceway) is not needed since the definition of electrical duct is provided in 310-60(a) - editorial only]

At locations where electrical ducts enter equipment enclosures from underground, spacing between such ducts, as shown in Figure 310-60, shall be permitted to be reduced without requiring the ampacity of conductors therein to be reduced.

(4) Ambients Not in Tables. Ampacities at ambient temperatures other than those shown in the tables shall be determined by means of the following formula:

$$I_2 = I_1 \sqrt{\frac{TC - TA_2 - DELTA\ \ TD}{TC - TA_1 - DELTA\ \ TD}}$$

Where:

I_1 = Ampacity from tables at ambient TA_1

I_2 = Ampacity at desired ambient TA_2

TC = Conductor temperature in degrees C

TA_1 = Surrounding ambient from tables in degrees C

TA_2 = Desired ambient in degrees C

DELTA TD = Dielectric loss temperature rise

(FPN): For ampacities calculated in accordance with the above formula, reference IEEE/ICEA "Power Cable Ampacities," Vol. I and II (IPCEA Pub. No. P-46-426) and the "References" therein for availability of all factors and constants.

(d) Engineering Supervision. Under engineering supervision, conductor ampacities shall be permitted to be calculated by means of the following general formula:

$$I = \sqrt{\frac{TC - (TA + DELTA\ \ TD)}{RDC(1 + YC)RCA}}$$

Where:

TC = Conductor temperature in degrees C

TA = Ambient temperature in degrees C

DELTA TD = Dielectric loss temperature rise

RDC = DC resistance of conductor at temperature TC

YC = Component ac resistance resulting from skin effect and proximity effect

RCA = Effective thermal resistance between conductor and surrounding ambient

(FPN): See Appendix B for examples of formula applications

TABLES 310-67 THROUGH 310-86 TO BE INSERTED HERE
THESE TABLES ARE NOT MODIFIED

INSERT FIGURE 310-1 (RENAMED 310-60) AFTER THE TABLES

Cross Reference List for New Proposal on Section 310-15
(not part of the proposal text)

1996 NEC Section	New Proposal Section
310-15	310-15(a)(1)
310-15(a)	310-15(b) 310-60(b)
310-15(b)	310-15(c) 310-60(d)
310-15(c)	310-15(a)(2) 310-60(b)(1)
310-15(d)	310-60(a)
Tables 310-16 to 310-19	Tables 310-16 to 19
Obelisk note to Tables 310-16 and 310-17	New Section 240-3(d) Proposal to CMP 10
Note 1 (0 to 2000V)	310-15(b)(1)
Note 3 (0 to 2000V)	310-15(b)(6) Table 310-15(b)(6)
Note 5 (0 to 2000V)	310-15(b)(3)
Note 6 (0 to 2000V)	310-15(b)(7)
Note 7 (0 to 2000V)	310-15(a)(1)FPN No. 2

Note 8 (0 to 2000V)	310-15(b)(2)a 310-15(b)(2)b Table 310-15(b)(2) Exception #5 has been deleted (already covered)
Note 9 to (0 to 2000V)	Deleted (redundant - Article 240 covers)
Note 10 (0 to 2000V)	310-15(b)(4)
Note 11 (0 to 2000V)	310-15(b)(5)
Tables 310-61 to 64	Tables 310-61 to 64
Definitions under Table 310-64	310-60(a)
Tables 310-67 to 86	Tables 310-67 to 86
Note 1 (2,001 to 35,000V)	310-60(c)(4)
Note 2 (2,001 to 35,000V)	310-60(c)(1)
Note 3 (2,001 to 35,000V)	310-60(c)(2)
Note 4 (2,001 to 35,000V)	310-60(a)
Note 5 (2,001 to 35,000V)	310-60(c)(3)
Figure 310-1	Figure 310-60

SUBMITTER: Bob Macfarlane, McLean, VA
RECOMMENDATION: Add title "Ambient Temperature Adjustment Factors" between the two tables contained in referenced table.
SUBSTANTIATION: A title before the second table would alert users that there are actually two tables in Table 310-20. Presently, the tables are run together. There are already titles before the second tables found in Tables 310-16 through 310-19, so this change would make the format consistent. The proposed title is consistent with my recommended revision of the title "Correction Factors" between the two tables contained in each Table 310-16 through 310-19.
PANEL ACTION: Accept in Principle.
In the recommendation, replace "Ambient Temperature Adjustment Factors" with "Correction Factors".
PANEL STATEMENT: The portion of the heading addressed in the recommendation for Table 310-20 should match the similar portion of the heading for Tables 310-16 through 310-19.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3108)

6- 111 - (Table 310-20): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the second and fourth columns of the table heading.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3139)

6- 112 - (Table 310-20): Accept in Principle
SUBMITTER: Jeff Palovich, Flint, MI
RECOMMENDATION: In the title of the table insert the word <u>one</u> before the word two so it reads as follows:
"Ampacity of <u>One,</u> Two or Three..."
SUBSTANTIATION: This table should also apply to duplex cable as well as triplex and quadraplex.
PANEL ACTION: Accept in Principle.
Change title to read as follows:
"Table 310-20. Ampacities of Insulated Conductors, Rated 0 Through 2000 Volts, Not More than Three Single Current-Carrying Conductors Supported on a Messenger, Based on Ambient Air Temperature of 40°C (104°F)"
PANEL STATEMENT: This revision better meets the intent of submitter and is more consistent with other ampacity table titles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4201)

6- 113 - (Table 310-20): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 7-88. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Insert "MI" into the 90°C copper column.
SUBSTANTIATION: Section 321-3(a) expressly allows Type MI cable on a messenger. This table looks like the appropriate place to cover the ampacity of this wiring system, but there needs to be an express reference that installers can point to in order to achieve consistency of enforcement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
GANATRA: See my Comment on Affirmative on Proposal 6-91.

(Log #CP601)

6- 113a - (Table 310-21): Accept
SUBMITTER: CMP 6
RECOMMENDATION: Reverse the order of inch-pound and SI units for the wind velocity.
SUBSTANTIATION: See substantiation for Proposal 6-27.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #808)

6- 114 - (Table 310-21): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise heading:
Ampacities of Bare ~~Covered~~ Conductors <u>in Free Air,</u> Based on 40°C (104°F) Ambient, 80°C (176°F) Total Conductor Temperature, 2 ft/sec (610 mm/sec.) wind velocity.
Delete all references to covered conductors in the table.
SUBSTANTIATION: It is assumed this table applies to single conductors in free air, although not specified. The code does not indicate a temperature rating of covered conductors nor any data relative to material covering, sunlight resistance, wet location use, etc. A covered conductor (per definition) does not appear to be a listed product. It is somewhat puzzling that a covered conductor is higher ampere rated than a bare conductor of the same size and material. A covering, (presumed to be nonmetallic) does not normally have greater heat-dissipating qualities than a bare conductor.
PANEL ACTION: Accept in Principle.
Add "or covered" in the first line of the recommendation.
PANEL STATEMENT: Typically, the covering provides circuit protection from momentary contacts with other conductors or trees and corrosion resistance in certain environments. Covered conductors are to be installed on insulators.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3153)

6- 115 - (Table 310-22): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with Table 310-16. This proposal will be referred to Code Making Panel 7 for information. This action will be considered by the Panel as a Public Comment.
SUBMITTER: John Lewellyn, Montrose, MI
RECOMMENDATION: Move Table B-310-3 to Section 310-15 as new Table 310-22.
SUBSTANTIATION: The table for determination of ampacity of large size multiconductor cables needs to be in Section 310-15 so it is available for use. Electrical contractors are experiencing installations on a frequent basis where they are installing large size multiconductor cables. They need a table available for this purpose, and inspectors need a table readily available to use to determine if the ampacity has been selected properly. This table is referenced in a fine print note in Section 318-11.
PANEL ACTION: Accept in Principle.
Replace the existing note below the existing Table B-310-3 with "See 240-3(d)" and delete all of the existing asterisks. Delete wire

sizes 18,16, and 14 from column 10. Add asterisks to columns number 1 and 10 for wire sizes 14,12, and 10.
PANEL STATEMENT: See panel action on Proposal 6-6. The panel desires that the new Tables 310-21 and 310-22 in the same format as Tables 310-16 and 310-17.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1240)

6- 116 - (Figure 310-60): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change dimensions in Figure 310-60 to read as follows:
~~7.5 in.~~ 190 mm (7.5 in.)
~~11.5 in. x 11.5 in.~~ 290 x 290 mm (11.5 in. x 11.5 in.)
~~19 in. x 19 in.~~ 475 x 475 mm (19 in. x 19 in.)
~~19. in. x 27 in~~ 475 x 675 mm (19 in. x 27 in.)
~~27 in. x 27 in.~~ 675 x 675 mm (27 in. x 27 in.)
~~27 in. x 11.5 in.~~ 675 x 290 mm (27 in. x 11.5 in.)
~~27 in. x 19 in.~~ 675 x 475 mm (27 in. x 19 in.)
~~24 in.~~ 600 mm (24 in.)
Change dimensions in Note 1 in Figure 310-60 to read as follows:
Note 1: ~~30 in.~~ 750 mm (30 in.)
Note 1: ~~36 in.~~ 900 mm (36 in.)
Delete Note 2 in Figure 310-60.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1241)

6- 117 - (310-60(b)(1), Exception): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "10 ft (3.05 m)" to "3.0 m (10 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4422)

6- 118 - (310-60(c)): Reject
SUBMITTER: Craig M. Wellman, Newark, DE
RECOMMENDATION: Revise paragraph as marked:
"(b) Tables. Ampacities for conductors rated 2001 to 35,000 volts shall be as specified in the Ampacity Tables 310-60(c) and 310-67 through 310-86..."
Insert new table as follows:

SUBSTANTIATION: Finding the correct table consistently is difficult. The proposed change will reduce code application errors.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed recommendation does not add to the usability of the various ampacity tables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PETTIGREW: See my Explanation of Negative Vote on Proposal 6-48.

(Log #1242)

6- 119 - (310-60(c)(2)b): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "increased foot (305 mm) of depth" to "300 mm (1 foot) increase in depth".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1988)

6- 120 - (310-60(d)): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Substitute "scientific" for "conductor" in the second line.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions. The word conductor is redundant because ampacities apply only for conductors by definition.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

Table 310-60(c) Selection of Ampacity Tables 2000-35,000 Volts

Application	Reference
Insulated single conductor cables triplexed in air	Table 310-67 and 310-68
Insulated single conductor isolated in air	Table 310-69 and 310-70
Insulated three conductor cable isolated in air	Table 310-71 and 310-72
Insulated triplexed or 3 single conductor cables in isolated conduit in air	Table 310-73 and 310-74
Insulated 3-C cable in isolated conduit in air	Table 310-75 and 310-76
Insulated single conductor cables in cable tray per Section 318-13(a)	Table 310-67, 310-68, 310-69, and 310-70
Multiconductor cables in cable tray per Section 318-13(b)	Table 310-71, 310-72, 310-75, and 310-76
Three single insulated conductors in underground ducts (3 conductors per duct)	Table 310-77 and 310-78
Three insulated conductors cabled within an overall covering (3/C cable) in underground ducts	Table 310-79 and 310-80
Single insulated conductors directly buried in earth	Table 310-81 and 310-82
Three insulated conductors cabled within an overall covering, (3/C cable) directly buried in earth	Table 310-83 and 310-84
Three triplexed single insulated conductors directly buried in earth	Table 310-85 and 310-86

For adjustment factors see Notes to Tables 310-69 through 310-86.

(Log #3619)

6- 121 - (Table 310-61): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Add an additional type of conductor to this Table 310-61.

Table 310-61. Conductor Application and Insulation

Trade Name	Type Letter	Maximum Operating Temperature	Application Provision	Insulation	Outer Covering
Gas Tube and Ignition Cable	GTO**	105°C	Dry or wet locations rated 2001 volts and higher	Thermoplastic	None or Jacket sheath

**Type GTO cable shall be restricted to a maximum ampacity of 300 milliamperes where installed for the secondary circuit conductors as required by Section 600-23(d).

Rest of section to remain as stated now in this table.
SUBSTANTIATION: Problem: Article 600 refers to a GTO Type of cable that has no reference in Article 310 and no one really knows what this conductor is.
Substantiation: This Type conductor which is a high voltage application cable is and has been used by the Sign industry for many years.
This Conductor is and has been listed by NRTLs for many years under UL Standard 814. The Code has never defined Type GTO cable in Article 310 leaving confusion within the inspection community.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-40.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1243)

6- 122 - (Table 310-62): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add SI units for insulation thicknesses using the following table:
Delete "comma in Mils" from table heading.
Split Column A and Column B into two columns each - the first with the heading "mm" and the second with the heading "Mils" and insert the SI units for each insulation thickness using the table.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

Conversion Table for Insulation Thickness Values in Tables 310-13, -62, -63 and -64 of 1999 NEC

mm	Mils	mm	Mils	mm	Mils	mm	Mils	mm	Mils
		2.67	105	5.33	210	8.00	315	10.67	420
0.36	14	2.79	110	5.46	215	8.13	320	10.80	425
0.38	15	2.92	115	5.59	220	8.26	325	10.92	430
		3.05	120	5.72	225	8.38	330	11.05	435
0.51	20	3.18	125	5.84	230	8.51	335	11.18	440
0.58	23	3.30	130	5.97	235	8.64	340	11.30	445
0.76	30	3.43	135	6.10	240	8.76	345	11.43	450
0.91	36	3.56	140	6.22	245	8.89	350	11.56	455
1.02	40	3.68	145	6.35	250	9.02	355	11.68	460
1.14	45	3.81	150	6.48	255	9.14	360	11.81	465
1.27	50	3.94	155	6.60	260	9.27	365	11.94	470
1.40	55	4.06	160	6.73	265	9.40	370	12.07	475
1.52	60	4.19	165	6.86	270	9.53	375	12.19	480
1.65	65	4.32	170	6.99	275	9.65	380	12.32	485
1.78	70	4.45	175	7.11	280	9.78	385	12.45	490
1.91	75	4.57	180	7.24	285	9.91	390	12.57	495
2.03	80	4.70	185	7.37	290	10.03	395	12.70	500
2.16	85	4.83	190	7.49	295	10.16	400	12.83	505
2.29	90	4.95	195	7.62	300	10.29	405	12.95	510
2.41	95	5.08	200	7.75	305	10.41	410	13.08	515
2.54	100	5.21	205	7.87	310	10.54	415	13.21	520

(Log #1244)

6- 123 - (Table 310-63): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add SI units for insulation thicknesses using the following conversion table.
Delete "comma in Mils" from Table heading.
Insert "Mils" at the top of each existing column except the first.
Insert a new column before each column except the first with the heading 'mm" and add the equivalent SI units from the table.

Conversion Table for Insulation Thickness Values in Tables 310-13, -62, -63 and -64 of 1999 NEC

mm	Mils	mm	Mils	mm	Mils	mm	Mils	mm	Mils
		2.67	105	5.33	210	8.00	315	10.67	420
0.36	14	2.79	110	5.46	215	8.13	320	10.80	425
0.38	15	2.92	115	5.59	220	8.26	325	10.92	430
		3.05	120	5.72	225	8.38	330	11.05	435
0.51	20	3.18	125	5.84	230	8.51	335	11.18	440
0.58	23	3.30	130	5.97	235	8.64	340	11.30	445
0.76	30	3.43	135	6.10	240	8.76	345	11.43	450
0.91	36	3.56	140	6.22	245	8.89	350	11.56	455
1.02	40	3.68	145	6.35	250	9.02	355	11.68	460
1.14	45	3.81	150	6.48	255	9.14	360	11.81	465
1.27	50	3.94	155	6.60	260	9.27	365	11.94	470
1.40	55	4.06	160	6.73	265	9.40	370	12.07	475
1.52	60	4.19	165	6.86	270	9.53	375	12.19	480
1.65	65	4.32	170	6.99	275	9.65	380	12.32	485
1.78	70	4.45	175	7.11	280	9.78	385	12.45	490
1.91	75	4.57	180	7.24	285	9.91	390	12.57	495
2.03	80	4.70	185	7.37	290	10.03	395	12.70	500
2.16	85	4.83	190	7.49	295	10.16	400	12.83	505
2.29	90	4.95	195	7.62	300	10.29	405	12.95	510
2.41	95	5.08	200	7.75	305	10.41	410	13.08	515
2.54	100	5.21	205	7.87	310	10.54	415	13.21	520

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1245)

6- 124 - (Table 310-64): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add SI units for insulation thicknesses using the following conversion table.
Delete "comma in Mils" at the top of each existing column except the first.
Insert a new column before each column except the first with the heading "mm" and add the equivalent SI units from the table.

Conversion Table for Insulation Thickness Values in Tables 310-13, -62, -63 and -64 of 1999 NEC									
mm	Mils	mm	Mils	mm	Mils	mm	Mils	mm	Mils
		2.67	105	5.33	210	8.00	315	10.67	420
0.36	14	2.79	110	5.46	215	8.13	320	10.80	425
0.38	15	2.92	115	5.59	220	8.26	325	10.92	430
		3.05	120	5.72	225	8.38	330	11.05	435
0.51	20	3.18	125	5.84	230	8.51	335	11.18	440
0.58	23	3.30	130	5.97	235	8.64	340	11.30	445
0.76	30	3.43	135	6.10	240	8.76	345	11.43	450
0.91	36	3.56	140	6.22	245	8.89	350	11.56	455
1.02	40	3.68	145	6.35	250	9.02	355	11.68	460
1.14	45	3.81	150	6.48	255	9.14	360	11.81	465
1.27	50	3.94	155	6.60	260	9.27	365	11.94	470
1.40	55	4.06	160	6.73	265	9.40	370	12.07	475
1.52	60	4.19	165	6.86	270	9.53	375	12.19	480
1.65	65	4.32	170	6.99	275	9.65	380	12.32	485
1.78	70	4.45	175	7.11	280	9.78	385	12.45	490
1.91	75	4.57	180	7.24	285	9.91	390	12.57	495
2.03	80	4.70	185	7.37	290	10.03	395	12.70	500
2.16	85	4.83	190	7.49	295	10.16	400	12.83	505
2.29	90	4.95	195	7.62	300	10.29	405	12.95	510
2.41	95	5.08	200	7.75	305	10.41	410	13.08	515
2.54	100	5.21	205	7.87	310	10.54	415	13.21	520

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

A "soft" conversion is necessary to conform to U.S. industry practice and applicable product standards.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #587)

6- 125 - (Table 310-64 Note 3 (New)): Reject

SUBMITTER: Raafat Mounib, Al-Hejailan Consultants

RECOMMENDATION: New text to read as follows:

173 Percent Insulation Level. Cables in this category shall be permitted to be applied where the clearing time requirements of the 133 percent level category cannot be met, and yet there is adequate assurance that the faulted section will be de-energized in time exceeding (one) hour.

SUBSTANTIATION: Cable Strength:

173% IL (Percent Insulation Level): Generally used in refineries or in critical areas, where it is required to operate cable longer than one hour continuously with one phase conductor grounded. These types of cables (173% IL) are available now and have been used in success in Ras-tanura Refinery (biggest refinery in Saudi Arabia) since May 1996.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter did not provide any technical substantiation for the recommendation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

FRIEDMAN: The proposal should have been Accepted in Principle.

Some suggested wording that would address the submitter's concern is:

"173 Percent Insulation Level. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installation, cables in this category shall be permitted to be applied in situations where the clearing time requirements of the 133 percent level category cannot be met, and yet there is adequate assurance that the faulted section will be de-energized in an orderly shutdown. Also, they shall be permitted to be used where additional insulation strength over the 133 percent level category is desirable."

The revised text specifically address the submitter's concern regarding the need of continuous process industries such as petrochemical plants and pulp and paper facilities to continue to operate with one phase conductor grounded until an orderly shutdown can be accomplished, which may take more than one hour. The 173 percent insulation level has been defined in ICEA standards for many years.

ZIMNOCH: Cables with a 173 percent insulation level have been produced and used in the US and abroad in the past for industrial customers. They are used on ungrounded delta systems where the time to de-energize a grounded section is indefinite. Their use is also recommended for resonant grounded systems. This level is also used when an increased level of confidence (insulation thickness) is desired.

ICEA and AEIC currently recognize 173 percent insulation level.

COMMENT ON AFFIRMATIVE:

GANATRA: I am voting to support Panel action to reject this proposal with following the comment. The proposal has a possible application in industrial establishments and it could be accepted. Suggested wording could be: "173 Percent Insulation Level. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons

will service the installation, cables in this category shall be permitted to be applied in situations where the clearing time requirements of the 133 percent level category cannot be met, and yet there is adequate assurance that the faulted section will be de-energized in an orderly shutdown."

Appropriate thickness values should be added to the applicable tables.

The revised text could address the submitter's concern regarding the need of continuous processes in industrial facilities such as petrochemical plants and pulp and paper facilities to continue to operate with one phase conductor grounded until an orderly shutdown can be accomplished, which may take more than one hour. The 173 percent insulation level has been defined in ICEA standards for many years.

(Log #1989)

6- 126 - (Table 310-67): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1990)

6- 127 - (Table 310-68): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1991)

6- 128 - (Table 310-69): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1992)

6- 129 - (Table 310-70): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1993)

6- 130 - (Table 310-71): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1994)

6- 131 - (Table 310-72): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1995)

6- 132 - (Table 310-73): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1998)

6- 133 - (Table 310-74): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1996)

6- 134 - (Table 310-75): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1997)

6- 135 - (Table 310-76): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1999)

6- 136 - (Table 310-77): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2000)

6- 137 - (Table 310-78): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2001)

6- 138 - (Table 310-79): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2002)

6- 139 - (Table 310-80): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2003)

6- 140 - (Table 310-81): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.

PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2004)

6- 141 - (Table 310-82): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2005)

6- 142 - (Table 310-83): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2006)

6- 143 - (Table 310-84): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2007)

6- 144 - (Table 310-85): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2008)

6- 145 - (Table 310-86): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3104)

6- 145a - (315-15(b)(6)): Accept in Principle
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the table:
Table 310-15(b)(6). Conductor Types and Sizes for 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders.
Conductor Types ~~RH,~~ RHH, RHW, RHW-2, THHN, THHW, THW, THW-2, THWN, THWN-2, XHHW, XHHW-2, SE, USE, USE-2.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductors is no longer being produced.
PANEL ACTION: Accept in Principle.
See panel action on Proposal 6-5.
PANEL STATEMENT: See panel statement on Proposal 6-5. Reference 315-15(b)(6) should be Table 310-15(b)(6) as stated in the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 318 — CABLE TRAYS

(Log #1276)

8- 11 - (318): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
Article 318 - Cable Trays
318 - 3 (b) (1) (a) Single conductor cable shall be No. 1/0 or larger and shall be of a type listed and marked on the surface for use in cable trays. Where Nos. 1/0 through 4/0 single conductor cables are installed in ladder cable tray, the maximum allowable rung spacing for the ladder cable tray shall be ~~9 in. (229 mm).~~ 230 mm (9 in.). Where exposed to direct rays of the sun, cables shall be identified as being sunlight resistant.
318 - 6 (a) Complete System. Cable trays shall be installed as a complete system. Field bends or modifications shall be made so that the electrical continuity of the cable tray system and support for the cables shall be maintained. Cable tray systems shall be permitted to have mechanically discontinuous segments between cable tray runs or between cable tray runs and equipment. The system shall provide for the support of the cables in accordance with their corresponding articles.
Where cable trays support individual conductors and where the conductors pass from one cable tray to another, or from a cable tray to raceways or to equipment where the conductors are terminated, the support distance between cable trays or between the cable tray and the equipment shall not exceed ~~6 ft (1.83 m).~~1.8 m (6 ft). The conductors shall be secured to the cable tray(s) at the transition and they shall be protected, by guarding or by location, from physical damage.
A bonding jumper sized in accordance with Section 250-102 shall connect the two sections of cable tray, or the cable tray and the raceway or equipment. Bonding shall be in accordance with Section 250-96.
318 - 6 (j) Raceways, Cables, and Outlet Boxes Supported from Cable Trays. In industrial facilities where conditions of maintenance and supervision ensure only qualified persons will service the installation and where cable trays are designed to support the load, raceways, cables, and outlet boxes shall be permitted to be supported from cable trays. For raceway terminating at the tray, a listed cable tray clamp or adapter shall be used and no nearby support, such as a support within ~~3 ft (914 mm)~~ 900 mm (3 ft), shall be required.
For raceway or cable running parallel to, but under or beside, a tray, support shall be in accordance with the requirements of the appropriate raceway or cable article.
For outlet boxes located under or beside a tray, support shall be in accordance with the requirements of Article 370.
318 - 9 (b) Multiconductor Control and/or Signal Cables Only. Where a ladder or ventilated trough cable tray, having a usable inside depth of ~~6 in. (152 mm)~~150 mm (6 in.) or less, contains multiconductor control and/or signal cables only, the sum of the cross-sectional areas of all cables at any cross section shall not exceed 50 percent of the interior cross-sectional area of the cable tray. A depth of ~~6 in. (152 mm)~~150 mm (6 in.) shall be used to compute the allowable interior cross-sectional area of any cable tray that has a usable inside depth of more than ~~6 in. (152 mm)~~150 mm (6 in.).
318 - 9 (d) Solid Bottom Cable Tray - Multiconductor Control and/or Signal Cables Only. Where a solid bottom cable tray, having a usable inside depth of ~~6 in. (152 mm)~~150 mm (6 in.) or less, contains multiconductor control and/or signal cables only, the sum of the cross-sectional areas of all cables at any cross section shall not exceed 40 percent of the interior cross-sectional area of the cable tray. A depth of ~~6 in. (152 mm)~~150 mm (6 in.) shall be used to compute the allowable interior cross-sectional area of any cable tray that has a usable inside depth of more than ~~6 in. (152 mm)~~150 mm (6 in.).
318 - 10 (b) Ventilated Channel Cable Trays. Where 75 mm (3 in.) ~~3 in. (76 mm)~~, 100 mm (4 in.) ~~4 in. (102 mm)~~, or 150 mm (6 in.) ~~6 in. (152 mm)~~ wide ventilated channel cable trays contain single conductor cables, the sum of the diameters of all single conductors shall not exceed the inside width of the channel.
318 - 11 (a) (2) Where cable trays are continuously covered for more than 1.8 m (6 ft) ~~6 ft (1.83 m)~~ with solid unventilated covers, not over 95 percent of the allowable ampacities of Tables 310-16 and 310-18 shall be permitted for multiconductor cables.
318 - 11 (b) (1) Where installed according to the requirements of Section 318-10, the ampacities for 600 kcmil and larger single conductor cables in uncovered cable trays shall not exceed 75 percent of the allowable ampacities in Tables 310-17 and 310-19. Where cable trays are continuously covered for more than 1.8 m (6 ft)~~6 ft (1.83 m)~~ with solid unventilated covers, the ampacities for 600 kcmil and larger cables shall not exceed 70 percent of the allowable ampacities in Tables 310-17 and 310-19.
318 - 11 (b) (2) Where installed according to the requirements of Section 318-10, the ampacities for No. 1/0 through 500 kcmil single conductor cables in uncovered cable trays shall not exceed 65 percent of the allowable ampacities in Tables 310-17 and 310-19. Where cable trays are continuously covered for more than 1.8 m (6 ft)~~6 ft (1.83 m)~~ with solid unventilated covers, the ampacities for No. 1/0 through 500 kcmil cables shall not exceed 60 percent of the allowable ampacities in Tables 310-17 and 310-19.
318 - 13 (a) (1) Where cable trays are continuously covered for more than 1.8 m (6 ft)~~6 ft (1.83 m)~~ with solid unventilated covers, not more than 95 percent of the allowable ampacities of Tables 310-75 and 310-76 shall be permitted for multiconductor cables.
318 - 13 (b) (1) The ampacities for Nos. 1/0 and larger single conductor cables in uncovered cable trays shall not exceed 75 percent of the allowable ampacities in Tables 310-69 and 310-70. Where the cable trays are covered for more than 1.8 m (6 ft)~~6 ft (1.83 m)~~ with solid unventilated covers, the ampacities for Nos. 1/0 and larger single conductor cables shall not exceed 70 percent of the allowable ampacities in Tables 310-69 and 310-70.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.
In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.
In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel directs staff to correct 230 mm to 225 mm in the second sentence of the proposal. This reflects the hard conversion value for 9 inches in the directive from the NEC TCC. This value also reflects the use of 225 mm in product standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: I acknowledge the incentive to "metricate" the National Electrical Code is so that it will be more user friendly in other countries and for harmonization with other international standards. However, I do not think it is necessary to make the transition for the 2002 cycle. I vote negative to the proposals developed by the Metrication Task Group, primarily for the following reasons:
Usability - In consideration of the end users of the code, such as inspectors, electricians, technicians, and contractors, I think these proposals will make the NEC less user friendly than if the

metrication issues were left as they currently exist in the code. The vast majority of these users do not need the SI units, and certainly do not want them to replace the English units that they will continue to use. I would suggest that these individuals would be close to unanimous in their desire to leave the code in its current form relative to metrication issues.

Enforcement - Enforcement of the different measurements or sizes will certainly present problems. Even though the Metrication Task Group and Code Making Panel members agree that either of the units of measurement is acceptable, the authority having jurisdiction may decide that one is preferable to the other.

Urgency - I do not share the same sense of urgency for adoption of SI units that the Metrication Task Group proposes. I do not think any harm would result if reviewed for a code cycle or two.

LOYD: I agree with Mr. Lindsay's negative comment. In addition, although I support the international use of the NEC, the addition of metric first with in./lb. units in parentheses will apparently not be the only version of the Code that NFPA will have to print. For example, Mexico will not accept dual measurements; it will accept metric only.

The Federal Government has also backed off rom its mandate that all federal construction projects have to be in metric.

UL's written policy on metrication states that for U.S. based standards, the base unit is in.-pounds with SI units in soft converson in parentheses. The installation code that governs the installation of these products should reflect the units of measurement shown in the product standards.

If this proposal is accepted, the same in.-pound unit could be expressed in different metric conversions leading to confusion. The Task Group on metrication allows soft conversions for dimensions where safety issues would be a factor or where industry policy so dictates. Other dimensions are being converted using hard metric. As a result, a 10 ft unit will be expressed either as 3m (10 ft) or 3.05m (10 ft).

(Log #2936)

8- 12 - (318-1): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: After the words, "solid bottom", insert the words "single rail, wire mesh".

New wording should read:

"solid bottom center rail, wire basket, and other structures."

SUBSTANTIATION: Single rail and wire basket are new types of cable tray manufactured and used for many applications. They should be added for completeness.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation to support the addition of these types of cable trays. There are issues such as cable tray fill, support (318-6(j)) and types of wiring systems permitted that are not addressed in the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
GRIFFITH: The two types of cable tray the submitter proposes to add to 318-1 are widely used overseas and are appearing with increasing frequency in the U.S. (see photos provided for multiple examples.) Rules for application are, therefore, needed in the code and the panel is urged to recognize these systems should reasonable support and a basis to do so be provided during the comment period.

Note: Supporting material is available for review at NFPA Headquarters.

(Log #2449)

8- 13 - (318-2-Cable Tray Systems): Reject
SUBMITTER: John A. Hoffman, Centre Region Code Admin.
RECOMMENDATION: Revise as follows:

A unit or assembly of units or sections and associated fittings forming a rigid structure system used to securely fasten or support conductors, cables, and raceways.

SUBSTANTIATION: This change reflects that cable tray systems are not limited to support of cables and raceways. Cable tray systems are also permitted to support conductors when installed in accordance with 318-3(b)(1).
PANEL ACTION: Reject.
PANEL STATEMENT: The present definition adequately describes the types of wiring methods that are permitted to be supported by a cable tray. Cable trays are permitted to support single conductors only within industrial establishments.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1840)

8- 14 - (318-3): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 318-2 as follows:

318-3. Uses Permitted. Cable tray installations shall not be limited to industrial establishments.

Where exposed to direct rays of the sun, conductors and cables shall be identified as being sunlight resistant.

(a) Wiring Methods. (No change)

(b) In Industrial Establishments. The wiring methods in Section 318-3(a) shall be permitted to be used in any industrial establishment under the conditions described in their respective articles. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installed cable tray system ~~any of~~ the cables in (1) and (2) shall also be permitted to be installed in ladder, ventilated trough, or ventilated channel cable trays.

(1) Single Conductors. Single conductors ~~cables~~ shall be permitted to be installed in accordance with the following.

(a) Single conductor cable shall be No. 1/0 or larger and shall be of a type listed and marked on the surface for use in cable trays. Where Nos. 1/0 through 4/0 single conductor cables are installed in ladder cable tray, the maximum allowable rung spacing for the ladder cable tray shall be 9 in. (229 mm). ~~Where exposed to direct rays of the sun, cables shall be identified as being sunlight resistant.~~

(b) Welding cables shall comply with the provisions of Article 630, Part D.

(c) Single conductors used as equipment grounding conductors shall insulated, covered, or bare and they shall be No. 4 or larger.

~~(2) Multiconductor. Multiconductor cables, Type MV (Article 326) where exposed to direct rays of sun, shall be identified as being sunlight resistant.~~

Medium Voltage. Single and multiconductor Type MV cable. Single conductors shall be installed in accordance with 318-3(b)(1).

SUBSTANTIATION: The requirement that conductors or cables exposed to the sun must be identified as sunlight resistant is not limited to just industrial establishments; it applies regardless of the type of occupancy.

To clarify that in addition to the cables listed in 318-3(a), single conductors (600V and 2000V) and Type MV (5000V and higher) single conductors and multiconductor cables can also be installed in cable tray in industrial establishments.
PANEL ACTION: Accept in Principle.
Revise 318-3 as follows:

"318-3. Uses Permitted. Cable tray installations shall not be limited to industrial establishments.

Where exposed to direct rays of the sun, insulated conductors and jacketed cables shall be identified as being sunlight resistant.

(a) Wiring Methods. (No change)

(b) In Industrial Establishments. The wiring methods in Section 318-3(a) shall be permitted to be used in any industrial establishment under the conditions described in their respective articles. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installed cable tray system any of the cables in (1) and (2) shall be permitted to be installed in ladder, ventilated trough, or ventilated channel cable trays.

(1) Single Conductors. Single conductor cables shall be permitted to be installed in accordance with the following.

(a) Single conductor cable shall be No. 1/0 or larger and shall be of a type listed and marked on the surface for use in cable trays. Where Nos. 1/0 through 4/0 single conductor cables are installed in ladder cable tray, the maximum allowable rung spacing for the ladder cable tray shall be 9 in. (229 mm).

(b) Welding cables shall comply with the provisions of Article 630, Part D.

(c) Single conductors used as equipment grounding conductors shall insulated, covered, or bare and they shall be No. 4 or larger.

(2)Medium Voltage. Single and multiconductor medium voltage cables shall be Type MV Cable (Article 326). Single conductors shall be installed in accordance with 318-3(b)(1)."
PANEL STATEMENT: The panel agrees with the intent of the submitter's proposal. The text was revised to enhance clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2297)

8- 15 - (318-3): Accept in Principle in Part
SUBMITTER: William T. Fiske, I T S North America/Rep. Intertek Testing Services , ETL SEMKO
RECOMMENDATION: Revise text to read as follows:
"~~Cable tray installations shall not be limited to industrial establishments.~~ Cable tray installations shall be permitted to be used for feeder circuits, branch circuits, communications circuits, control circuits and signaling circuits."
SUBSTANTIATION: The existing language, "not...limited to industrial establishments," is confusing. The reader is left in doubt as to what, if any, limitations do exist. Section 318-4, as written, does not clarify the Panel's intent for Section 318-3. Should permit all circuits, with specific exclusions in Section 318-4.
PANEL ACTION: Accept in Principle in Part.
The Panel does not accept the deletion of the first sentence of 318-3.
Revise 318-3 by adding a new sentence so the section reads as follows:
"318-3. Uses Permitted. Cable tray shall be permitted to be used as a support system for services, feeders, branch circuits, communications circuits, control circuits, and signaling circuits. Cable tray installations shall not be limited to industrial establishments."
PANEL STATEMENT: It is important to retain the existing sentence. This sentence serves to clarify the permitted use of cable tray by removing the misconception that cable tray is limited to industrial establishments only.
The word "services" is added to the proposed new sentence because cable tray may be used for services.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1212)

8- 16 - (Table 318-3): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise the reference for power limited tray cable from 725-71(e) to 725-71(f).
SUBSTANTIATION: If my proposal to establish a new section 725-71(b) is accepted, a new section is added and the sections will be renumbered including section 725-71(e). The new section creates two new cable types, Type CL3P-50 and Type CL2P-50. This proposal correlates section 318-3 with those proposed changes.
PANEL ACTION: Accept.
PANEL STATEMENT: Staff is advised to make the editorial correction if Panel 16 accepts the proposal to establish a new section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1841)

8- 17 - (318-3(a)): Reject
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Add a paragraph at the end of 318-3(a):
"Single conductors or multiconductor cables that comply with the requirements for both Type MV and Type MC, and are identified as Type MV or MC and for use in cable tray shall also be permitted to be installed in cable tray."
SUBSTANTIATION: Sections 326-1 and 334-1 both authorize single and multiconductor constructions. Section 334-21(b) authorizes the use of Type MC cable as open runs of cable. If a construction marked "Type MV or MC" can be used as open wiring, it should also be permitted in cable tray in the same occupancies.
PANEL ACTION: Reject.
PANEL STATEMENT: The language of this proposal would permit Type MV cable to be used in cable tray installations in all occupancies. Because of the increased hazards associated with the higher operating voltages of Type MV cable it is limited to those industrial establishments identified in 318-3(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2963)

8- 18 - (318-3(a)): Accept
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: The following is the revised listed of acceptable wiring methods for cable tray:
(a) Wiring Methods. The following shall be permitted to be installed in cable tray systems under the conditions described in their respective articles and sections:

	Article	Section
Armored cable		333
Communication Raceways		800
Electrical metallic tubing		348
Electrical nonmetallic tubing		331
Fire alarm cables		760
Flexible metal conduit		350
Flexible metallic tubing		349
Instrumentation tray cable		727
Intermediate metal conduit		345
Liquidtight flexible metal conduit and liquidtight flexible nonmetallic conduit		351
Metal-clad cable		334
Mineral-insulated, metal-sheathed cable		330
Multiconductor service-entrance cable		338
Multiconductor underground feeder and branch-circuit cable		339
Multipurpose and communications cables		800
Nonmetallic-sheathed cable		336
Power and control tray cable		340
Power-limited tray cable	725-61(c) and 725-71(e)	
Optical fiber cables		770
Optical Fiber Raceways		770
Other factory-assembled, multiconductor control, signal, or power cables that are specifically approved for installation in cable trays		
Rigid metal conduit		346
Rigid nonmetallic conduit		347

SUBSTANTIATION: Optical Fiber/Communication Raceways are listed raceways used in plenum, riser and general purpose areas of a building. These listed raceways are commonly used in cable trays. Optical Fiber/Communication Raceways are use to separate the Optical Fiber Cable and/or Telecommunications Cable from the other wiring methods found in the cable tray. These raceways are made of the same materials as the cable jacket and are used as a cable management system.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2335)

8- 19 - (318-3(a)(1)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add the following to 318-3:
318-3(a)(1). Data Processing Facilities. In data processing facilities, telephone switching facilities and other similar occupancies, single conductors of systems rated 50 volts or less, shall per permitted to be installed in accordance with 318-3(b)(1).
SUBSTANTIATION: It has become common to see very large low voltage systems in these types of facilities. Systems are being designed in excess of 4000 amps at 48 volts dc. The interconnections of equipment has become increasingly more and more difficult as the complexities of the systems increase.
These facilities usually have maintenance staff that serve the multiple facilities and are familiar with the equipment. These facilities are much the same as an industrial facility, the main difference is that they do not produce products.
PANEL ACTION: Reject.
PANEL STATEMENT: The phrase data processing facilities, telephone switching facilities, and other similar occupancies are not clearly understood and are too broad. There should be specific requirements for the competency level of the maintenance personnel. Where determined to be an industrial facility by the AHJ, the referenced facilities may be permitted to use section 318-3(b)(1) where the required conditions of supervision and maintenance are provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2298)

8- 20 - (318-3(b)): Reject
SUBMITTER: William T. Fiske, I T S North America/Rep. Intertek Testing Services , ETL SEMKO
RECOMMENDATION: Revise text to read as follows:
"~~The wiring methods in Section 318-3(a) shall be permitted to be used in any industrial establishment under the conditions described in their respective articles.~~ In industrial establishments only, where conditions of maintenance and service ensure that only qualified persons will service the installed cable tray system...".
SUBSTANTIATION: The first sentence is redundant to Section 318-3(a), adding neither additional information nor clarification.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel disagrees with the substantiation. The proposed deleted language is intended to clarify the permitted wiring methods for use in industrial establishments. Section 318-3 is clearly divided into industrial establishments and all others. To maintain that clear distinction, it is appropriate to maintain the proposed deleted language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2943)

8- 21 - (318-3(b)): Accept
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Revise text to read as follows:
(b) In Industrial Establishments. The wiring methods in Section 318-3(a) shall be permitted to be used in any industrial establishment under the conditions described in their respective articles. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installed cable tray system, any of the cables in (1) and (2) shall be permitted to be installed in ladder, ventilated trough, <u>solid bottom,</u> or ventilated channel cable trays.
SUBSTANTIATION: Cables are installed within solid metal enclosures every day i.e., conduit and wireway. There is no reason to exclude solid bottom tray from containing these cables as long as they are being installed by qualified individuals in industrial establishments and the fill requirements are consistent with the conservative numbers used for conduit and wireway.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LOYD: The submitter provided no substantiation for adding solid bottom tray to this section, which permits the use of single conductors in cable tray. I am concerned that hot spots may develop in the conductors lying on solid bottom cable tray. I believe it is appropriate for the panel to require technical support for this change.

(Log #4092)

8- 22 - (318-3(b), Exception (New)): Reject
SUBMITTER: L. James Milne, BICCGeneral
RECOMMENDATION: Add the following exception:
(b) In Industrial Establishments. The wiring methods in Section 318-3(a) shall be permitted to be used in any industrial establishment under the conditions described in their respective articles. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installed cable tray system, any of the cables in (1) and (2) shall be permitted to be installed in ladder, ventilated trough, or ventilated channel cable trays.
<u>Exception: Single conductor Type MI cable is not restricted to use in industrial establishments.</u>
SUBSTANTIATION: For sizes larger than #4 AWG, mineral insulated cable is only available in single conductor configurations. Single conductor mineral insulated cable has been installed in cable tray for some time in commercial and industrial installations across the country. The Underwriters Laboratories Building Materials Directory includes cable tray as an option for installing 2 hour fire resistive mineral insulated cables which includes single conductor cable. These cables are used almost exclusively in commercial and institutional properties for emergency feeders.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Single conductor Type MI cable is currently permitted by 318-3(a) in other than industrial establishments under the conditions described in Article 330.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1059)

8- 23 - (318-3(b)(1)a): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 318 as follows:
318-3(b)(1)(a) - change "No. 1/0 or larger" to "1/0 AWG or larger" and "Where Nos. 1/0 through 4/0 single" to "Where 1/0 through 4/0 AWG single"
318-3(b)(1)(c) - change "No. 4 or larger" to "4 AWG or larger"
318-8(e) - change "Nos. 1/0 through 4/0" to "1/0 through 4/0 AWG"
318-9(a)(1) - change "No. 4/0 or larger" to "4/0 AWG or larger"
318-9(a)(2) - change "No. 4/0" to "4/0 AWG"
318-9(a)(3) - change "No. 4/0" to "4/0 AWG" in four places
Table 318-9, footnote b - change "Nos. 4/0" to "4/0 AWG"
318-9(c)(1) - change "No. 4/0" to "4/0 AWG"
318-9(c)(2) - change "No. 4/0" to "4/0 AWG"
318-9(c)(3) - change "No. 4/0" to "4/0 AWG" in four places
318-10(a)(4) - change "Nos. 1/0 through 4/0" to "1/0 through 4/0 AWG"
318-11(b)(2) - change "No. 1/0" to "1/0 AWG" in two places.
318-11(b)(3) - change "Nos. 1/0" to "1/0 AWG"
318-11(b)(4) - change "Nos. 1/0" to "1/0 AWG"
318-13(b)(1) - change "Nos. 1/0" to "1/0 AWG" in two places
318-13(b)(2) - change "Nos. 1/0" to "1/0 AWG"
318-13(b)(3) - change "Nos. 1/0" to "1/0 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #810)

8- 24 - (318-3(b)(1)(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Single conductors used as equipment grounding conductors shall be insulated ~~covered,~~ or bare and they shall be No. 4 or larger.
SUBSTANTIATION: Editorial. Single covered conductors, per definition, are not indicated in code tables re: dimension, material type, temperature rating, etc., and do not appear to be a listed conductor. See my proposal for Article 100 Conductor-Covered.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 250-118(1) specifically allows an equipment-grounding conductor to be "insulated, covered, or bare". The use of the term covered is appropriate as 250-118 permits it.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1842)

8- 25 - (318-3(d)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise as follows:
"... cable types permitted in ~~Sections~~ 501-4, 502-4, 503-3, ~~and~~ 504-20 and 505-15."
SUBSTANTIATION: Section 505-15 defines the wiring methods for Class I, Zone 0, 1, and 2 locations and should be included with the other hazardous location references.
Section 4.1.2 of the 1999 National Electrical Code Style Manual stipulates that "... references shall include only the number of the rule being referenced; the word section, subsection, and paragraph shall not be used."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #CP801)

8- 25a - (318-3(e)): Accept
SUBMITTER: CMP 8
RECOMMENDATION: Revise Section 318-3(e) to read as follows:
"(e) Nonmetallic Cable Tray. In addition to the uses permitted elsewhere in Article 318, nonmetallic cable tray shall be permitted in corrosive areas and in areas requiring voltage isolation."
SUBSTANTIATION: The revised text is to clarify that nonmetallic cable tray is permitted for purposes other than voltage isolation and corrosive area applications.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2110)

8- 26 - (318-3(e)): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete Section 318-3(e).
SUBSTANTIATION: This section is not required. The use of nonmetallic cable tray should not be limited to corrosive areas and conditions where voltage isolation is required. Nonmetallic tray is acceptable in all areas where metallic tray is acceptable as long as the nonmetallic tray is not used as the grounding conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: The language in Section 318-3(e) is permissive for the specific locations identified and is not intended to limit the use of nonmetallic cable tray in other locations. See panel action on Log # CP801.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2296)

8- 27 - (318-4): Reject
SUBMITTER: William T. Fiske, I T S North America/Rep. Intertek Testing Services , ETL SEMKO
RECOMMENDATION: Revise text to read as follows:
318-4 Uses Not Permitted.
(a) Hoistways. Cable tray systems shall not be used in hoistways.
(b) Subject to Damage. Cable tray systems shall not be used where subject to severe physical damage.
(c) Dwellings. Cable tray systems shall not be used in dwellings.
(d) Health Care Facilities. Cable tray systems shall not be used in health care facilities where prohibited by provisions of Article 517.
(e) Spaces Used for Environmental Air. Cable tray systems shall not be used in environmental air spaces.
Exception: Cable tray systems shall be permitted to be used as permitted by provisions of Section 300-22 to support wiring methods permitted for use in such spaces.
SUBSTANTIATION: The language of Sections 318-3 and 318-4 taken together, do not make it clear where cable tray can and cannot be used. Required wiring methods in Sections 517-10(b)(2), 517-30(c)(3) and 517-61(a) and (b), effectively exclude cable tray, and readers of Section 318 should be made aware of those exclusions. Given that dwellings are not staffed by persons even remotely qualified, dwelling spaces should also be excluded.
PANEL ACTION: Reject.
PANEL STATEMENT: Cable tray systems are structural systems utilized to securely fasten or support cables and raceways. Where the cable tray is installed in accordance with 318-3(a), cable tray is permitted to be used in a dwelling .
Cable tray may be used with the wiring methods given in the referenced sections. Section 318-3(d) adequately addresses the issue of cable tray use in hazardous (classified) locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2937)

8- 28 - (318-5(e), FPN (New)): Accept in Principle
NOTE:The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: After 318-5(e), insert the following fine print note:
FPN: For information concerning the selection and application of metal cable trays, refer to NEMA-VEI metal cable tray systems, 1998.
SUBSTANTIATION: This standard is an industry resource in the selection of cable trays including dimensions, finish, and load rating. This document has been harmonized with CSA standards.
PANEL ACTION: Accept in Principle.
Locate the proposed FPN in Section 318-1 and amend it to read:
"For further information on cable trays, see NEMA-VE 1,1998 Metal Cable Tray Systems; NEMA-VE 2, 1996, Metal Cable Tray Installation Guidelines; and NEMA-FG 1,1998, Nonmetallic Cable Tray Systems."
PANEL STATEMENT: As Section 90-1(c) states that the NEC is not a design manual, reference to selection of cable trays is not appropriate. The FPN has been placed after Section 318-1 to correspond with the article scope. The panel wishes to point out that CSA Standards support CEC requirements and not the NEC. As such, the panel does not support that portion of the substantiation. Two other standards were added to the FPN to provide more comprehensive information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2216)

8- 29 - (318-5(f)): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: The phrase "flame-tested" does not convey the requirement that the material contain flame-retardant properties.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
DOLLINS: See Ganatra's Explanation of Negative Vote on Proposal 6-3.

(Log #2938)

8- 30 - (318-5(f), FPN (New)): Accept in Principle
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: After 318-5(f), insert the following fine print note:
FPN: For information concerning the selection and application of nonmetallic cable tray, refer to NEMA Standard FG 1-1998, Nonmetallic Cable Tray Systems, 1997.
SUBSTANTIATION: This standard is an industry resource in the selection of nonmetallic cable trays.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-28.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2864)

8- 31 - (318-5(g) (New)): Accept in Principle
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Add text to read as follows:
318-5(f) Identification and Suitability. Cable Tray(s) and their associated fittings shall be suitable for the conditions of use and location and identified for its intended use.
SUBSTANTIATION: Cable tray is manufactured in many forms. From a simple hanger or wire mesh to a substantial steel rigid support system. It can designed and manufactured to support a specific type system, or to support all wiring methods and single power conductors as listed in Section 318-3 in all environments or specific environments.
To assure a safe support system it is necessary that all types of cable tray be identified for its intended use and be suitable for the location and the conditions for which it may be used
PANEL ACTION: Accept in Principle.
Add a new sentence to Section 318-3 to read as follows:
Cable trays and their associated fittings shall be identified for the intended use.
"Staff is advised that the Panel Action on proposal 8-15 added a new second sentence to 318-3 and this Panel Action adds a new third sentence".
PANEL STATEMENT: Section 318-3 deals with permitted uses for cable tray. Section 318-5 deals with construction specifications. The proposed text deals with the use of cable tray and belongs in 318-3. The revised wording meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1168)

8- 32 - (318-6(a)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise the first sentence of the second paragraph to read:
"Where cable trays support individual conductors and where the conductors pass from one cable tray to another, or from a cable tray to raceway(s) or from a cable tray to equipment where the conductors are terminated, the ~~support~~ distance between cable trays or between the cable tray and the raceway(s) or the equipment shall not exceed 6 ft (1.83 m)."
SUBSTANTIATION: Edit. The proposed wording clearly separates the raceways from the modifying phrase "where the conductors are terminated". This section apparently relates to nonsupport of conductors but present wording appears to literally address distance between supports for cable trays, raceways, and equipment.
Three installations are noted: tray to tray, tray to raceway, and tray to equipment (equipment being perceived as not including tray or raceway). However, the 6 ft limitation is only designated for two installations and thereby doesn't address the tray to raceway installation.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LOYD: The submitter provided no technical support for permitting cables to extend up to six feet out of the cable tray before entering a raceway. He only states he felt it was intended by the panel to extend this permission. I feel cables should be supported at all times and although a bonding conductor between the cable tray and the raceway is required, I cannot envision this to be a safe, neat and workmanlike installation.
COMMENT ON AFFIRMATIVE:
GRIFFITH: The submitter's recommended revision to the first sentence of the second paragraph should read, "where cable trays support individual conductors or cables and where the conductors or cables pass from one cable tray...".
Although I agree with the submitter's revision as proposed, it is believed that this sentence, which was new in the last revision of the code, should have always applied to cables as well as individual conductors. The practice involving up to 6 foot cable tray discontinuities is universally applied to cables, as well as individual conductors.

(Log #1166)

8- 33 - (318-6(j)): Reject
Note:The Technical Correlating Committee directs that the panel clarify the last sentence of the Panel Statement relative to the action taken on Proposal 8-34. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
"Raceways, Cables, and ~~Outlet~~ Boxes Supported from Cable Trays. In industrial facilities where conditions of maintenance and supervision assure only qualified persons will service the installation and where cable trays are designed to support the load, raceways, cables, ~~and outlet~~ boxes, and conduit bodies shall be permitted to be supported by cable trays. For ~~raceway~~ rigid metal conduit, intermediate metal conduit, and electrical metallic tubing terminating at, and secured to the tray with a listed tray clamp or adapter, ~~shall be used and no nearby support, such as a~~

~~support within 3 ft (914 mm) shall be required~~ fastening of the raceway shall be permitted to be increased to a distance of 5 ft (1.52 m) from the termination.

For raceway or cable running parallel to, but under or beside a cable tray, support shall be in accordance with the requirements of the appropriate raceway or cable article.

For ~~outlet~~ boxes and conduit bodies located under or beside a tray, support shall be in accordance with the requirements of Article 370."

SUBSTANTIATION: Edit. Many in the trade loosely refer to all boxes as "outlet" boxes and EMT as "conduit" or "thin-wall conduit". While intent may be understood, it is not technically correct in a Code sense. Some boxes are designated as "pull", "junction", or "device" boxes, as indicated by Article 370. Specific limitation to "outlet" boxes suggests boxes for other uses and conduit bodies are not permitted to be supported. If a reference to cable tray support is deemed necessary, other use boxes and conduit bodies should be included.

The reference to "nearby" and "such as 3 ft" is vague; does this intend to include nonrequirement of fastening at 5 ft as permitted by Sections 348-13 Exception No. 1, 345-12(a), and 346-12(a)? The reference to 3 ft suggests RMC, IMC, RNMC, and EMT were the raceways contemplated since other raceways have different support/fastening intervals from terminations. If the 3 ft or 5 ft interval is not required where does the measurement for the first support start? Additionally, the word "support" is not the same as "fastened in place" used in raceway articles. Section 347-8 and Table 347-8 require fastening and support at 3 ft intervals for 1/2 to 1 in. RNMC which is the same fastening distance from terminations; this section appears to negate that requirement.

The proposal would require adherence to the 3 ft interval from terminations for fastening RNMC and correlate with the 5 ft interval permitted for RMC, IMC, and EMT if listed cable tray clamps or adapters are used, and allow other raceway articles to govern fastening/support requirements for flexible conduit, wireways, busways, etc.

PANEL ACTION: Reject.

PANEL STATEMENT: It is not appropriate to limit the requirement of this section to metal raceways. Where the raceway is attached to the cable tray with the appropriate fitting, it is intended that the support of the raceway be accomplished in accordance with the respective raceway article.

There is no technical substantiation to remove the word outlet prior to boxes as this will expand the permission to all boxes, including cutout boxes.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

COMMENT ON AFFIRMATIVE:

BERMAN: Panel Action should have been Accept in Part, based on action taken on Proposal 8-34. The Panel Statement regarding the submitter's proposal to remove the word "outlet" is incorrect, as this same deletion of text was clearly accepted in Proposal 8-34, with the statement that the proposed text clarifies the requirement.

(Log #2595)

8- 34 - (318-6(j)): Accept in Principle

Note: The Technical Correlating Committee directs the panel to confirm the action on this Proposal relative to the position of the panel stated in the panel statement on Proposal 3-33. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Donald R. Cook, Southern Section, IAEI

RECOMMENDATION: Delete the word outlet from Section 318-6(j) so the Section read as follows:

(j) Raceways, Cables, and ~~Outlet~~ Boxes Supported from Cable Trays. In industrial facilities where conditions of maintenance and supervision ensure only qualified persons will service the installation and where cable trays are designed to support the load, raceways, cables and ~~outlet~~ boxes shall be permitted to be supported from cable trays. For raceway terminating at the tray, a listed cable tray clamp or adaptor shall be used and no nearby support, such as a support within 3 ft (914 mm), shall be required. For raceway or cable running parallel to, but under or beside, a tray, support shall be in accordance with the requirements of the appropriate raceway or cable article.

For ~~outlet~~ boxes located under or beside a tray, support shall be in accordance with the requirements of Article 370.

SUBSTANTIATION: Cable tray is a support system. If designed to support the load there is no reason to restrict its use to the support of "outlet boxes" only. Tray should be allowed to support all boxes. These would include not just outlet boxes but such boxes as pull and junction.

PANEL ACTION: Accept in Principle.

In the title of this Section delete the word "outlet" and after "boxes" add "and conduit bodies."

Delete the word "outlet" in the first sentence and reword it to read: "boxes and conduit bodies as covered in Section 370-1."

In the last sentence of this section delete the word "outlet" and change it to read "boxes and conduit bodies..."

In the last sentence change the reference to Section 370-23.

PANEL STATEMENT: The amended text meets the intent of the submitter and clarifies the requirement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 1

NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:

LOYD: The panel action should have been to reject. While it is true cable tray is a support system, it is only designed to support wiring methods linearly with the weight distribution on the bottom of the tray and not on the sides.

No technical substantiation was provided to permit cable tray to support large boxes of unlimited dimensions.

This change will now permit a cabinet or junction box weighing several hundred pounds to be attached directly to the sidewall of the cable tray. The stress during cable pulling which could easily damage the cable tray was not considered.

(Log #3736)

8- 35 - (318-6(j)): Accept in Principle

SUBMITTER: Wayne A. Lilly, Bridgewater, VA

RECOMMENDATION: Delete the word "outlet" from Section 318-6(j) so the section reads as follows:

(j) Raceways, Cables, and ~~Outlet~~ Boxes Supported from Cable Trays. In industrial facilities where conditions of maintenance and supervision ensure only qualified persons will service the installation and where cable trays are designed to support the load, raceways, cables, and ~~outlet~~ boxes shall be permitted to be supported from cable trays. For raceway terminating at the tray, a listed cable tray clamp or adapter shall be used and no nearby support, such as a support within 3 ft (914 mm), shall be required.

For raceway or cable running parallel to, but under or beside, a tray, support shall be in accordance with the requirements of the appropriate raceway or cable article.

For ~~outlet~~ boxes located under or beside a tray, support shall be in accordance with the requirements of Article 370.

SUBSTANTIATION: Cable tray is a support system. If designed to support the load there is no reason to restrict their use to the support of "outlet boxes" only. Tray should be allowed to support all boxes. These would include not just outlet boxes but such boxes as pull and junction.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 8-34.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #4477)

8- 36 - (318-6(j)): Accept in Principle

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Delete the word outlet from Section 318-6(j) so the Section reads as follows:

(j) Raceways, Cables, and ~~Outlet~~ Boxes Supported from Cable Trays. In industrial facilities where conditions of maintenance and supervision ensure only qualified persons will service the installation and where cable trays are designed to support the load, raceways, cables and ~~outlet~~ boxes shall be permitted to be supported from cable trays. For raceway terminating at the tray, a listed cable tray clamp or adapter shall be used and no nearby support, such as a support within 3 ft (914 mm), shall be required. For raceway or cable running parallel to, but under or beside, a tray, support shall be in accordance with the requirements of the appropriate raceway or cable article.

For ~~outlet~~ boxes located under or beside a tray, support shall be in accordance with the requirements of Article 370.
SUBSTANTIATION: Cable tray is a support system. If designed to support the load there is no reason to restrict their use to the support of "outlet boxes" only. Tray should be allowed to support all boxes. These would include not just outlet boxes but such boxes as pull and junction.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-34.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2939)

8- 37 - (318-6(j), FPN (New)): Accept in Principle
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: After 318-6(j), insert the following fine print note:
FPN: For information concerning the installation of metal cable trays refer to NEMA Standard VE-2, Metal Cable Tray Installation Guidelines, 1995.
SUBSTANTIATION: This standard is an industry resource cable tray installation.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-28.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1277)

8- 38 - (Table 318-7 through 10): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:

Table 318-7 (b) (2). Metal Area Requirements for Cable Trays Used as Equipment Grounding Conductors

Maximum Fuse Ampere Rating, Circuit Breaker Ampere Trip Setting, or Circuit Breaker Protective Relay Ampere Trip Setting for Ground-Fault Protection of Any Cable Circuit in the Cable Tray System	Minimum Cross Sectional Area of Metal[a]			
	Steel Cable Trays		Aluminum Cable Trays	
	mm^2	in^2	mm^2	in^2
60	129	0.20	129	0.20
100	258	0.40	129	0.20
200	451.5	0.70	129	0.20
400	645	1.00	258	0.40
600	967.5	1.50[b]	258	0.40
1000	-----	-----	387	0.60
1200	-----	-----	645	1.00
1600	-----	-----	967.5	1.50
2000	-----	-----	1290	2.00[b]

[a] Total cross-sectional area of both side rails for ladder or trough cable trays; or the minimum cross-sectional area of metal in channel cable trays or cable trays of one-piece construction.
[b] Steel cable trays shall not be used as equipment grounding conductors for circuits with ground-fault protection above 600 amperes. Aluminum cable trays shall not be used as equipment grounding conductors for circuits with ground-fault protection above 2000 amperes.

Revise Tables 318-7(b)(2); 318-9; 318-9(e) and 318-10 to read as follows:

Table 318-9. Allowable Cable Fill Area for Multiconductor Cables in Ladder, Ventilated Trough, or Solid Bottom Cable Trays for Cables Rated 2000 Volts or Less

Maximum Allowable Fill Area for Multiconductor Cables									
Inside Width of Cable Tray		Column 1 Applicable for Section 318-9(a)(2) only		Column 2[a] Applicable for Section 318-9(a)(3) only		Column 3 Applicable for Section 318-9(c)(2)		Column 4[a] Applicable for Section 318-9(c) (3)	
mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
150	6.0	4500	7.0	4500 – (1.2 Sd)[b]	7-(1.2 Sd)[b]	3500	5.5	3500 – Sd[b]	5.5 – Sd[b]
225	9.0	6800	10.5	6800 – (1.2 Sd)	10.5-(1.2 Sd)	5100	8.0	5100 – Sd	8.0 – Sd
300	12.0	9000	14.0	9000 – (1.2 Sd)	14 – (1.2 Sd)	7100	11.0	7100 – Sd	11.0 – Sd
450	18.0	13500	21.0	13500 – (1.2 Sd)	21 – (1.2 Sd)	10600	16.5	10600 – Sd	16.5 – Sd
600	24.0	18000	28.0	18000 – (1.2 Sd)	28 – (1.2 Sd)	14200	22.0	14200 – Sd	22.0 – Sd
750	30.0	22500	35.0	22500 – (1.2 Sd)	35 – (1.2 Sd)	17700	27.5	17700 – Sd	27.5 – Sd
900	36.0	27000	42.0	27000 – (1.2 Sd)	42 – (1.2 Sd)	21300	33.0	21300 – Sd	33.0 – Sd

[a] The maximum allowable fill areas in Columns 2 and 4 shall be computed. For example, the maximum allowable fill, in mm^2 for a 150 mm w cable tray in Column 2 shall be 4500 minus [1.2 multipled by Sd] (in square inches, for a 6-in. ~~(1.52 mm)~~ wide cable tray in Column 2 shall b minus (1.2 multiplied by Sd)).

[b] The term Sd in Columns 2 and 4 is equal to the sum of the diameters, in mm, of all cables 107.2 mm^2 (in inches, of all Nos. 4/0) and larger multiconductor cables in the same cable tray with smaller cables.

Table 318-9(e). Allowable Cable Fill Area for Multiconductor Cables in Ventilated Channel Cable Trays for Cables Rated 2000 Volts or Less

		Maximum Allowable Fill Area for Multiconductor Cables			
Inside Width of Cable Tray		Column 1 One Cable		Column 2 More than One Cable	
mm	in.	mm^2	$in.^2$	mm^2	$in.^2$
75	3	1500	2.3	850	1.3
100	4	2900	4.5	1600	2.5
150	6	4500	7.0	2450	3.8

Table 318-10. Allowable Cable Fill Area for Single Conductor Cables in Ladder or Ventilated Trough Cable Trays for Cables Rated 2000 Volts or Less

		Maximum Allowable Fill Area for Single Conductor Cables in Ladder or Ventilated Trough Cable Trays			
Inside Width of Cable Tray		Column 1 Applicable for Section 318-10(a)(2) Only		Column 2[a] Applicable for Section 318-10(a)(3) Only	
mm	in.	mm^2	in^2	mm^2	in^2
150	6	4200	6.5	4200 – (1.1 Sd)[b]	6.5 – (1.1 Sd)[b]
225	9	6100	9.5	6100 – (1.1 Sd)	9.5 – (1.1 Sd)
300	12	8400	13.0	8400 – (1.1 Sd)	13.0 – (1.1 Sd)
450	18	12600	19.5	12600 – (1.1 Sd)	19.5 – (1.1 Sd)
600	24	16899	26.0	16800 – (1.1 Sd)	26.0 – (1.1 Sd)
750	30	21000	32.5	21000 – (1.1 Sd)	32.5 – (1.1 Sd)
900	36	25200	39.0	25200 – (1.1 Sd)	39.0 – (1.1 Sd)

[a] The maximum allowable fill areas in Column 2 shall be computed. For example, the maximum allowable fill, in mm^2 for a 150 mm wide cab tray in Column 2 shall be 4192.5 minus [1.1 multipled by Sd] (in square inches, for a 6-in. wide cable tray in Column 2 shall be 6.5 minus (1.1 multiplied by Sd)).

[b] The term Sd in Column 2 is equal to the sum of the diameters, in mm, of all cables 507 mm^2 (in inches, of all 1000 kcmil) and larger single conductor cables in the same ladder or ventilated trough cable tray with small cables.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.
In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.
In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
Notes to staff:
In Table 318-9, column 1, all mm designations shall be underlined to indicate new material.
In Table 318-10, column 3, row 8 change 16899 to 16800.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #2940)

8- 39 - (318-7(b)(4)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Replace present wording with the following:
(4) Cable tray sections, fittings, and connected raceways shall be bonded in accordance with Section 250-96(a) using bolted mechanical connections, listed pressure connections, listed clamps or other listed means as permitted in Section 250-8, or bonding jumpers sized and installed in accordance with Section 250-102(a), (b), (c), and (d).
SUBSTANTIATION: This change references the appropriate parts of Sections 250-96 and 250-102 and lists the bonding methods described in 250-8 as applied to cable trays.
This is not a change in requirements, only a rearrangement of wording from 250 to Article 318 for clarity and completeness.
PANEL ACTION: Reject.
PANEL STATEMENT: The current language of this section adequately covers the bonding requirements for cable trays.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #809)

8- 40 - (318-8(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Cable Splices. For other than metal-armored cables ~~Cable~~ splices made an insulated by approved methods shall be permitted without a box or fitting ~~to be~~ if located within a cable tray provided they are accessible and do not project above the side rails, except that splices for equipment grounding conductors shall not be required to be insulated.
SUBSTANTIATION: Editorial. It appears the intent is to permit splices in nonmetallic-covered cables without a box or fitting, but wording is not specific. This should be limited to nonmetallic jacketed cables to preserve grounding integrity of cables such as Type AC, MC, and MI. Equipment grounding conductors normally need not be insulated at splices.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation to only allow splices in nonmetallic cables. Approved splices are permitted in any of the wiring methods permitted by Section 318-3. The existing text does not prohibit uninsulated splices in equipment grounding conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2944)

8- 41 - (Table 318-9(e)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Revise Table 318-9(e) to include allowable cable fill area for multiconductor cables in solid bottom channel cables trays. Also revise Table 318-9(e) to include fill areas for 2 in. and 8 in. channel cable tray.
SUBSTANTIATION: Two inch and 8 in. channel cable tray are two widely available sizes that have been overlooked in previous NEC proposals. Due to continued inquiries by the industry, adding the 2 in. and 8 in. sizes would increase the available options for installing small amounts of cables while building on previously proven installation practices.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation to support the inclusion of the new sizes. More information is necessary to determine the safe proposed fill allowances.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: Although the submitter did not use the correct format for these proposals, as a group they all proposed revisions that would provide fill rules for multi-conductor cables installed in 2 in. and 8 in. ventilated channel cable tray, as well as 2 in. through 8 in. solid bottom channel cable tray. Solid bottom channel is being applied in all these sizes as is the ventilated channel in sizes 2 in. and 8 in. It is believed the submitter's proposal provides fill rules for all these channel types and sizes when using multi-conductor cables consistent with the way installations are being designed and installed, and the history of successful use for these practices is of an equivalent weight to that available when cable tray was first recognized as a wiring method some years ago. In addition, it is believed that the adequacy of the fill limits is self-evident as compared to accepted fill practices for other raceway systems discussed in the submitter's substantiation.

(Log #2945)

8- 42 - (318-9(f) (New)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add new text to read as follows:
(f) Solid Channel Cable Trays. Where solid channel cable trays contain multiconductor cables of any type, the following shall apply.
SUBSTANTIATION: Solid channel cable trays have been available for years but have been overlooked in previous NEC revisions. Taking into account the success of solid bottom cable tray applications there appears to be insufficient argument for the continued exclusion of solid channel cable tray in the National Electrical Code.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-3.3 of the Regulations Governing Committee Projects requires each proposal to include the proposed text of the Proposal, including the wording to be added, revised, (and how revised), or deleted. This proposal is incomplete in the wording it proposes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: See my Explanation of Negative Vote on Comment 8-41.

Table 318-9(e). Allowable Cable Fill Area for Multiconductor Cables in ~~Ventilated~~ Channel Cable Trays for Cables Rated 2000 Volts or Less

Inside Width of Cable Tray (in.)	Maximum Allowable Fill Area for Multiconductor Cables			
	Ventilated Channel Cable Trays Section 318-9(e)		Solid Bottom Channel Cable Trays Section 318-9(f)	
	Column 1 Applicable for Section 318-9(e)(1) only ($in.^2$)	Column 2 Applicable for Section 318-9(e)(2) only ($in.^2$)	Column 3 Applicable for Section 318-9(f)(1) only ($in.^2$)	Column 4 Applicable fo Section 318-9(f)(2) only ($in.^2$)
2	1.5	0.9	1.3	0.8
3	2.3	1.3	2.0	1.1
4	4.5	2.5	3.7	2.1
6	7.0	3.8	5.5	3.2
8	8.4	5.0	7.4	4.3

(Log #2946)

8- 43 - (318-9(f)(1) (New)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add new text to read as follows:
(1) Where only one multiconductor cable is installed, the cross-sectional area shall not exceed the value specified in Column 3 of Table 318-9(e).
SUBSTANTIATION: In keeping with the conservative nature of the area fill values for multiconductor cables in ventilated channel cable tray, the values depicted in Column 3 of the proposed Table 318-9(e) were based on the 53 percent area fill values used for installing one conductor in conduit raceway found in Chapter 9 of the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-3.3 of the Regulations Governing Committee Projects requires each proposal to include the proposed text of the Proposal, including the wording to be added, revised, (and how revised), or deleted. This proposal is incomplete in the wording it proposes.
No substantiation was provided to indicate on what basis and how the proposed values were determined other than an arbitrary selection of 53%.
Table 318-9(e) was not revised. See panel action and statement on Proposal 8-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: See my Explanation of Negative Vote on Comment 8-41.

(Log #2947)

8- 44 - (318-9(f)(2) (New)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add new text to read as follows:
(2) Where more than one multiconductor cable is installed, the sum of the cross-sectional area of all cables shall not exceed the value specified in Column 4 of Table 318-9(e).
SUBSTANTIATION: In keeping with the conservative nature of the area fill values for multiconductor cables in ventilated channel cable tray, the values depicted in Column 4 of the proposed Table 318-9(e) were based on the 31 percent area fill values used for installing two conductors in conduit raceway found in Chapter 9 of the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-3.3 of the Regulations Governing Committee Projects requires each proposal to include the proposed text of the Proposal, including the wording to be added, revised, (and how revised), or deleted. This proposal is incomplete in the wording it proposes.
No substantiation was provided to indicate on what basis and how the proposed values were determined other than an arbitrary selection of 31%.
Table 318-9(e) was not revised. See panel action and statement on Proposal 8-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: See my Explanation of Negative Vote on Comment 8-41.

(Log #2954)

8- 45 - (Table 318-10): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add Columns 3 and 4 for Solid Bottom Tray Cable.
(Table shown below)
SUBSTANTIATION: Column 3 and 4 are based on the extremely conservative 20 percent area fill requirement for metal wireway. If these cables can be installed in an enclosed metal wireway, there is little argument to exclude their use in an open system such as solid bottom cable tray as long as it is being installed by qualified individuals in industrial establishments.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation to support the inclusion of solid bottom cable tray. More information is necessary to determine the safe proposed fill allowances.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

Table 318-10. Allowable Cable Fill Area for Single Conductor Cables in Ladder, ~~or~~ Ventilated Trough, or Solid Bottom Cable Trays for Cables Rated 2000 Volts or Less.

	Maximum Allowable Fill Area for Single Conductor Cables			
	Ladder or Ventilated Trough Cable Trays Section 318-10(a)		Solid Bottom Cable Trays Section 318-10(c)	
Inside Width of Cable Tray (in.)	Column 1 Applicable for Section 318-10(a)(2) only (in.^{2})	Column 2 Applicable for Section 318-10(a)(3) only (in.^{2})	Column 3 Applicable for Section 318-10(c)(2) only (in.^{2})	Column 4 Applicable f Section 318-10(c)(3) o (in.^{2})
6	6.5	6.5-(1.1 Sd)[b]	3.5	3.5-(1.1 Sd)[b]
9	9.5	9.5-(1.1 Sd)	5.5	5.5-(1.1 Sd)
12	13.0	13.0-(1.1 Sd)	7.0	7.0-(1.1 Sd)
18	19.5	19.5-(1.1 Sd)	11.0	11.0-(1.1 Sd)
24	26.0	26.0-(1.1 Sd)	14.5	14.5-(1.1 Sd)
30	32.5	32.5-(1.1 Sd)	18.0	18.0-(1.1 Sd)
36	39.0	39.0-(1.1 Sd)	21.5	21.5-(1.1 Sd)

(Log #2948)

8- 46 - (318-10(b)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Revise text to read as follows:
(b) Ventilated Channel Cable Trays. Where 2 in. (51 mm), 3-in. (76-mm), 4-in. (102-mm), 6-in. (152-mm), or 8 in. (204 mm) wide ventilated channel cable trays contain single conductor cables, the sum of the diameters of tall single conductors shall not exceed the inside width of the channel.
SUBSTANTIATION: Two inch and 8 in. Channel Cable Tray are two widely available sizes that have been overlooked in previous NEC proposals. Due to continued inquiries by the industry, adding the 2-in and 8-in. sizes would increase the available options for installing small amounts of cables while building on previously proven installation practices.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation to support the inclusion of the new sizes. Since this proposal relates to cable tray fill, it is necessary to correlate it with the additional information requested by the panel in its statement on Proposal 8-41.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: Although the submitter did not use the correct format for these proposals, as a group they all propose revisions that would provide fill rules for single conductor cables installed in 2 in. and 8 in. ventilated channel cable tray, as well as Table 318-10 sizes of solid bottom cable tray. Solid bottom cable tray is being applied in all these sizes as is the ventilated channel in sizes 2 in. and 8 in. It is believed the submitter's proposal provides fill rules for all these channel/tray types and sizes when using individual conductors consistent with the way installations are being designed and installed, and the history of successful use for these practices is of an equivalent weight to that available when cable tray was first recognized as a wiring method some years ago. In addition, it is believed that the adequacy of the fill limits is self-evident as compared to accepted fill practices for other raceway systems discussed in the submitter's substantiation.

(Log #2949)

8- 47 - (318-10(c) (New)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add new text to read as follows:
(c) Solid Bottom Cable Trays. Where solid bottom cable trays contain single conductor cables, the maximum number of single conductors shall conform to the following:
SUBSTANTIATION: Single conductors are installed within solid metal enclosures every day i.e., conduit and wireway. There is no reason to exclude solid bottom tray from containing single conductor cables as long as they are being installed by qualified individuals in industrial establishments and the fill requirements are consistent with the conservative numbers used for conduit and wireway.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-3.3 of the Regulations Governing Committee Projects requires each proposal to include the proposed text of the Proposal, including the wording to be added, revised, (and how revised), or deleted. This proposal is incomplete in the wording it proposes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: See my Explanation of Negative Vote on Proposal 8-46.

(Log #2950)

8- 48 - (318-10(c)(1) (New)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add new text to read as follows:
(1) Where all of the cables are 1000 kcmil or larger, the sum of the diameters of all single conductor cables shall not exceed 90 percent of the cable tray width, and the cables shall be installed in a single layer.
SUBSTANTIATION: Single conductor cables installed in the above manner equates to approximately 30 percent fill in a 3 in. deep cable tray. This figure is equivalent to the fill area for conduit raceway which is fully enclosed. Based on this conservative figure, there is no reason to exclude these cables from solid bottom cable tray.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-3.3 of the Regulations Governing Committee Projects requires each proposal to include the proposed text of the Proposal, including the wording to be added, revised, (and how revised), or deleted. This proposal is incomplete in the wording it proposes.
No substantiation was provided to indicate on what basis and how the proposed values were determined other than an arbitrary selection of 30%.
See panel action and statement on Proposal 8-47.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: See my Explanation of Negative Vote on Proposal 8-46.

(Log #2951)

8- 49 - (318-10(c)(2)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add new text to read as follows:
(2) Where all of the cables are from 250 kcmil up to 1000 kcmil the sum of the cross-sectional areas of all single conductor cables shall not exceed the maximum allowable cable fill area in Column 3 of Table 318-10, for the appropriate cable tray width.

Table 318-10. Allowable Cable Fill Area for Single Conductor Cables in Ladder, ~~or~~ Ventilated Trough, or Solid Bottom Cable Trays for Cables Rated 2000 Volts or Less.

	Maximum Allowable Fill Area for Single Conductor Cables			
	Ladder or Ventilated Trough CableTrays Section 318-10(a)		Solid Bottom Cable Trays Section 318-10(c)	
Inside Width of Cable Tray (in.)	Column 1 Applicable for Section 318-10(a)(2) only (in.^{2})	Column 2 Applicable for Section 318-10(a)(3) only (in.^{2})	Column 3 Applicable for Section 318-10(c)(2) only (in.^{2})	Column 4 Applicable fo Section 318-10(c)(3) onl (in.^{2})
6	6.5	6.5-(1.1 Sd)[b]	3.5	3.5-(1.1 Sd)[b]
9	9.5	9.5-(1.1 Sd)	5.5	5.5-(1.1 Sd)
12	13.0	13.0-(1.1 Sd)	7.0	7.0-(1.1 Sd)
18	19.5	19.5-(1.1 Sd)	11.0	11.0-(1.1 Sd)
24	26.0	26.0-(1.1 Sd)	14.5	14.5-(1.1 Sd)
30	32.5	32.5-(1.1 Sd)	18.0	18.0-(1.1 Sd)
36	39.0	39.0-(1.1 Sd)	21.5	21.5-(1.1 Sd)

SUBSTANTIATION: Column 3 of the proposed Table 318-10 is based on 20 percent area fill accepted for conductor area fill in fully enclosed wireway (Article 362). Based on this conservative standpoint and the proven track record of wireway, an open system such as cable tray should be entirely acceptable.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-3.3 of the Regulations Governing Committee Projects requires each proposal to include the proposed text of the Proposal, including the wording to be added, revised, (and how revised), or deleted. This proposal is incomplete in the wording it proposes.
No substantiation was provided to indicate on what basis and how the proposed values were determined other than an arbitrary selection of 20%.
Table 318-10 was not revised. See panel action and statement on Proposal 8-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: See my Explanation of Negative Vote on Proposal 8-46.

(Log #2952)

8- 50 - (318-10(c)(3) (New)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add new text to read as follows:
(3) Where 1000 kcmil or larger single conductor cables are installed in the same cable tray with single conductor cables smaller than 1000 kcmil shall not exceed the maximum allowable fill area resulting from the computation in Column 4 of Table 318-10, for the appropriate cable tray width.
SUBSTANTIATION: Refer to Column 3 for an explanation on the computation in column 4. Column 3 is based on 20 percent area fill for a 3 in. deep cable tray. Twenty percent area fill is currently used for area fill for wireway (Article 362).
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-3.3 of the Regulations Governing Committee Projects requires each proposal to include the proposed text of the Proposal, including the wording to be added, revised, (and how revised), or deleted. This proposal is incomplete in the wording it proposes.
No substantiation was provided to indicate on what basis and how the proposed values were determined other than an arbitrary selection of 20%.
Table 318-10 was not revised. See panel action and statement on Proposal 8-45.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: See my Explanation of Negative Vote on Proposal 8-46.

(Log #2953)

8- 51 - (318-10(c)(4) (New)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: Add new text to read as follows:
(4) Where any of the single conductor cables are Nos. 1/0 through 4/0, the sum of the diameters of all single conductor cables shall not exceed 90 percent of the cable tray width, and the cables shall be installed in a single layer.
SUBSTANTIATION: Putting 1/0 through 4/0 single conductor cables in a single layer into a 3 in. deep ladder cable tray as is called out in Section 318-10(a)(4) gives you an area fill of 12 to 16 percent. This is less than the 20 percent fill used for metal wireways that are fully enclosed (Article 362). Based on the extremely conservative loading resulting from using only 90 percent of the cable tray width, adding single conductors to solid bottom tray poses no harm.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 4-3.3 of the Regulations Governing Committee Projects requires each proposal to include the proposed text of the Proposal, including the wording to be added, revised, (and how revised), or deleted. This proposal is incomplete in the wording it proposes. See panel action and statement on Proposal 8-47.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: See my Explanation of Negative Vote on Proposal 8-46.

(Log #1771)

8- 52 - (318-11(a)): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(a) Multiconductor Cables. The allowable ampacity of multiconductor cables, nominally rated 2000 volts or less, installed according to the requirements of Section 318-9, shall be as given in Tables 310-16 and 310-18, subject to the provisions of (1), (2), and (3), and Section 310-15(a)(2).
SUBSTANTIATION: This reference is needed to make it clear that where the conductors leave the tray they are often placed in raceways and terminated on motors or equipment with lower ampacity allowances. To permit the higher ampacities of the tables without consideration of the terminations and other wiring methods is a safety issue that can result in fire or shock hazard.
PANEL ACTION: Accept.
Delete the word "and" from between (2) and (3) in the proposed text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2941)

8- 53 - (318-11(a)(3)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: In the last sentence of this section, change the words "Section 310-15(c)" to "Table B-310-3 in Appendix B".
Delete the FPN. Last line of this section should read ", in accordance with Table B-310-3 in Appendix B."
SUBSTANTIATION: Section 310-15(c) provides a general formula for ampacity but refers to Appendix B for Examples of formula applications. Reference to Table B-310-3 provides a direct reference to correct table. This change returns this section to the 1990 NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 310-15(c) is a rule which requires engineering supervision. 310-15(c) references Appendix B as a FPN. FPN and Appendixes are for information only. See 90-3 and Appendix B.
Mandatory requirements are not permitted to make mandatory references to information contained in an appendix.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1770)

8- 54 - (318-11(b)): Accept
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise to read as follows:
(b) Single Conductor Cables. The allowable ampacity of single conductor cables, shall be as permitted by Section 310-15(a)(2). The derating factors of Section 310-15(b)(2)(a), shall not apply to the ampacity of cables in cable trays. The ampacity of single conductor cables, or single conductors cabled together (triplexed, quadruplexed, etc.), nominally rated 2000 volts or less, shall comply with the following.
SUBSTANTIATION: This reference is needed to make it clear that where the conductors leave the tray they are often placed in raceways and terminated on motors or equipment with lower ampacity allowances. To permit the higher ampacities of the tables without consideration of the terminations and other wiring methods is a safety issue that can result in fire or shock hazard.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3388)

8- 55 - (318-11(b), FPN (New)): Accept in Principle
SUBMITTER: Will Dockham, Gilmanton Iron Works, NH
RECOMMENDATION: Add the following Fine Print Note after Section 318-11(b).
FPN: See Section 110-14(c) for conductor temperature limitations due to termination provisions.
SUBSTANTIATION: I have seen numerous incidence where engineers and electricians have applied the ampacities provided for in Section 318-11(b) to the complete circuit, including the equipment that is supplied by the cables installed in the cable tray. This usually results in a violation to Section 110-14(c), because the equipment connected to the cables installed in the cable tray have termination temperature limitations based on the ampacities in Table 310-16. I believe that a FPN referencing Section 110-14(c) will significantly reduce these violations.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's intent has been accomplished by the panel's action on Proposal 8-54.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3141)

8- 56 - (318-14 (New)): Accept in Principle
SUBMITTER: Marcus Howard, Flint, MI
RECOMMENDATION: There should be a new section added, 318-14, dealing with support requirements for cable trays as follows:
Cable trays shall be supported at intervals in accordance with manufacturing listing.
SUBSTANTIATION: Presently there aren't any support requirements for cable trays and it can be installed with spacing inconsistent with manufacturer's listings.
PANEL ACTION: Accept in Principle.
Add a new second paragraph to Section 318-6(c):
"Cable trays shall be supported at intervals in accordance with the installation instructions."
PANEL STATEMENT: The panel agrees with the submitter's intent and the proposed language is more appropriately located in Section 318-6(c). Also, listing is not a requirement, see panel action on Proposal 8-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 320 — OPEN WIRING ON INSULATORS

(Log #459)

7- 3 - (320): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 320-6(a) - revise as follows:
"Supports shall be installed as follows:
(1) Within 150 mm (6 in.) ~~6 in. (152 mm)~~ from a tap or splice
(2) Within 300 mm (12 in.) ~~12 in. (305 mm)~~ of a dead-end connection to a lampholder or receptacle
(3) At intervals not exceeding 1.4 m (4 1/2 ft) ~~4 1/2 ft (1.37 m)~~ and at closer intervals sufficient to provide adequate support where likely to be disturbed"
320-6(b) - revise as follows:
"Supports for conductors No. 8 or larger installed across open spaces shall be permitted up to 4.5 m (15 ft) ~~15 ft (4.57 m)~~ apart if noncombustible, nonabsorbent insulating spacers are used at least every 1.4 m (4 1/2 ft) ~~4 1/2 ft (1.37 m)~~ to maintain at least 65 mm (2 1/2 in.) ~~2 1/2 in. (64 mm)~~ between conductors."
In the second paragraph, change "6 in. (152 mm)" to "150 mm (6 in.)"
320-6(c) - change "30 ft (9.1 m)" to "9 m (30 ft)"
320-10 - revise second sentence as follows:
"The tubing shall be in continuous lengths not exceeding 4.5 m (15 ft) ~~15 ft (4.57 m)~~ and secured to the surface by straps at intervals not exceeding 1.4 m (4 1/2 ft) ~~4 1/2 ft (1.37 m).~~"
320-12 - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
320-14 - revise as follows:
"Conductors within 2.1 m (7 ft) ~~7 ft (2.13 m)~~ from the floor shall be considered exposed to physical damage. Where open conductors cross ceiling joists and wall studs and are exposed to physical damage, they shall be protected by one of the following methods:
(1) Guard strips not less than 25 mm (1 in.) ~~1 in. (25.4 mm)~~ nominal in thickness and at least as high as the insulating supports, placed on each side of and close to the wiring
(2) A substantial running board at least 13 mm (1/2 in.) ~~1/2 in. (12.7 mm)~~ thick in back of the conductors with side protections. Running boards shall extend at least 25 mm (1 in.) ~~1 in. (25.4 mm)~~ outside the conductors, but not more than 50 mm (2 in.) ~~2 in. (50.8 mm)~~, and the protecting sides shall be at least 50 mm (2 in.) ~~2 in. (50.8 mm)~~ high and at least 25 mm (1 in.) ~~1 in. (25.4 mm)~~ nominal in thickness
(3) Boxing made as above and furnished with a cover kept at least 25 mm (1 in.) ~~1 in. (25.4 mm)~~ away from the conductors within. Where protecting vertical conductors on side walls, the boxing shall be closed at the top and the holes through which the conductors pass shall be bushed."
320-15(a) -revise second sentence as follows:
"Where run through bored holes, conductors in the joists and in studs or rafters to a height of not less than 2.1 m (7 ft) ~~7 ft (2.13 m)~~ above the floor or floor joists shall be protected by substantial running boards extending not less than 25 mm (1 in.) ~~1 in. (25.4 mm)~~ on each side of the conductors."
320-15(b) Exception - change "3 ft (914 mm)" to "900 mm (3 ft)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #CP703)

7- 3a - (320): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 320 to comply with NEC Style Manual.

ARTICLE 320 -- Open Wiring on Insulators

I General

320-1. Scope. This article covers the use, installation, and construction specifications of open wiring on insulators.
320-2. Definition.
Open Wiring on Insulators. An exposed wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of single insulated conductors run in or on buildings.

II. Installation

320-10. Uses Permitted. Open wiring on insulators shall be permitted only for industrial or agricultural establishments on systems of 600 volts, nominal, or less, as follows:
(1) Indoors or outdoors
(2) In wet or dry locations
(3) Where subject to corrosive vapors
(4) For services
320-12 Uses Not Permitted. Open wiring on insulators shall not be installed where concealed by the building structure.
320-15 Exposed Work.
(a) Dry locations. In dry locations, where not exposed to severe physical damage, conductors shall be permitted to be separately enclosed in flexible nonmetallic tubing. The tubing shall be in continuous lengths not exceeding 4.5 m (15 ft) and secured to the surface by straps at intervals not exceeding 1.4 m (4 1/2 ft).

(b) Entering Spaces Subject to Dampness, Wetness, or Corrosive Vapors. Conductors entering or leaving locations subject to dampness, wetness, or corrosive vapors shall have drip loops formed on them and shall then pass upward and inward from the outside of the buildings, or from the damp, wet, or corrosive location, through noncombustible, nonabsorbent insulating tubes.

FPN: See 230-52 for individual conductors entering buildings or other structures.

(c) Exposed to Physical Damage. Conductors within 2.1 m (7 ft) from the floor shall be considered exposed to physical damage. Where open conductors cross ceiling joists and wall studs and are exposed to physical damage, they shall be protected by one of the following methods:

(1) Guard strips not less than 25 mm (1 in.) nominal in thickness and at least as high as the insulating supports, placed on each side of and close to the wiring

(2) A substantial running board at least 13 mm (1/2 in.) thick in back of the conductors with side protections. Running boards shall extend at least 25 mm (1 in.) outside the conductors, but not more than 50 mm (2 in.), and the protecting sides shall be at least 50 mm (2 in.) high and at least 25 mm (1 in.) nominal in thickness

(3) Boxing made as above and furnished with a cover kept at least 25 mm (1 in.) away from the conductors within. Where protecting vertical conductors on side walls, the boxing shall be closed at the top and the holes through which the conductors pass shall be bushed.

(4) Rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing, in which case the rules of Articles 345, 346, 347, or 348 shall apply; or by metal piping, in which case the conductors shall be encased in continuous lengths of approved flexible tubing.

320-17. Through or Parallel to Framing Members. Open conductors shall be separated from contact with walls, floors, wood cross members, or partitions through which they pass by tubes or bushings of noncombustible, nonabsorbent insulating material. Where the bushing is shorter than the hole, a waterproof sleeve of noninductive material shall be inserted in the hole and an insulating bushing slipped into the sleeve at each end in such a manner as to keep the conductors absolutely out of contact with the sleeve. Each conductor shall be carried through a separate tube or sleeve.

FPN: See 310-10 for temperature limitation of conductors.

320-19. Clearances. Open conductors shall be separated at least 50 mm (2 in.) from metal raceways, piping, or other conducting material, and from any exposed lighting, power, or signaling conductor, or shall be separated therefrom by a continuous and firmly fixed nonconductor in addition to the insulation of the conductor. Where any insulating tube is used, it shall be secured at the ends. Where practicable, conductors shall pass over rather than under any piping subject to leakage or accumulations of moisture.

320-23. In Accessible Attics. Conductors in unfinished attics and roof spaces shall comply with (a) or (b).

(a) Accessible by Stairway or Permanent Ladder. Conductors shall be installed along the side of or through bored holes in floor joists, studs, or rafters. Where run through bored holes, conductors in the joists and in studs or rafters to a height of not less than 2.1 m (7 ft) above the floor or floor joists shall be protected by substantial running boards extending not less than 25 mm (1 in.) on each side of the conductors. Running boards shall be securely fastened in place. Running boards and guard strips shall not be required for conductors installed along the sides of joists, studs, or rafters.

(b) Not Accessible by Stairway or Permanent Ladder. Conductors shall be installed along the sides of or through bored holes in floor joists, studs, or rafters.

Exception: In buildings completed before the wiring is installed, attic and roof spaces that are not accessible by stairway or permanent ladder and have headroom at all points less than 900 mm (3 ft), the wiring shall be permitted to be installed on the edges of rafters or joists facing the attic or roof space.

320-30. Securing and Supporting.

(a) Conductor Sizes Smaller than 8 AWG. Conductors smaller than 8 AWG shall be rigidly supported on noncombustible, nonabsorbent insulating materials and shall not contact any other objects. Supports shall be installed as follows:

(1) Within 150 mm (6 in.) from a tap or splice.

(2) Within 300 mm (12 in.) of a dead-end connection to a lampholder or receptacle.

(3) At intervals not exceeding 1.4 m (4 1/2 ft) and at closer intervals sufficient to provide adequate support where likely to be disturbed.

(b) Conductor Sizes 8 AWG and Larger. Supports for conductors 8 AWG or larger installed across open spaces shall be permitted up to 4.5 m (15 ft) apart if noncombustible, nonabsorbent insulating spacers are used at least every 1.4 m (4 1/2 ft) to maintain at least 65 mm (2 1/2 in.) between conductors.

Where not likely to be disturbed in buildings of mill construction, 8 AWG and larger conductors shall be permitted to be run across open spaces if supported from each wood cross member on approved insulators maintaining 150 mm (6 in.) between conductors.

(c) Industrial Establishments. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the system, conductors of sizes 250 kcmil and larger shall be permitted to be run across open spaces where supported at intervals up to 9.0 m (30 ft) apart.

(d) Mounting of Conductor Supports. Where nails are used to mount knobs, they shall not be smaller than tenpenny. Where screws are used to mount knobs, or where nails or screws are used to mount cleats, they shall be of a length sufficient to penetrate the wood to a depth equal to at least one-half the height of the knob and the full thickness of the cleat. Cushion washers shall be used with nails.

(e) Tie Wires. 8 AWG or larger conductors supported on solid knobs shall be securely tied thereto by tie wires having an insulation equivalent to that of the conductor.

320-42. Devices. Surface-type snap switches shall be mounted in accordance with 380-10(a), and boxes shall not be required. Other type switches shall be installed in accordance with 380-4

III. Construction specifications

320-104. Conductors. Conductors shall be of a type specified by Article 310.

SUBSTANTIATION: This revision to Article 320 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-3, 7-4, 7-5, 7-7, 7-8, 7-9, 7-11, 7-13, and 7-14.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1375)

7- 4 - (320): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise text to read as follows:

Article 320 — Open Wiring on Insulators

I. General

~~320-1.~~ 320-2. Definition.

Open wiring on insulators. ~~is an~~ An exposed wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of single insulated conductors run in or on buildings, and not concealed by the building structure.

~~320-2.~~ 320-3. Other Articles.

Open wiring on insulators shall comply with this article and also with the applicable provisions of other articles in this Code, especially Articles 225 and 300.

II. Installation

~~320-3.~~ 320-10. Uses Permitted.

(1) Open Wiring. Open wiring on insulators shall be permitted on systems of 600 volts, nominal, or less, only for industrial or agricultural establishments, indoors or outdoors, in wet or dry locations, where subject to corrosive vapors, and for services.

~~320-10. Flexible Nonmetallic Tubing~~

(2) ~~(a)~~ Dry Locations. In dry locations, where not exposed to severe physical damage, conductors shall be permitted to be separately enclosed in flexible nonmetallic tubing. The tubing shall be in continuous lengths not exceeding 15 ft (4.57 m) and secured to the surface by straps at intervals not exceeding 4 1/2 ft (1.37 m).

(3) ~~320-13.~~ (b) Entering Spaces Subject to Dampness, Wetness, or Corrosive Vapors.

Conductors entering or leaving locations subject to dampness, wetness, or corrosive vapors shall have drip loops formed on them and shall then pass upward and inward from the outside of

the buildings, or from the damp, wet, or corrosive location, through noncombustible, nonabsorbent insulating tubes.

FPN: See Section 230-52 for individual conductors entering buildings or other structures.

~~320-14.~~ 320-15. Exposed Work. ~~Protection from Physical Damage~~

Conductors within 7 ft (2.13 m) from the floor shall be considered exposed to physical damage. Where open conductors cross ceiling joists and wall studs and are exposed to physical damage, they shall be protected by one of the following methods:

1. Guard strips not less than 1 in. (25.4 mm) nominal in thickness and at least as high as the insulating supports, placed on each side of and close to the wiring.

2. A substantial running board at least 1/2 in. (12.7 mm) thick in back of the conductors with side protections. Running boards shall extend at least 1 in. (25.4 mm) outside the conductors, but not more than 2 in. (50.8 mm), and the protecting sides shall be at least 2 in. (50.8 mm) high and at least 1 in. (25.4 mm) nominal in thickness.

3. Boxing made as above and furnished with a cover kept at least 1 in. (25.4 mm) away from the conductors within. Where protecting vertical conductors on side walls, the boxing shall be closed at the top and the holes through which the conductors pass shall be bushed.

4. Rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or electrical metallic tubing, in which case the rules of Articles 345, 346, 347, or 348 shall apply; or by metal piping, in which case the conductors shall be encased in continuous lengths of approved flexible tubing.

~~320-11.~~ 320-17. ~~Through Walls, Floors, Wood Cross Members, etc~~ Through or Parallel to Framing Members. Open conductors shall be separated from contact with walls, floors, wood cross members, or partitions through which they pass by tubes or bushings of noncombustible, nonabsorbent insulating material. Where the bushing is shorter than the hole, a waterproof sleeve of noninductive material shall be inserted in the hole and an insulating bushing slipped into the sleeve at each end in such a manner as to keep the conductors absolutely out of contact with the sleeve. Each conductor shall be carried through a separate tube or sleeve.

FPN: See Section 310-10 for temperature limitation of conductors.

~~320-12.~~ 320-19. ~~Clearance from Piping, Exposed Conductors, etc.~~ Clearances. Open conductors shall be separated at least 2 in. (50.8 mm) from metal raceways, piping, or other conducting material, and from any exposed lighting, power, or signaling conductor, or shall be separated therefrom by a continuous and firmly fixed nonconductor in addition to the insulation of the conductor. Where any insulating tube is used, it shall be secured at the ends. Where practicable, conductors shall pass over rather than under any piping subject to leakage or accumulations of moisture.

~~320-15.~~ 320-23. ~~Unfinished Attics and Roof Spaces~~

In Accesible Attics. Conductors in unfinished attics and roof spaces shall comply with (a) or (b).

(a) Accessible by Stairway or Permanent Ladder. Conductors shall be installed along the side of or through bored holes in floor joists, studs, or rafters. Where run through bored holes, conductors in the joists and in studs or rafters to a height of not less than 7 ft (2.13 m) above the floor or floor joists shall be protected by substantial running boards extending not less than 1 in. (25.4 mm) on each side of the conductors. Running boards shall be securely fastened in place. Running boards and guard strips shall not be required for conductors installed along the sides of joists, studs, or rafters.

(b) Not Accessible by Stairway or Permanent Ladder. Conductors shall be installed along the sides of or through bored holes in floor joists, studs, or rafters.

Exception: In buildings completed before the wiring is installed, attic and roof spaces that are not accessible by stairway or permanent ladder and have headroom at all points less than 3 ft (914 mm), the wiring shall be permitted to be installed on the edges of rafters or joists facing the attic or roof space.

~~320-6.~~ 320-30. ~~Conductor Supports~~ Securing and Supporting.

(a) Conductor Sizes Smaller than No. 8. Conductors smaller than No. 8 shall be rigidly supported on noncombustible, nonabsorbent insulating materials and shall not contact any other objects.

Supports shall be installed as follows:

1. Within 6 in. (152 mm) from a tap or splice

2. Within 12 in. (305 mm) of a dead-end connection to a lampholder or receptacle

3. At intervals not exceeding 4 1/2 ft (1.37 m) and at closer intervals sufficient to provide adequate support where likely to be disturbed

(b) Conductor Sizes No. 8 and Larger. Supports for conductors No. 8 or larger installed across open spaces shall be permitted up to 15 ft (4.57 m) apart if noncombustible, nonabsorbent insulating spacers are used at least every 4 1/2 ft (1.37 m) to maintain at least 2 1/2 in. (64 mm) between conductors. Where not likely to be disturbed in buildings of mill construction, No. 8 and larger conductors shall be permitted to be run across open spaces if supported from each wood cross member on approved insulators maintaining 6 in. (152 mm) between conductors.

(c) Industrial Establishments. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the system, conductors of sizes 250 kcmil and larger shall be permitted to be run across open spaces where supported on intervals up to 30 ft (9.1 m) apart.

~~320-7.~~ (d) Mounting of Conductor Supports. Where nails are used to mount knobs, they shall not be smaller than tenpenny. Where screws are used to mount knobs, or where nails or screws are used to mount cleats, they shall be of a length sufficient to penetrate the wood to a depth equal to at least one-half the height of the knob and the full thickness of the cleat. Cushion washers shall be used with nails.

~~320-8.~~ (e) Tie Wires. No. 8 or larger conductors supported on solid knobs shall be securely tied thereto by tie wires having an insulation equivalent to that of the conductor.

~~320-16. Switches~~ 320-42. Devices. Surface-type snap switches shall be mounted in accordance with Section 380-10(a), and boxes shall not be required. Other type switches shall be installed in accordance with Section 380-4.

~~320-5(b)~~ 320-80. Ampacity. The ampacity shall comply with Section 310-15.

III. Construction Specifications

~~320-5 Conductors.~~ 320-104. Conductors

~~(a) Type.~~ Conductors shall be of a type specified by Article 310.

SUBSTANTIATION: The proposed article re-write was developed as part of a larger effort by the NEC Usability Committee to re-format existing raceway, cable and wiring articles. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

To the extent that this was possible in this article, this has been done. It is not the intent or purpose of this re-write to change the actual intent of the existing article requirements. The only new material in this proposal is the proposed new article scope which has been added to conform with the NEC Style Manual 2.2.1

A companion proposal has also been submitted which re-structures the article to a greater degree by splitting existing Code requirements into new sections to better adhere to the new article format. In some cases this is done with an alternate article re-write while in other cases, individual proposals have been submitted. These proposals are also intended to further enhance the structure and format of the article but in some cases existing code text requirements had to be revised or altered to meet the re-formatting needs. For this reason the proposals are separate which will allow the Code Making Panels to individually consider each proposal.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #271)

7- 5 - (320-1 and 320-2): Accept in Principle

SUBMITTER: Charles M. Trout, Maron Electric Co.

RECOMMENDATION: Revise Section 320-1 and 320-2.

Renumber Section 320-1 Definitions to 320-2 Definitions.

Place the following new text in 320-1:

320-1 Scope. This article covers the use, installation and construction specifications of open wiring on insulators.

Delete present text in Section 320-2. Other Articles and replace with text from renumbered Section 320-1 Definitions.

SUBSTANTIATION: As presently written, Section 320-2 titled "Other Articles" directs compliance with this article. This compliance is more properly shown as being the scope of this article. It is redundant to indicate that compliance with other applicable provisions of this code is required. This information is adequately covered in Section 903. to indicate that compliance with "especially" Articles 225 and 300 is a requirement is not only redundant as to Section 90-3 but appears to place a premium on the value of safety in some instances. The use of the term "especially" indicates an exceptional "degree" of importance being given to particular requirements for safety or conversely indicates a lack of importance to some safety requirements. The National Electrical Code should not apply degrees of safety to its requirements.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1169)

7- 6 - (320-1): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise the Open Wiring on Insulators to read:
"Open Wiring on Insulators" is an exposed wiring method using cleats, tubes, and flexible tubing for the protection and support of single (~~insulated~~) (circuit) conductors run in or on buildings and not concealed by the building structure." (alternate choices are in parenthesis)
SUBSTANTIATION: Clarification. This section indicates all conductors including grounded conductors and equipment grounding conductors are insulated. Section 320-5(a) indicates conductors shall be a type covered in Article 310. Section 310-2(a) Exception and 310-12(b) indicates bare conductors are permitted for grounded and grounding conductors. Proposal allows the panel to clarify the intent.
PANEL ACTION: Reject.
PANEL STATEMENT: The phase conductors and grounded conductor are required to be insulated. The equipment grounding conductor is covered by 250-119.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1307)

7- 7 - (320-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add 320-1 (New) as follows:
320-1. Scope. This article covers the use, installation, and construction specifications of open wiring on insulators.
Renumber existing Sections accordingly.
SUBSTANTIATION: NEC Style Manual Section 2.2.1 requires that each Article contain a Scope.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1308)

7- 8 - (320-2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 320-2.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3. Also, Section 4.4.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1414)

7- 9 - (320-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 320-2 in its entirety.
SUBSTANTIATION: The 1999 National Electrical Code Style Manual 4.1 states "Do not use a reference if the requirement is already covered by 90.3". 4.1.1 of the Style Manual stipulates that "References shall not be made to an entire article...unless additional conditions are specified."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #812)

7- 10 - (320-3): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Uses Permitted. Open wiring on insulators shall be permitted on systems of 600 volts, nominal, or less, only for industrial or agricultural establishments (excluding farm dwelling units), indoors or outdoors, in wet or dry locations, where subject to corrosive vapors, and services.
SUBSTANTIATION: Editorial. The text doesn't indicate whether dwelling units are intended to be included as part of agricultural establishments, such as a farm house or dwelling units provided for transient farm workers. This wiring method doesn't appear suitable for such use.
PANEL ACTION: Reject.
PANEL STATEMENT: The term agricultural establishments does not include dwelling units. The term applies to those buildings used expressly for agricultural purposes and the term dwelling is defined in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1309)

7- 11 - (320-3): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise existing 320-3 (320-10 New) to convert text to a list.
~~320-3.~~ 320-10. Uses Permitted. Open wiring on insulators shall be permitted only for industrial or agricultural establishments on systems of 600 volts, nominal, or less as follows:
(1) indoors or outdoors
(2) in wet or dry locations
(3) where subject to corrosive vapors
(4) ~~and~~for services.
SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that where possible lists or tables be used to present requirements, rather than long text descriptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3722)

7- 12 - (320-3): Reject
SUBMITTER: Barry Bauman, Alliante Energy/Rep. Alliant Energy/Rep. American Society of Agricultural Engineers
RECOMMENDATION: Revise text to read as follows:
"Open wiring on insulators shall be permitted on systems of 600 volts, nominal, or less, only for industrial ~~or agricultural~~ establishments, indoors or outdoors, in wet or dry locations, where subject to corrosive vapors, and for services."
SUBSTANTIATION: Open wiring on insulators is not appropriate in the interior of modern agricultural buildings. It is being used to avoid more appropriate wiring methods such as UF cable and nonmetallic conduit.
A similar proposal is being submitted for 547-4(a).
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation to demonstrate that the use of this wiring method is not appropriate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1310)

7- 13 - (320-4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a new Section 320-4 (320-12 New) as follows:
320-4. Uses Not Permitted. Open wiring on insulators shall not be installed where concealed by the building structure.
Delete the last phrase in 320-1 (320-2 New) which reads "and not concealed by the building structure."
SUBSTANTIATION: Requirement relocated from the last sentence of the definition and restated as a complete sentence. This requirement is more appropriate under Uses Not Permitted rather than as part of the Definition.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1311)

7- 14 - (320-5(b)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 320-5(b) (320-80 New) in its entirety.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. The NEC Style Manual Section 4.1 states "Do not use a reference if the requirement is already covered by 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-3a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1060)

7- 15 - (320-6(a)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 320 as follows:
320-6(a) - change "No. 8" to "8 AWG" in two places
320-6(b) - change "No. 8" to "8 AWG" in two places
320-8 - change "No. 8" to "8 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #272)

7- 16 - (320-6(c)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Delete Section 320-6(c) entirely.
SUBSTANTIATION: There is absolutely no reason for any "Industrial Establishment" to operate at a lessor degree of safety than any other installation. The practical safeguarding of persons and property from hazards arising from the use of electricity is no less important because of the industrial establishment location of the installation. To operate under the subterfuge that "conditions of maintenance and supervision ensures that only qualified persons will service the system", appears to be nothing more than a cover-up for a system of self-certification. There is nothing in these Code provisions that indicates what are the "conditions of maintenance and supervision", who ensures that "only qualified persons will service the system", who determines the "qualifications" of the persons that will service the system. The burden on the authority having jurisdiction will be impossible. How often must the continued employment of these "qualified" persons be monitored? Are the installations made in other occupancies more stringent because they are not maintained? Are the requirements of the Code a result of a study of how well maintained the installations are going to be? If a change in management policy dictates removal of these "qualified persons", who bears the responsibility for revisions to bring the installation into compliance with the code.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation of any problems with supporting conductors in accordance with 320-6(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #811)

7- 17 - (320-14): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Protection from Physical Damage. Conductors ~~within~~ less than 7 ft (2.13 m) ~~from~~ above the floor or grade shall be considered exposed to physical damage.
(remainder unchanged)
SUBSTANTIATION: Editorial. Since this wiring method may be used outdoors or in buildings where there are no floors, grade should be included.
PANEL ACTION: Reject.
PANEL STATEMENT: The addition of the new wording does not enhance the clarity of this section. The use of the term grade could cause confusion due to multiple interpretations of the term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
TRAINOR: It would seem that the submitter is correct in noting that open wiring on insulators can be used outdoors and that the present requirement appears to address indoor installations only. I recommend that this proposal be accepted.

ARTICLE 321 — MESSENGER SUPPORTED WIRING

(Log #CP704)

7- 17a - (321): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: CMP 7

RECOMMENDATION: Rewrite Article 321 to comply with NEC Style Manual.

321 -- Messenger Supported Wiring

I General

321-1. Scope. This article covers the use, installation, and construction specifications for Messenger Supported Wiring.

321-2. Definition.

Messenger Supported Wiring. An exposed wiring support system using a messenger wire to support insulated conductors by any one of the following:

(1) A messenger with rings and saddles for conductor support.

(2) A messenger with a field-installed lashing material for conductor support.

(3) Factory-assembled aerial cable.

(4) Multiplex cables utilizing a bare conductor, factory assembled and twisted with one or more insulated conductors, such as duplex, triplex, or quadruplex type of construction.

II Installation

321-10. Uses Permitted.

(a) Cable Types. The following shall be permitted to be installed in messenger supported wiring under the conditions described in the article or section referenced for each:

Article	Section
Metal-clad cable	334
Mineral-insulated, metal-sheathed cable	330
Multiconductor service-entrance cable	338
Multiconductor underground feeder and branch-circuit cable	339
Other factory-assembled, multiconductor control, signal, or power cables that are identified for the use	
Power and control tray cable	340
Power-limited tray cable	725-61(c) and 725-71(e)

(b) In Industrial Establishments. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installed messenger supported wiring, the following shall be permitted:

(1) Any of the conductor types shown in Table 310-13 or Table 310-62

(2) MV cable

Where exposed to weather, conductors shall be listed for use in wet locations. Where exposed to direct rays of the sun, conductors or cables shall be sunlight resistant.

(c) Hazardous (Classified) Locations. Messenger supported wiring shall be permitted to be used in hazardous (classified) locations where the contained cables are permitted for such use in 501-4, 502-4, 503-3, and 504-20.

321-12. Uses Not Permitted. Messenger supported wiring shall not be used in hoistways or where subject to severe physical damage.

321-30. Messenger Support. The messenger shall be supported at dead ends and at intermediate locations so as to eliminate tension on the conductors. The conductors shall not be permitted to come into contact with the messenger supports or any structural members, walls, or pipes.

.321-56. Conductor Splices and Taps. Conductor splices and taps made and insulated by approved methods shall be permitted in messenger supported wiring.

321-60. Grounding. The messenger shall be grounded as required by 250-80 and 250-86 for enclosure grounding.

SUBSTANTIATION: This revision to Article 321 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-18, 7-19, 7-20, 7-21, 7-22, and 7-27.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1376)

7- 18 - (321): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Article as Follows:

Article 321 — Messenger Supported Wiring

~~321-1.~~ 321-2 Definition. Messenger supported wiring is an exposed wiring support system using a messenger wire to support insulated conductors by any one of the following:

1. A messenger with rings and saddles for conductor support

2. A messenger with a field-installed lashing material for conductor support

3. Factory-assembled aerial cable

4. Multiplex cables utilizing a bare conductor, factory assembled and twisted with one or more insulated conductors, such as duplex, triplex, or quadruplex type of construction

~~321-2.~~ 321-3 Other Articles. Messenger supported wiring shall comply with this article and also with the applicable provisions of other articles in this Code, especially Articles 225 and 300.

~~321-3.~~ 321-10 Uses Permitted.

(a) Cable Types. The following shall be permitted to be installed in messenger supported wiring under the conditions described in the article or section referenced for each:

Article	Section
Metal-clad cable	334
Mineral-insulated, metal-sheathed cable	330
Multiconductor service-entrance cable	338
Multiconductor underground feeder and branch-circuit cable	339
Other factory-assembled, multiconductor control, signal, or power cables that are identified for the use	
Power and control tray cable	340
Power-limited tray cable	725-61(c) and 725-71(e)

(b) In Industrial Establishments. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installed messenger supported wiring, the following shall be permitted:

1. Any of the conductor types shown in Table 310-13 or Table 310-62

2. MV Cable. Where exposed to weather, conductors shall be listed for use in wet locations. Where exposed to direct rays of the sun, conductors or cables shall be sunlight resistant.

(c) Hazardous (Classified) Locations. Messenger supported wiring shall be permitted to be used in hazardous (classified) locations where the contained cables are permitted for such use in Sections 501-4, 502-4, 503-3, and 504-20.

~~321-4.~~ 321-12 Uses Not Permitted. Messenger supported wiring shall not be used in hoistways or where subject to severe physical damage.

~~321-6.~~ 321-30 Messenger Support. The messenger shall be supported at dead ends and at intermediate locations so as to eliminate tension on the conductors. The conductors shall not be permitted to come into contact with the messenger supports or any structural members, walls, or pipes.

~~321-8.~~ 321-56 Conductor Splices and Taps. Conductor splices and taps made and insulated by approved methods shall be permitted in messenger supported wiring.

~~321-7.~~ 321-60 Grounding. The messenger shall be grounded as required by Sections 250-80 and 250-86 for enclosure grounding.

~~321-5.~~ 321-80 Ampacity. The ampacity shall be determined by Section 310-15.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.

A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-17a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #270)

7- 19 - (321-1 and 321-2): Accept in Principle
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Delete all the present text in Section 321-2. Other Articles and retitle to Section 321.2. Definitions.
Relocate the present text of Section 321-1. Definitions to retitled Section 321-2. Definitions.
Retitle Section 321-1. Scope and insert the following text:
"This article covers the use, installation and construction specifications of messenger supported wiring."
SUBSTANTIATION: As presently written, Section 321-2 titled "Other Articles" directs compliance with this article. This compliance is more properly shown as being the scope of this article. It is redundant to indicate that compliance with other applicable provisions of this code is required. This information is adequately covered in Section 90-3. To indicate that compliance with "especially" Articles 225 and 300 is a requirement, is not only redundant as to Section 90-3 but appears to place a premium on the value of safety in these articles. The use of the term "especially" indicates an exceptional degree of importance being given to particular requirements or conversely indicates a lack of importance to some safety requirements. The National Electrical Code should not apply degrees of safety to its requirements.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-17a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1312)

7- 20 - (321-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add new text to read:
321-1. Scope. This article covers the use, installation, and construction specifications for Messenger Supported Wiring.
Renumber existing Sections accordingly.
SUBSTANTIATION: NEC Style Manual requires that each article contain a statement of scope and that the scope statement be the first section of the article. See 2.2.1 and 2.2.2.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-17a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1313)

7- 21 - (321-2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete this section.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3. Also Section 4.1.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-17a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1415)

7- 22 - (321-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 321-2 in its entirety.
SUBSTANTIATION: The 1999 National Electrical Code Style Manual 4.1 states "Do not use a reference if the requirement is already covered by 90.3". 4.1.1 of the Style Manual stipulates that "References shall not be made to an entire article...unless additional conditions are specified."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-17a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1213)

7- 23 - (Table 321-3): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information.
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise the reference for power limited tray cable from 725-71(e) to 725-71(f).
SUBSTANTIATION: If my proposal to establish a new section 725-71(b) is accepted, a new section is added and the sections will be renumbered including section 725-71(e). The new section creates two new cable types, Type CL3P-50 and Type CL2P-50. This proposal correlates section 321-3 with those proposed changes.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel accepts the proposal contingent upon acceptance of the referenced proposal by CMP 16. CMP 7 refers this action to the Technical Correlating Committee for correlation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
ABSTENTION: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF ABSTENTION:
HALL: No industry consenses with the Society of the Plastics Industry could be reached on this proposal. Due to this, I am abstaining.

(Log #269)

7- 24 - (321-3(b)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Delete Section 321-3(b) In "Industrial Establishments" in its entirety.
SUBSTANTIATION: There is absolutely no reason for any "Industrial Establishment" to operate at a lesser degree of safety than any other installation. To operate under the subterfuge that "conditions" of maintenance and supervision ensures that only qualified persons will service the installed messenger supported wiring is nothing more than a cover-up for self certification. There is nothing in these or any other Code provisions that indicates what are the "conditions of maintenance and supervision", who ensures that "only qualified persons will service the installed messenger supported wiring", who determines the "qualifications" of these people. The burden on the authority having jurisdiction will be impossible. How often must the continued employment of these "qualified" be monitored. Are the requirements for installation in other occupancies more stringent because of the quality of maintenance? Are the requirements of the code a result of a study of how well-maintained the installations are going to be? If a change in management policy dictates removal of these "qualified persons", who bears the responsibility for revisions necessary to bring the installation into compliance with the code.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation of any problems with supporting conductors in accordance with 321-3(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #813)

7- 25 - (321-3(b), Exception (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception: Where permitted elsewhere in this code, bare equipment grounding conductors and bare grounded circuit conductors shall be permitted.
SUBSTANTIATION: Editorial. Bare conductors are not indicated in Tables 310-13 or 310-62, nor listed for wet locations or sunlight resistance. Section 321-1(4) indicates a bare conductor, as does Section 250-184(a) Exception No. 2.
PANEL ACTION: Reject.
PANEL STATEMENT: Grounded conductors are required to be insulated except as permitted in Article 230. The reference for equipment grounding conductors is not necessary as they are addressed by 250-119.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1843)

7- 26 - (321-4): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete the word "severe" in the second line.
SUBSTANTIATION: There is no distinction between "physical damage" and "severe physical damage" in the code; messenger supported wiring should not be subjected to physical damage.
Section 3.2.5.4 of the 1999 National Electrical Code Style Manual also shows "protection against physical damage".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1314)

7- 27 - (321-5): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 321-5 (321-80 New) in its entirety.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. The NEC Style Manual Section 4.1 states "Do not use a reference if the requirement is already covered by 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-17a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #814)

7- 28 - (321-8): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Except where conductors are components of Type MC or Type MI cable, ~~Conductor~~ conductor splices and taps made an insulated by approved methods shall be permitted in messenger supported wiring without a box or conduit body, except that splices for equipment grounding conductors shall not be required to be insulated.
SUBSTANTIATION: The inferred intent is that a box or conduit body is not required for splices or taps. If that perception is correct, it should be clearly stated. However, Type MC and MI cables should be excluded to prevent conductor damage and maintain grounding paths. Equipment grounding conductors normally need not be insulated at splices.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text adequately addresses the splicing of messenger supported wiring using approved methods.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

ARTICLE 324 — CONCEALED KNOB-AND-TUBE WIRING

(Log #460)

7- 29 - (324): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 324-6 - revise second sentence as follows:
"Supports shall be installed as follows:
(1) Within 150 mm (6 in.) ~~6 in. (152 mm)~~ of each side of each tap or splice
(2) At intervals not exceeding 1.4 m (4 1/2 ft) ~~4 1/2 ft (1.37 m)~"~~
324-8(a) - revise as follows:
"A clearance of not less than 75 mm (3 in.) ~~3 in. (76 mm)~~ shall be maintained between conductors and a clearance of not less than 25 mm (1 in.) ~~1 in. (25.4 mm)~~ between the conductor and the surface over which it passes."
324-9 - change "3 in. (76 mm)" to "75 mm (3 in.)"
324-11(a) - revise second sentence as follows:
"Where run through bored holes, conductors in the joists and in studs or rafters to a height of not less than 2.1 m (7 ft) ~~7 ft (2.13 m)~~ above the floor or floor joists shall be protected by substantial running boards extending not less than 25 mm (1 in.) ~~1 in. (25.4 mm)~~ on each side of the conductors."
324-11(b) Exception - change "3 ft (914 mm)" to "900 mm (3 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #CP705)

7- 29a - (324): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 324 to comply with NEC Style Manual.

ARTICLE 324 -- Concealed Knob-and-Tube Wiring

I General

324-1. Scope. This article covers the use, installation, and construction specifications of Concealed Knob-and-Tube Wiring.
324-2. Definition.
Concealed Knob-and-Tube Wiring. A wiring method using knobs, tubes, and flexible nonmetallic tubing for the protection and support of single insulated conductors.

II Installation

324-10. Uses Permitted. Concealed knob-and-tube wiring shall be permitted to be installed in the hollow spaces of walls and ceilings or in unfinished attics and roof spaces as provided in 324-23 only as follows:
(1) For extensions of existing installations
(2) Elsewhere by special permission
324-12. Uses Not Permitted. Concealed knob-and-tube wiring shall not be used in following:
(1) Commercial garages
(2) Theaters and similar locations
(3) Motion picture studios
(4) Hazardous (classified) locations
(5) Hollow spaces of walls, ceilings, and attics where such spaces are insulated by loose, rolled, or foamed-in-place insulating material that envelops the conductors
324-17. Through or Parallel to Framing Members. Conductors shall comply with 320-11 where passing through holes in structural members. Where passing through wood cross members in plastered partitions, conductors shall be protected by noncombustible, nonabsorbent, insulating tubes extending not less than 75 mm (3 in.) beyond the wood member
324-19. Clearances.
(a) General. A clearance of not less than 75 mm (3 in.) shall be maintained between conductors and a clearance of not less than 25 mm (1 in.) between the conductor and the surface over which it passes.

(b) Limited Conductor Space. Where space is too limited to provide these minimum clearances, such as at meters, panelboards, outlets, and switch points, the individual conductors shall be enclosed in flexible nonmetallic tubing, which shall be continuous in length between the last support and the enclosure or terminal point.

(c) Clearance from Piping, Exposed Conductors, etc. Conductors shall comply with 320-19 for clearances from other exposed conductors, piping, etc.

324-23. In Accessible Attics. Conductors in unfinished attics and roof spaces shall comply with (a) or (b).

FPN: See 310-10 for temperature limitation of conductors.

(a) Accessible by Stairway or Permanent Ladder. Conductors shall be installed along the side of or through bored holes in floor joists, studs, or rafters. Where run through bored holes, conductors in the joists and in studs or rafters to a height of not less than 2.1 m (7 ft.) above the floor or floor joists shall be protected by substantial running boards extending not less than 25 mm (1 in.) on each side of the conductors. Running boards shall be securely fastened in place. Running boards and guard strips shall not be required where conductors are installed along the sides of joists, studs, or rafters.

(b) Not Accessible by Stairway or Permanent Ladder. Conductors shall be installed along the sides of or through bored holes in floor joists, studs, or rafters.

Exception: In buildings completed before the wiring is installed, attic and roof spaces that are not accessible by stairway or permanent ladder and have headroom at all points less than 900 mm (3 ft.), the wiring shall be permitted to be installed on the edges of rafters or joists facing the attic or roof space.

324-30 Securing and Supporting.

(a) Supporting. Conductors shall be rigidly supported on noncombustible, nonabsorbent insulating materials and shall not contact any other objects. Supports shall be installed as follows:

(1) Within 150 mm (6 in.) of each side of each tap or splice and

(2) At intervals not exceeding 1.4 m (4 1/2 ft)

Where it is impracticable to provide supports, conductors shall be permitted to be fished through hollow spaces in dry locations, provided each conductor is individually enclosed in flexible nonmetallic tubing that is in continuous lengths between supports, between boxes, or between a support and a box.

(b) Securing. Where solid knobs are used, conductors shall be securely tied thereto by tie wires having insulation equivalent to that of the conductor.

324-42. Devices. Switches shall comply with 380-4 and 380-10(b).

324-56. Splices and Taps. Splices shall be soldered unless approved splicing devices are used. In-line or strain splices shall not be used.

III Construction Specifications

324-104. Conductors. Conductors shall be of a type specified by Article 310.

SUBSTANTIATION: This revision to Article 324 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-29, 7-30, 7-31, 7-32, 7-33, 7-34, 7-35, 7-36, and 7-38.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1377)

7- 30 - (324): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise text to read as follows:

Article 324 — Concealed Knob-and-Tube Wiring

I. General

~~324-1.~~ 324-2. Definition. Concealed knob-and-tube wiring. ~~is a~~ A wiring method using knobs, tubes, and flexible nonmetallic tubing for the protection and support of single insulated conductors.

~~324-2.~~ 324-3. Other Articles. Concealed knob-and-tube wiring shall comply with this article and also with the applicable provisions of other articles in this Code, especially Article 300.

II. Installation

~~324-3.~~ 324-10. Uses Permitted. Concealed knob-and-tube wiring shall be permitted to be installed in the hollow spaces of walls and ceilings or in unfinished attics and roof spaces as provided in Section ~~324-11~~ 324-23 only as follows:

1. For extensions of existing installations, or

2. Elsewhere by special permission.

~~324-4.~~ 324-12. Uses Not Permitted. Concealed knob-and-tube wiring shall not be used in commercial garages, theaters and similar locations, motion picture studios, hazardous (classified) locations, or in the hollow spaces of walls, ceilings, and attics where such spaces are insulated by loose, rolled, or foamed-in-place insulating material that envelops the conductors.

~~324-9. Through Walls, Floors, Wood Cross Members, etc.~~

324-17 Through or Parlallel to Framing Members. Conductors shall comply with Section ~~320-11~~ 320-17 (New) where passing through holes in structural members. Where passing through wood cross members in plastered partitions, conductors shall be protected by noncombustible, nonabsorbent, insulating tubes extending not less than 3 in. (76 mm) beyond the wood member.

~~324-8.~~ 324-19. ~~Conductor~~ Clearances.

(a) General. A clearance of not less than 3 in. (76mm) shall be maintained between conductors and a clearance of not less than 1 in. (25.4 mm) between the conductor and the surface over which it passes.

(b) Limited Conductor Space. Where space is too limited to provide these minimum clearances, such as at meters, panelboards, outlets, and switch points, the individual conductors shall be enclosed in flexible nonmetallic tubing, which shall be continuous in length between the last support and the enclosure or terminal point.

~~324-10.~~ (c) Clearance from Piping, Exposed Conductors, etc. Conductors shall comply with Section 320~~-12~~-19 for clearances from other exposed conductors, piping, etc.

~~324-11. Unfinished Attics and Roof Spaces.~~

324-23. In Accessible Attics. Conductors in unfinished attics and roof spaces shall comply with (a) or (b).

FPN: See Section 310-10 for temperature limitation of conductors.

(a) Accessible by Stairway or Permanent Ladder. Conductors shall be installed along the side of or through bored holes in floor joists, studs, or rafters. Where run through bored holes, conductors in the joists and in studs or rafters to a height of not less than 7 ft (2.13 m) above the floor or floor joists shall be protected by substantial running boards extending not less than 1 in. (25.4 mm) on each side of the conductors. Running boards shall be securely fastened in place. Running boards and guard strips shall not be required where conductors are installed along the sides of joists, studs, or rafters.

(b) Not Accessible by Stairway or Permanent Ladder. Conductors shall be installed along the sides of or through bored holes in floor joists, studs, or rafters.

Exception: In buildings completed before the wiring is installed, attic and roof spaces that are not accessible by stairway or permanent ladder and have headroom at all points less than 3 ft (914 mm), the wiring shall be permitted to be installed on the edges of rafters or joists facing the attic or roof space.

~~324-6. Conductor Supports.~~

324-30. Securing and Supporting.

(a) Supporting. Conductors shall be rigidly supported on noncombustible, nonabsorbent insulating materials and shall not contact any other objects. Supports shall be installed ~~as follows~~:

1. within 6 in. (152 mm) of each side of each tap or splice, and

2. at intervals not exceeding 4 1/2 ft (1.37 m).

Where it is impracticable to provide supports, conductors shall be permitted to be fished through hollow spaces in dry locations, provided each conductor is individually enclosed in flexible nonmetallic tubing that is in continuous lengths between supports, between boxes, or between a support and a box.

~~324-7. Tie Wires~~ (b) Securing. Where solid knobs are used, conductors shall be securely tied thereto by tie wires having insulation equivalent to that of the conductor.

~~324-13.~~ 324-40. Boxes and Fittings, Outlet boxes shall comply with Article 370.

~~324-14 Switches.~~ 324-42. Devices. Switches shall comply with Sections 380-4 and 380-10(b).

~~324-12.Splices.~~ 324-56. Splices and Taps. Splices shall be soldered unless approved splicing devices are used. In-line or strain splices shall not be used.

~~324-5(b)~~ 324-80. Ampacity. The ampacity shall comply with Section 310-15.

III. Construction Specifications

~~324-5.~~ 324-104. Conductors.

~~(a) Type.~~Conductors shall be of a type specified by Article 310.

SUBSTANTIATION: The proposed article re-write was developed as part of a larger effort by the NEC Usability Committee to re-format existing raceway, cable and wiring articles. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

To the extent that this was possible in this article, this has been done. It is not the intent or purpose of this re-write to change the actual intent of the existing article requirements. The only new material in this proposal is the proposed new article scope which has been added to conform with the NEC Style Manual 2.2.1

A companion proposal has also been submitted which re-structures the article to a greater degree by splitting existing Code requirements into new sections to better adhere to the new article format. In some cases this is done with an alternate article re-write while in other cases, individual proposals have been submitted. These proposals are also intended to further enhance the structure and format of the article but in some cases existing code text requirements had to be revised or altered to meet the re-formatting needs. For this reason the proposals are separate which will allow the Code Making Panels to individually consider each proposal.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #267)

7- 31 - (324-1 and 324-2): Accept in Principle
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Delete all present text in Section 324-2. Other Articles and retitle Section 324-2. Definitions.

Relocate the present text of Section 324-1. Definitions to retitled Section 324-2. Definitions.

Retitle Section 321-1. Scope and insert the following text:

"This article covers the use, installation and construction specifications of concealed knob-and-tube wiring."

SUBSTANTIATION: As presently written, Section 324-2 titled Other Articles directs compliance with this article. This compliance is more properly shown as being the scope of this article. It is redundant to indicate that compliance with other applicable articles in this code is required. This information is adequately covered in Section 90-3. To indicate that compliance with "especially" Article 300 is not only redundant to Section 90-3 but appears to place a premium on the value of safety in Article 300. The use of the term "especially" indicates an exceptional degree of importance being given to particular requirements or conversely indicates a lack of importance to other safety requirements. The National Electrical Code should not apply degrees of safety to its requirements.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1315)

7- 32 - (324-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add 324-1 (New) as follows:

324-1. Scope. This article covers the use, installation, and construction specifications of Concealed Knob-and-Tube Wiring.

Renumber existing Sections accordingly.
SUBSTANTIATION: NEC Style Manual Section 2.2.1 requires that each Article contain a Scope.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1317)

7- 33 - (324-2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 324-2.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3. Also, Section 4.4.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1416)

7- 34 - (324-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 324-2 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:

Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."

Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1318)

7- 35 - (324-4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 324-4 (324-12 New) to read as follows:

324-4. Uses Not Permitted. Concealed knob-and-tube wiring shall not be used in the following:

(1) C~~c~~ommercial garages~~,~~,
(2) T~~t~~heaters and similar locations~~,~~,
(3) M~~m~~otion picture studios~~,~~,
(4) H~~h~~azardous (classified) locations~~, or in the~~
(5) H~~h~~ollow spaces of walls, ceilings, and attics where such spaces are insulated by loose, rolled, or foamed-in-place insulating material that envelops the conductors.

SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that if possible, use lists or tables to present requirements, rather than long text descriptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1319)

7- 36 - (324-5(b)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 324-5(b) (324-80 New) in its entirety.

SUBSTANTIATION: Section 90-3 adequately covers this requirement. The NEC Style Manual Section 4.1 states "Do not use a reference if the requirement is already covered by 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #815)

7- 37 - (324-13): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
~~Outlet boxes~~ Boxes shall comply with Article 370.
SUBSTANTIATION: Editorial. Limitation to boxes with a designated use implies that boxes with other uses, such as pull, junction, device, etc., are not included.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 324-13 has been deleted, therefore the proposed language is unnecessary. See panel action on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1316)

7- 38 - (324-13): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 324-13.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3. Also, Section 4.4.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-29a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #816)

7- 39 - (324-14): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Switches shall comply with ~~Sections 380-4 and 380-10(b)~~ Article 380.
SUBSTANTIATION: Editorial. Limitation to only two sections of Article 380 implies other pertinent sections may not be applicable.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC Style Manual Section 4.1.1 states that references shall not be made to an entire article unless additional conditions are specified. References to parts within an article shall be permitted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

ARTICLE 325 — INTEGRATED GAS SPACER CABLE: TYPE IGS

(Log #CP706)

7- 39a - (325): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 325 to comply with NEC Style Manual.

ARTICLE 325 -- Integrated Gas Spacer Cable: Type IGS

I General

325-1. Scope. This article covers the use, installation, and construction specifications for Integrated Gas Spacer Cable, Type IGS.

325-2. Definition.
Integrated Gas Spacer Cable, Type IGS. A factory assembly of one or more conductors, each individually insulated and enclosed in a loose fit, nonmetallic flexible conduit as an integrated gas spacer cable rated 0 through 600 volts.

II Installation

325-10. Uses Permitted. Type IGS cable shall be permitted for use underground, including direct burial in the earth, as:
(1) Service-entrance conductors.
(2) Feeder or branch-circuit conductors.

325-12. Uses Not Permitted. Type IGS cable shall not be used as interior wiring or be exposed in contact with buildings.

325-24. Bending Radius. Where the coilable nonmetallic conduit and cable is bent for installation purposes or is flexed or bent during shipment or installation, the radii of bends measured to the inside of the bend shall not be less than specified in Table 325-24.

Table 325-24. Minimum Radii of Bends

Conduit Metric Designator	Conduit Trade Size	Minimum Radii mm	in
53	2	600	24
78	3	900	35
103	4	1150	45

325-26. Bends. A run of Type IGS cable between pull boxes or terminations shall not contain more than the equivalent of four quarter bends (360 degrees total), including those bends located immediately at the pull box or terminations.

325-40. Fittings. Terminations and splices for Type IGS cable shall be identified as a type that is suitable for maintaining the gas pressure within the conduit. A valve and cap shall be provided for each length of the cable and conduit to check the gas pressure or to inject gas into the conduit.

325-80. Ampacity. The ampacity of Type IGS cable shall not exceed values shown in Table 325-80.

Table 325-80. Ampacity of Type IGS Cable

Size (kcmil)	Amperes	Size (kcmil)	Amperes
250	119	2500	376
500	168	3000	412
750	206	3250	429
1000	238	3500	445
1250	266	3750	461
1500	292	4000	476
1750	344	4250	491
2000	336	4500	505
2250	357	4750	519

III. Construction Specifications

325-104. Conductors. The conductors shall be solid aluminum rods, laid parallel, consisting of one to nineteen 12.7 mm (1/2 in) diameter rods. The minimum conductor size shall be 250 kcmil and the maximum size shall be 4750 kcmil.

325-112. Insulation. The insulation shall be dry kraft paper tapes and a pressurized sulfur hexafluoride gas (SF6), both approved for electrical use. The nominal gas pressure shall be 138 kPa gauge (20 pounds per square inch gauge). The thickness of the paper spacer shall be as specified in Table 325-112.

Table 325-112. Paper Spacer Thickness

	Thickness	
Size (kcmil)	mm	in.
250–1000	1.02	0.040
1250–4750	1.52	0.060

325-116. Conduit. The conduit shall be a medium density polyethylene identified as suitable for use with natural gas rated pipe in metric designator 53, 78, or 103 (trade size 2, 3, or 4). The percent fill dimensions for the conduit are shown in Table 325-116.
The size of the conduit permitted for each conductor size shall be calculated for a percent fill not to exceed those found in Table 1, Chapter 9.

Table 325-116. Conduit Dimensions

Conduit Metric Designator	Conduit Trade Size	Actual Outside Diameter		Actual Inside Diameter	
		mm	In.	mm	in.
53	2	60	2.375	49.46	1,947
78	3	89	3.500	73.30	2.886
103	4	114	4.500	94.23	3.710

325-120. Marking. The cable shall be marked in accordance with 310-11(a), 310-11(b)(1), and 310-11(d).
SUBSTANTIATION: This revision to Article 325 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-40, 7-41, 7-42, 7-43, 7-44, 7-45, 7-46, 7-47, 7-48, 7-49, 7-50, and 7-51.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1378)

7- 40 - (325): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise text to read as follows:

ARTICLE 325 -- Integrated Gas Spacer Cable: Type IGS

~~A.~~ I. General

325-1 325-2. Definition. Type IGS cable is a factory assembly of one or more conductors, each individually insulated and enclosed in a loose fit, nonmetallic flexible conduit as an integrated gas spacer cable rated 0 through 600 volts.

~~325-2~~ 325-3 . Other Articles. Type IGS cable shall comply with this article and also with the applicable provisions of other articles in this Code.

~~B.~~ II. Installation

~~325-3~~ 325-10. Uses Permitted. Type IGS cable shall be permitted for use underground, including direct burial in the earth, as service-entrance conductors, or as feeder or branch-circuit conductors.

~~325-4~~ 325-12. Uses Not Permitted. Type IGS cable shall not be used as interior wiring or be exposed in contact with buildings.

~~325-11~~ 325-24. Bending Radius. Where the coilable nonmetallic conduit and cable is bent for installation purposes or is flexed or bent during shipment or installation, the radii of bends measured to the inside of the bend shall not be less than specified in Table ~~325-11~~ 325-24.

Table ~~325-11~~ 325-24. Minimum Radii of Bends

Conduit Trade Size (in.)	Minimum Radii In.	Mm
2	24	~~610~~
3	35	~~889~~
4	45	~~1143~~

~~325-12~~ 325-26. Bends. A run of Type IGS cable between pull boxes or terminations shall not contain more than the equivalent of four quarter bends (360 degrees total), including those bends located immediately at the pull box or terminations.

~~325-13~~ 325-40. Fittings. Terminations and splices for Type IGS cable shall be identified as a type that is suitable for maintaining the gas pressure within the conduit. A valve and cap shall be provided for each length of the cable and conduit to check the gas pressure or to inject gas into the conduit.

325-14 325-80. Ampacity. The ampacity of Type IGS cable and conduit shall not exceed values shown in Table ~~325-14~~ 325-80 for single conductor or multiconductor cable.

Table ~~325-14~~ 325-80. Ampacity of Type IGS Cable

Size (kcmil)	Amperes	Size (kcmil)	Amperes
250	119	2500	376
500	168	3000	412
750	206	3250	429
1000	238	3500	445
1250	266	3750	461
1500	292	4000	476
1750	344	4250	491
2000	336	4500	505
2250	357	4750	519

~~C.~~ III. Construction Specifications

~~325-20~~ 325-100. Conductors. The conductors shall be solid aluminum rods, laid parallel, consisting of one to nineteen 1/2-in. (12.7-mm) diameter rods.

The minimum conductor size shall be 250 kcmil and the maximum size shall be 4750 kcmil.

~~325-21~~ 325-112. Insulation. The insulation shall be dry kraft paper tapes and a pressurized sulfur hexafluoride gas (SF6), both approved for electrical use. The nominal gas pressure shall be 20 pounds per square inch gauge (psig) (138 kPa gauge).

The thickness of the paper spacer shall be as specified in Table ~~325-21~~ 325-112.

Table ~~325-21~~. 325-112. Paper Spacer Thickness

Size (kcmil)	Thickness in.	mm
250–1000	0.040	1.02
1250–4750	0.060	1.52

~~325-22.~~ 325-116. Conduit. The conduit shall be a medium density polyethylene identified as suitable for use with natural gas rated pipe in 2-in., 3-in., or 4-in. trade size. The percent fill dimensions for the conduit are shown in Table ~~325-22.~~ 325-116.

The size of the conduit permitted for each conductor size shall be calculated for a percent fill not to exceed those found in Table 1, Chapter 9.

Table ~~325-22.~~ 325-116. Conduit Dimensions

Conduit Trade Size (in.)	Outside Diameter in.	mm	Inside Diameter in.	mm
2	2.375	60	1.947	49.46
3	3.500	89	2.886	73.30
4	4.50	114	3.710	94.23

~~325-24~~ 325-120. Marking. The cable shall be marked in accordance with Sections 310-11(a), 310-11(b)(1), and 310-11(d).
SUBSTANTIATION: The proposed article re-write was developed as part of a larger effort by the NEC Usability Committee to re-format existing raceway, cable and wiring articles. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

To the extent that this was possible in this article, this has been done. It is not the intent or purpose of this re-write to change the actual intent of the existing article requirements. The only new material in this proposal is the proposed new article scope which has been added to conform with the NEC Style Manual 2.2.1

A companion proposal has also been submitted which re-structures the article to a greater degree by splitting existing Code requirements into new sections to better adhere to the new article format. In some cases this is done with an alternate article re-write while in other cases, individual proposals have been

submitted. These proposals are also intended to further enhance the structure and format of the article but in some cases existing code text requirements had to be revised or altered to meet the re-formatting needs. For this reason the proposals are separate which will allow the Code Making Panels to individually consider each proposal.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #273)

7- 41 - (325-1 and 325-2): Accept in Principle
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Delete the present text in Section 325-2. Other Articles and retitle Section 325-2. Definitions.
Relocate the present text of Section 325-1. Definitions to retitled Section 325-2. Definitions.
Retitle Section 325-1. Scope and insert the following text:
"This article covers the use, installation, and construction specifications of integrated gas spacer cable."
SUBSTANTIATION: As presently written, Section 325-2 title Other Articles directs compliance with this article. This requirement for compliance is more properly shown as being the scope of this article. It is redundant to indicate that compliance with other articles of this code is required. This information is adequately covered in Section 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1321)

7- 42 - (325-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add new text to read:
325-1. Scope. This article covers the use, installation, and construction specifications for Integrated Gas Spacer Cable.
Renumber existing Sections accordingly.
SUBSTANTIATION: NEC Style Manual requires that each article contain a statement of scope and that the scope statement be the first section of the article. See 2.2.1 and 2.2.2.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1320)

7- 43 - (325-1-Integrated Gas Spacer Cable (Type IGS)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 325-1 (325-2. New) definition as follows:
Integrated Gas Spacer Cable (Type IGS). ~~Type IGS cable is a~~ A factory assembly of one or more conductors, each individually insulated and enclosed in a loose fit, nonmetallic flexible conduit as an integrated gas spacer cable rated 0 through 600 volts.
SUBSTANTIATION: The Definition has been editorially revised to match the sentence structure of the other cable and wiring articles which contain a "definition" of the covered cable or wiring article. It is not intended that this change be other than editorial to provide a similar format where the definition follows a standard sentence structure where ever possible.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1323)

7- 44 - (325-2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete this section.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3. Also Section 4.1.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1417)

7- 45 - (325-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 325-2 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1324)

7- 46 - (325-3): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise existing 325-3 (325-10 New) to convert text to a list.
~~325-3.~~ 325-10. Uses Permitted. Type IGS cable shall be permitted for use underground, including direct burial in the earth as:
(1) service-entrance conductors
(2) feeder or branch-circuit conductors.
SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that where possible lists or tables be used to present requirements, rather than long text descriptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #462)

7- 47 - (Table 325-11): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 325-11 as follows:

Table 325-11. Minimum Radii of Bends

Metric Designator	~~Conduit~~ Trade Size ~~(in.)~~	Minimum Radii mm	Minimum Radii in.
53	2	600 ~~610~~	24
78	3	900 ~~889~~	35
103	4	1150 ~~1143~~	45

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1322)

7- 48 - (325-14): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 325-14 to read :
"The ampacity of Type IGS cable ~~and conduit~~ shall not exceed the values shown in Table 325-14 ~~for single conductor or multiconductor cable~~."
SUBSTANTIATION: Type IGS cable is defined in 325-1 as one or more conductors enclosed in a conduit so the ampacity is for the complete IGS cable and it is not necessary to repeat "for single or multiconductor cable".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #461)

7- 49 - (325-20, 21, and 22): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 325-20 - revise as follows:
"The conductors shall be solid aluminum rods, laid parallel, consisting of one to nineteen 12.7 mm (1/2 in.) ~~1/2 in. (12.7 mm)~~ diameter rods."
Table 325-21 - reverse the position of the last two columns.
325-22 - revise the first sentence as follows:
"The conduit shall be a medium density polyethylene identified as suitable for use with natural gas rated pipe in metric designator 53, 78, or 103 (trade size 2, 3, or 4). ~~2 in., 3 in., or 4 in. trade size.~~"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded in Section 325-20 and Table 325-21 since the diameter of the aluminum rod and the paper spacer thickness are product specific and safety related.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #463)

7- 50 - (325-21): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the second sentence as follows:
"The nominal gas pressure shall be 138 kPa (20 pounds per square inch gauge (psig) ~~20 pounds per square inch gauge (psig) (138 kPa gauge).~~"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI unit is not rounded since the dimension shown is product related.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #464)

7- 51 - (Table 325-22): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 325-22 as follows.
(Table shown below)

Table 325-22. Conduit Dimensions

Metric Designator	~~Conduit~~ Trade Size ~~(in.)~~	*Actual Outside Diameter* mm	*Actual Outside Diameter* in.	Actual Inside Diameter mm	Actual Inside Diameter in.
53	2	60	2.375	49.46	1.947
78	3	89	3.500	73.30	2.886
103	4	114	4.500	94.23	3.710

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI unit as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since the conduit dimensions require a soft conversion because of wire fill calculations.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-39a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1844)

7- 52 - (325-24): Reject
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 325-24. Marking. in its entirety.
SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3, and 4 apply generally.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 310-11(b) does not specify that Type IGS cable is covered, therefore a specific reference for marking within this article is needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

ARTICLE 326 — MEDIUM VOLTAGE CABLE: TYPE MV

(Log #CP707)

7- 52a - (326): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 326 to comply with NEC Style Manual.
ARTICLE 326 -- Medium Voltage Cable: Type MV
I General
326-1. Scope. This article covers the use, installation, and construction specifications for Medium Voltage Cable, Type MV.
326-2. Definition.
Medium Voltage Cable, Type MV. A single or multiconductor solid dielectric insulated cable rated 2001 volts or higher.
II Installation
326-10. Uses Permitted. Type MV cables shall be permitted for use on power systems rated up to 35,000 volts, nominal:
(1) In wet or dry locations
(2) In raceways
(3) In cable trays as specified in 318-3(b)(1)
(4) Direct buried in accordance with 300-50
(5) In messenger supported wiring
326-12. Uses Not Permitted. Type MV cable shall not be used unless identified for the use:
(1) Where exposed to direct sunlight
(2) In cable trays
326-80. Ampacity. The ampacity of Type MV cable shall be determined in accordance with 310-60. The ampacity of Type MV cable installed in cable tray shall be determined in accordance with 318-13.
III Construction Specifications
326-100. Construction. Type MV cables shall have copper, aluminum, or copper-clad aluminum conductors and shall be constructed in accordance with Article 310.
SUBSTANTIATION: This revision to Article 326 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-53, 7-54, 7-55, 7-56, 7-58, 7-59, 7-60, 7-61, 7-62, and 7-63.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1379)

7- 53 - (326): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise text to read as follows:
Article 326 — Medium Voltage Cable: Type MV
I. General.
~~326-1.~~ 326-2. Definition.
Medium Voltage Cable (Type MV). ~~cable is a~~ A single or multiconductor solid dielectric insulated cable rated 2001 volts or higher.
~~326-2.~~ 326-3. Other Articles.
In addition to the provisions of this article, Type MV cable shall comply with the applicable provisions of this Code, especially those of Articles 300, 305, 310, 318, and 490.
II. Installation.
~~326-3.~~ 326-10. Uses Permitted. Type MV cables shall be permitted for use on power systems rated up to 35,000 volts, nominal, in wet or dry locations, in raceways, in cable trays as specified in Section 318-3(b)(1) or directly buried in accordance with Section 300-50, and in messenger supported wiring.
~~326-4.~~ 326-12. Uses Not Permitted. Type MV cable shall not be used unless identified for the use (1) where exposed to direct sunlight, and (2) in cable trays.
~~326-6.~~ 326-80. Ampacity. The ampacity of Type MV cable shall be in accordance with Section 310-60.
Exception: The ampacity of Type MV cable installed in cable tray shall be in accordance with Section 318-13.
III. Construction Specifications.
~~326-5.~~ 326-100. Construction. Type MV cables shall have copper, aluminum, or copper-clad aluminum conductors and shall be constructed in accordance with Article 310.
~~326-7.~~ 326-120. Marking. Medium voltage cable shall be marked as required in Section 310-11.
SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.
A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.
For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #268)

7- 54 - (326-1 and 326-2): Accept in Principle
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Delete all of the present text in Section 326-2 "Other Articles" and retitle Section 326-2 "Definitions."
Relocate the present text of Section 326-1 "Definition" to retitled Section 326-2 "Definitions."
Retitle Section 326-1 "Scope" and insert the following text:
"This article covers the use, installation, and construction medium voltage cable: Type MV."
SUBSTANTIATION: As presently written, Section 326-2 titled Other Articles directs compliance with this article. This compliance is more properly shown as being the scope of this article. It is redundant to indicate that compliance with other applicable provisions of this code is required. This information is adequately covered in Section 90-3. To indicate that compliance with "especially" Articles 300, 305, 310, 318, and 490 is

a requirement, is not only redundant to Section 90-3 but appears to place a premium on the value of safety in these articles. The National Electrical Code Style Manual in Part B. References in paragraph B.2(b) discourages cross-references to an entire article unless a reference to one or more sections would not be sufficiently complete. The use of the term "especially" indicates an exceptional degree of importance being given to particular requirements or conversely indicates a lack of importance to some safety requirements.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1325)

7- 55 - (326-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add new text to read:
326-1. Scope. This article covers the use, installation, and construction specifications for Medium Voltage Cable: Type MV.
Renumber existing Sections accordingly.
SUBSTANTIATION: NEC Style Manual requires that each article contain a statement of scope and that the scope statement be the first section of the article. See 2.2.1 and 2.2.2.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1326)

7- 56 - (326-2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete this section.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3. Also Section 4.1.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #817)

7- 57 - (326-3): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Type MV cables shall be permitted for use on power systems rated up to 35,000 volts, nominal, in wet or dry locations, in approved raceways, in cablebus assemblies, in auxiliary gutters, in cable trays as specified in Section 318-3(b)(1), as open wiring in accordance with Section 310-7(b), as open wiring in accordance with Article 225 and Section 300-37, ~~or~~ directly buried in accordance with Section 310-7(b), and in messenger supported wiring in accordance with Section 321-3(b).
SUBSTANTIATION: Editorial. Approved raceways should be specified as all are not approved (listed) for over 600 volts. If wiring methods are to be listed they should be inclusive.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 326-3 is not intended to be an all inclusive list of uses permitted, but a list of common applications for the wiring method. Uses not permitted are specifically covered in Section 326-4 and the wiring methods proposed by the submitter are not excluded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
TRAINOR: I do not agree with the Panel Statement. Section 110-8 reads, "Only wiring methods recognized as suitable are included in this Code. The recognized methods of wiring shall be permitted to be installed in any type of building or occupancy, except as otherwise provided in this Code."
Restrictions on the use of wiring methods can be placed in either "Uses Permitted" or "Uses Not Permitted." In uses not permitted, the restriction is generally a specific prohibition. If the wiring method is permitted for any use except those specifically prohibited in uses not permitted, then there should be no entry in uses permitted. Section 300-2 states that the wiring methods specified in Chapter 3 shall be used for voltages of 600 volts, nominal, unless otherwise limited and that they shall be permitted for voltages over 600 volts, nominal only where specifically permitted elsewhere in the Code. Type MV Cable is used on circuits with voltages ranging from 2,000 V to 35,000 V. The present wording of 326-3 allows MV cable to be used "in raceways" with no limitation. This would allow it to be installed in Electrical Nonmetallic Tubing which is clearly not acceptable.
Because MV cable is used at over 600 V, it's permitted uses with other wiring methods must be limited to those which are also identified for use at voltages up to 35,000 V. I agree with the bulk of the submitter's proposal. I believe that the Uses Permitted for Type MV Cable should be very specific and should read something like the following:
(1) In raceways identified for the voltage of the circuit
(2) In cablebus assemblies
(3) In cable trays in accordance with 318-3(b), 318-6(f), 318-12 and 318-13
(4) as open wiring in accordance with Article 225 and Section 300-37
(5) directly buried in accordance with 300-50 and 310-7
(6) in messenger supported wiring in accordance with 321-3(b)
I did not find a reference to over 600 V for Auxiliary Gutters although they are typically used in such systems.

(Log #1327)

7- 58 - (326-3): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise existing 326-3 (326-10 New) to convert text to a list.
~~326-3.~~ 326-10. Uses Permitted
Type MV cables shall be permitted for use on power systems rated up to 35,000 volts, nominal~~,~~:
(1) In ~~in~~ wet or dry locations~~,~~
(2) In ~~in~~ raceways~~,~~
(3) In ~~in~~ cable trays as specified in ~~Section~~ 318-3(b)(1)
(4) Direct ~~or directly~~ buried in accordance with ~~Section~~ 300-50
(5) In ~~and in~~ messenger supported wiring.
SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that where possible lists or tables be used to present requirements, rather than long text descriptions. The word "Section" was deleted in accordance with the NEC Style Manual requirement in 4.1.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1845)

7- 59 - (326-3): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: In the fourth line, add a comma after "318-3(b)(1)" and revise as follows:
"Type MV cables shall be permitted for use on power systems rated up to 35,000 volts, nominal, in wet or dry locations, in raceways, in cable trays as specified in ~~Section~~ 318-3(b)(1), ~~or~~ directly buried in accordance with ~~Section~~ 300-50, and in messenger supported wiring."
SUBSTANTIATION: The comma was added and "or" was deleted for clarity.
Section 4.1.2 of the 1999 National Electrical Code Style Manual stipulates that "... references shall include only the number of the

rule being referenced; the word section, subsection, and paragraph shall not be used."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1328)

7- 60 - (326-4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 326-4 (326-12 New) to read as follows:
326-4. Uses Not Permitted. Type MV cable shall not be used unless identified for the use:
(1) Where ~~where~~ exposed to direct sunlight~~, and~~
(2) In ~~in~~ cable trays.
SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that if possible, use lists or tables to present requirements, rather than long text descriptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1329)

7- 61 - (326-6): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change the Exception into positive text and revise 326-6 (326-80 New) as follows:
~~326-6~~ 326-80. Ampacity. The ampacity of Type MV cable shall be determined in accordance with ~~Section~~ 310-60. The ampacity of Type MV cable installed in cable tray shall be determined in accordance with 318-13.
~~Exception: The ampacity of Type MV cable installed in cable tray shall be in accordance with Section 318-13.~~
SUBSTANTIATION: T he Exception was reworded as a requirement in accordance with Section 2.3.5.2 of the NFPA Style Manual. The word "Section" was deleted in two places in accordance with NEC Style Manual Section 4.1.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1330)

7- 62 - (326-7): Accept in Principle
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete this section.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3. Also Section 4.1.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
GUIDA: This proposal should have been rejected because Section 310-11(b) does not include Type MV cable in the list of cables covered. Therefore a specific reference for marking within Article 326 is needed.

(Log #1846)

7- 63 - (326-7): Accept in Principle
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 326-7. Marking. in its entirety.
SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3, and 4 apply generally.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-52a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
GUIDA: This proposal should have been rejected because Section 310-11(b) does not include Type MV cable in the list of cables covered. Therefore a specific reference for marking within Article 326 is needed.

ARTICLE 328 — FLAT CONDUCTOR CABLE: TYPE FCC

(Log #CP708)

7- 63a - (328): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
The Technical Correlating Committee directs the Panel to reconsider Section 328-12 to be consistent with the other cable articles. See Proposals 7-89a, 7-128a, 7-247, and 7-265a. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 328 to comply with NEC Style Manual.

ARTICLE 328 -- Flat Conductor Cable: Type FCC

I General

328-1. Scope. This article covers a field-installed wiring system for branch circuits incorporating Type FCC cable and associated accessories as defined by the article. The wiring system is designed for installation under carpet squares.
328-2. Definitions.
Type FCC Cable. Three or more flat copper conductors placed edge-to-edge and separated and enclosed within an insulating assembly.
FCC System. A complete wiring system for branch circuits that is designed for installation under carpet squares. The FCC system includes Type FCC cable and associated shielding, connectors, terminators, adapters, boxes, and receptacles.
Cable Connector. A connector designed to join Type FCC cables without using a junction box.
Insulating End. An insulator designed to electrically insulate the end of a Type FCC cable.
Top Shield. A grounded metal shield covering under-carpet components of the FCC system for the purposes of providing protection against physical damage.
Bottom Shield. A protective layer that is installed between the floor and Type FCC flat conductor cable to protect the cable from physical damage and may or may not be incorporated as an integral part of the cable.
Transition Assembly. An assembly to facilitate connection of the FCC system to other wiring systems, incorporating (1) a means of electrical interconnection, and (2) a suitable box or covering for providing electrical safety and protection against physical damage.
Metal Shield Connections. Means of connection designed to electrically and mechanically connect a metal shield to another metal shield, to a receptacle housing or self-contained device, or to a transition assembly.

II Installation

328-10. Uses Permitted.
(a) Branch Circuits. Use of FCC systems shall be permitted both for general-purpose and appliance branch circuits and for individual branch circuits.
(b) Branch-Circuit Ratings.
(1) Voltage. Voltage between ungrounded conductors shall not exceed 300 volts. Voltage between ungrounded conductors and the grounded conductor shall not exceed 150 volts.
(2) Current. General-purpose and appliance branch circuits shall have ratings not exceeding 20 amperes. Individual branch circuits shall have ratings not exceeding 30 amperes
(c) Floors. Use of FCC systems shall be permitted on hard, sound, smooth, continuous floor surfaces made of concrete, ceramic, or composition flooring, wood, and similar materials.
(d) Walls. Use of FCC systems shall be permitted on wall surfaces in surface metal raceways.
(e) Damp Locations. Use of FCC systems in damp locations shall be permitted.
(f) Heated Floors. Materials used for floors heated in excess of 30ºC (86ºF) shall be identified as suitable for use at these temperatures.
(g) System Height Any portion of an FCC system with a height above floor level exceeding 2.3 mm (0.090 in.) shall be tapered or feathered at the edges to floor level.
(h) Coverings. Floor-mounted Type FCC cable, cable connectors, and insulating ends shall be covered with carpet squares not larger than 914 mm (36 in.) square. Those carpet squares that are adhered to the floor shall be attached with release-type adhesives.
(I) Corrosion Resistance. Metal components of the system shall be either corrosion resistant, coated with corrosion-resistant materials, or insulated from contact with corrosive substances.
(j) Metal-Shield Connectors. Metal shields shall be connected to each other and to boxes, receptacle housings, self-contained devices, and transition assemblies using metal-shield connectors
328-12. Uses Not Permitted. FCC systems shall not be used in the following:
(1) Outdoors or in wet locations
(2) Where subject to corrosive vapors
(3) In any hazardous (classified) location
(4) In residential, school, and hospital buildings
.
328-18. Crossings. Crossings of more than two Type FCC cable runs shall not be permitted at any one point. Crossings of a Type FCC cable over or under a flat communications or signal cable shall be permitted. In each case, a grounded layer of metal shielding shall separate the two cables, and crossings of more than two flat cables shall not be permitted at any one point.
328-30. Securing and Supporting. All FCC system components shall be firmly anchored to the floor or wall using an adhesive or mechanical anchoring system identified for this use. Floors shall be prepared to ensure adherence of the FCC system to the floor until the carpet squares are placed.

328-40. Boxes and Fittings.
(a) Cable Connections and Insulating Ends. All Type FCC cable connections shall use connectors identified for their use, installed such that electrical continuity, insulation, and sealing against dampness and liquid spillage are provided. All bare cable ends shall be insulated and sealed against dampness and liquid spillage using listed insulating ends.
(b) Polarization of Connections. All receptacles and connections shall be constructed and installed so as to maintain proper polarization of the system.
(c) Shields.
(1) Top Shield. A metal top shield shall be installed over all floor-mounted Type FCC cable, connectors, and insulating ends. The top shield shall completely cover all cable runs, corners, connectors, and ends.
(2) Bottom Shield. A bottom shield shall be installed beneath all Type FCC cable, connectors, and insulating ends.
(d) Connection to Other Systems. Power feed, grounding connection, and shield system connection between the FCC system and other wiring systems shall be accomplished in a transition assembly identified for this use.
328-42 Devices.
(a) Receptacles. All receptacles, receptacle housings, and self-contained devices used with the FCC system shall be identified for this use and shall be connected to the Type FCC cable and metal shields. Connection from any grounding conductor of the Type FCC cable shall be made to the shield system at each receptacle.
(b) Receptacles and Housings. Receptacle housings and self-contained devices designed either for floor mounting or for in- or on-wall mounting shall be permitted for use with the FCC system. Receptacle housings and self-contained devices shall incorporate means for facilitating entry and termination of Type FCC cable and for electrically connecting the housing or device with the metal shield. Receptacles and self-contained devices shall comply with 210-7. Power and communications outlets installed together in common housing shall be permitted in accordance with 800-52(a)(2), Exception No. 1.
328-56. Splices And Taps.
(a) FCC Systems Alterations. Alterations to FCC systems shall be permitted. New cable connectors shall be used at new connection points to make alterations. It shall be permitted to leave unused cable runs and associated cable connectors in place and energized. All cable ends shall be covered with insulating ends.
(b) Transition Assemblies. All transition assemblies shall be identified for their use. Each assembly shall incorporate means for facilitating entry of the Type FCC cable into the assembly, for connecting the Type FCC cable to grounded conductors, and for electrically connecting the assembly to the metal cable shields and to equipment grounding conductors.
328-60. Grounding. All metal shields, boxes, receptacle housings, and self-contained devices shall be electrically continuous to the equipment grounding conductor of the supplying branch circuit. All such electrical connections shall be made with connectors identified for this use. The electrical resistivity of such shield system shall not be more than that of one conductor of the Type FCC cable used in the installation.

III Construction

328-100. Construction.
(a) Type FCC Cable. Type FCC cable shall be listed for use with the FCC system and shall consist of three, four, or five flat copper conductors, one of which shall be an equipment grounding conductor.
(b) Shields.
(1) Materials and Dimensions. All top and bottom shields shall be of designs and materials identified for their use. Top shields shall be metal. Both metallic and nonmetallic materials shall be permitted for bottom shields.
(2) Resistivity. Metal shields shall have cross-sectional areas that provide for electrical resistivity of not more than that of one conductor of the Type FCC cable used in the installation.
.
328-112. Insulation. The insulating material of the cable shall be moisture resistant and flame retardant. All insulating materials in the FCC systems shall be identified for their use.
.
328-120. Markings.
(a) Cable Marking. Type FCC cable shall be clearly and durably marked on both sides at intervals of not more than 610 mm (24 in.) with the information required by 310-11(a) and with the following additional information:
(1) Material of conductors
(2) Maximum temperature rating
(3) Ampacity
(b) Conductor Identification. Conductors shall be clearly and durably identified on both sides throughout their length as specified in 310-12.
SUBSTANTIATION: This revision to Article 328 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-64, 7-65, 7-66, 7-67, and 7-68.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1380)

7- 64 - (328): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise text to read as follows:
Article 328 -- Flat Conductor Cable: Type FCC
A. I. General
328-1. Scope. This article covers a field-installed wiring system for branch circuits incorporating Type FCC cable and associated

accessories as defined by the article. The wiring system is designed for installation under carpet squares.

328-2. Definitions.

Flat Conductor Cable (Type FCC). ~~Cable Type FCC cable consists of~~ Tthree or more flat copper conductors placed edge-to-edge and separated and enclosed within an insulating assembly.

FCC System. A complete wiring system for branch circuits that is designed for installation under carpet squares. The FCC system includes Type FCC cable and associated shielding, connectors, terminators, adapters, boxes, and receptacles.

Cable Connector. A connector designed to join Type FCC cables without using a junction box.

Insulating End. An insulator designed to electrically insulate the end of a Type FCC cable.

Top Shield. A grounded metal shield covering under-carpet components of the FCC system for the purposes of providing protection against physical damage.

Bottom Shield. A protective layer that is installed between the floor and Type FCC flat conductor cable to protect the cable from physical damage and may or may not be incorporated as an integral part of the cable.

Transition Assembly. An assembly to facilitate connection of the FCC system to other wiring systems, incorporating (1) a means of electrical interconnection, and (2) a suitable box or covering for providing electrical safety and protection against physical damage.

Metal Shield Connections. Means of connection designed to electrically and mechanically connect a metal shield to another metal shield, to a receptacle housing or self-contained device, or to a transition assembly.

328-3. Other Articles. The FCC systems shall conform with the applicable provisions of Articles 210, 220, 240, 250, and 300.

~~B.~~ II. Installation

~~328-4~~. 328-10. Uses Permitted.

(a) Branch Circuits. Use of FCC systems shall be permitted both for general-purpose and appliance branch circuits and for individual branch circuits.

~~328-6~~ (b) Branch-Circuit Ratings.

~~328-6. (b)~~ (1) Current. General-purpose and appliance branch circuits shall have ratings not exceeding 20 amperes. Individual branch circuits shall have ratings not exceeding 30 amperes.

~~328-6. (a)~~ (2) Voltage. Voltage between ungrounded conductors shall not exceed 300 volts. Voltage between ungrounded conductors and the grounded conductor shall not exceed 150 volts

~~(b)~~ (c) Floors. Use of FCC systems shall be permitted on hard, sound, smooth, continuous floor surfaces made of concrete, ceramic, or composition flooring, wood, and similar materials.

~~(c)~~ (d) Walls. Use of FCC systems shall be permitted on wall surfaces in surface metal raceways.

~~(d)~~ (e) Damp Locations. Use of FCC systems in damp locations shall be permitted.

~~(e)~~ (f) Heated Floors. Materials used for floors heated in excess of 30°C (86°F) shall be identified as suitable for use at these temperatures.

~~328-18.~~ (g) System Height. Any portion of an FCC system with a height above floor level exceeding 0.090 in. (2.29 mm) shall be tapered or feathered at the edges to floor level.

~~328-10~~. (h) Coverings. Floor-mounted Type FCC cable, cable connectors, and insulating ends shall be covered with carpet squares not larger than 36 in. (914 mm) square. Those carpet squares that are adhered to the floor shall be attached with release-type adhesives.

~~328-33~~. (i) Corrosion Resistance. Metal components of the system shall be either corrosion resistant, coated with corrosion-resistant materials, or insulated from contact with corrosive substances.

~~328-35 (c).~~ (j) Metal-Shield Connectors. Metal shields shall be connected to each other and to boxes, receptacle housings, self-contained devices, and transition assemblies using metal-shield connectors.

~~328-5~~ 328-12. Uses Not Permitted. FCC systems shall not be used in the following:

1. Outdoors or in wet locations
2. Where subject to corrosive vapors
3. In any hazardous (classified) location
4. In residential, school, and hospital buildings

~~328-17~~. 328-18. Crossings. Crossings of more than two Type FCC cable runs shall not be permitted at any one point. Crossings of a Type FCC cable over or under a flat communications or signal cable shall be permitted. In each case, a grounded layer of metal shielding shall separate the two cables, and crossings of more than two flat cables shall not be permitted at any one point.

~~328-16~~. 328-30. ~~Anchoring~~ Securing and Supporting. All FCC system components shall be firmly anchored to the floor or wall using an adhesive or mechanical anchoring system identified for this use. Floors shall be prepared to ensure adherence of the FCC system to the floor until the carpet squares are placed.

328-40. Boxes and Fittings.

~~328-11.~~ (a) Cable Connections and Insulating Ends.

All Type FCC cable connections shall use connectors identified for their use, installed such that electrical continuity, insulation, and sealing against dampness and liquid spillage are provided. All bare cable ends shall be insulated and sealed against dampness and liquid spillage using listed insulating ends.

~~328-20.~~ (b) Polarization of Connections. All receptacles and connections shall be constructed and installed so as to maintain proper polarization of the system.

~~328-12.~~ (c) Shields.

~~(a)~~ (1) Top Shield. A metal top shield shall be installed over all floor-mounted Type FCC cable, connectors, and insulating ends. The top shield shall completely cover all cable runs, corners, connectors, and ends.

~~(b)~~ (2) Bottom Shield. A bottom shield shall be installed beneath all Type FCC cable, connectors, and insulating ends.

~~328-15~~. (d) Connection to Other Systems. Power feed, grounding connection, and shield system connection between the FCC system and other wiring systems shall be accomplished in a transition assembly identified for this use.

328-42 Devices.

~~328-14~~. (a) Receptacles.

All receptacles, receptacle housings, and self-contained devices used with the FCC system shall be identified for this use and shall be connected to the Type FCC cable and metal shields. Connection from any grounding conductor of the Type FCC cable shall be made to the shield system at each receptacle.

~~328-36~~. (b) Receptacles and Housings. Receptacle housings and self-contained devices designed either for floor mounting or for in- or on-wall mounting shall be permitted for use with the FCC system. Receptacle housings and self-contained devices shall incorporate means for facilitating entry and termination of Type FCC cable and for electrically connecting the housing or device with the metal shield. Receptacles and self-contained devices shall comply with Section 210-7. Power and communications outlets installed together in common housing shall be permitted in accordance with Section 800-52(a)(2), Exception No. 1.

328-56. Splices and Taps.

~~328-19.~~ (a) FCC Systems Alterations. Alterations to FCC systems shall be permitted. New cable connectors shall be used at new connection points to make alterations. It shall be permitted to leave unused cable runs and associated cable connectors in place and energized. All cable ends shall be covered with insulating ends.

~~328-37~~. (b) Transition Assemblies.

All transition assemblies shall be identified for their use. Each assembly shall incorporate means for facilitating entry of the Type FCC cable into the assembly, for connecting the Type FCC cable to grounded conductors, and for electrically connecting the assembly to the metal cable shields and to equipment grounding conductors.

328-60. Grounding.

~~328-13. Enclosure and Shield Connections.~~ All metal shields, boxes, receptacle housings, and self-contained devices shall be electrically continuous to the equipment grounding conductor of the supplying branch circuit. All such electrical connections shall be made with connectors identified for this use. The electrical resistivity of such shield system shall not be more than that of one conductor of the Type FCC cable used in the installation.

~~C.~~ *III. Construction Specifications*

328-100. Construction.

~~328-30~~. (a) Type FCC Cable. Type FCC cable shall be listed for use with the FCC system and shall consist of three, four, or five flat copper conductors, one of which shall be an equipment grounding conductor~~. The insulating material of the cable shall be moisture-resistant and flame-retardant. 328-32. (b) Order.~~ For a 2-wire FCC system with grounding, the grounding conductor shall be central

~~328-35~~. (b) Shields.

~~(a)~~ 1. Materials and Dimensions. All top and bottom shields shall be of designs and materials identified for their use. Top shields shall be metal. Both metallic and nonmetallic materials shall be permitted for bottom shields.

~~(b)~~ 2. Resistivity. Metal shields shall have cross-sectional areas that provide for electrical resistivity of not more than that of one conductor of the Type FCC cable used in the installation.
~~328-34.~~ 328-112. Insulation. The insulating material of the cable shall be moisture resistant and flame retardant. All insulating materials in the FCC systems shall be identified for their use.
~~328-31~~ 328-120. Markings.
(a) Cable Marking. Type FCC cable shall be clearly and durably marked on both sides at intervals of not more than 24 in. (610mm) with the information required by Section 310-11 (a) and with the following additional information:
1. Material of conductors
2. Maximum temperature rating
3. Ampacity
~~328-32~~ (b) Conductor Identification.
~~(a) Colors.~~ Conductors shall be clearly and durably ~~marked~~ identified on both sides throughout their length as specified in Section 310-12.
SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.
A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel Code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.
For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-63a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1331)

7- 65 - (328-3): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete this section:
~~328-3. Other Articles. The FCC systems shall conform with the applicable provisions of Articles 210, 220, 240, 250, and 300.~~
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-63a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1418)

7- 66 - (328-3): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 328-3 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-63a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #466)

7- 67 - (328-10): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the first sentence as follows:
"Floor-mounted Type FCC cable, cable connectors, and insulating ends shall be covered with carpet squares not larger than 914 mm (36 in.) ~~36 in. (914 mm)~~ square."
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI unit is not rounded since the dimension shown is standard industry practice.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-63a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #465)

7- 68 - (328-18 and 31): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 328-18 - revise as follows:
"Any portion of an FCC system with a height above floor level exceeding 2.3 mm (0.090 in.) ~~0.090 in. (2.29 mm)~~ shall be tapered or feathered at the edges to floor level."
328-31 - change "24 in. (610 mm)" to "610 mm (24 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units in Section 328-31 are not rounded since the measurement is product specific and 610 mm may be required to complete the legend, 600 mm may be too short.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-63a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2217)

7- 69 - (328-30): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: The term "flame-retardant" is used throughout the Code as a means of expressing to the user that the material resists ignition or the spread of flames, albeit the test methods are often not defined. The term "flame tested" is similarly undefined, but can be understood to mean a test which does not necessarily measure the ability of a material to resist

ignition or flame propagation. Some articles of the NEC offer information regarding the tests deemed appropriate for the required level of resistance to ignition or flame propagation. Others rely on the product standard to provide such information. The panel suggests that specific proposals be made wherever the generic reference to "flame retardant" is not sufficient.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
STEWART: The panel statement is correct. Changing the words "flame tested" is an undefined term that would lead to improper testing for the intended application.
TEMBLADOR: See Ravi Gantra's comment on Proposal 6-3.

ARTICLE 330 — MINERAL-INSULATED, METAL-SHEATHED CABLE: TYPE MI

(Log #CP709)

7- 69a - (330): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
The Technical Correlating Committee directs the Panel to move item (11), Uses Permitted, to an appropriate part of the Article. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 7
RECOMMENDATION: Revised Article 330 to conform with NEC Style Manual:
ARTICLE 330 -- Mineral-Insulated, Metal-Sheathed Cable: Type MI
I General
330-1 Scope. This article covers the use, installation, and construction specifications for Mineral- Insulated, Metal-Sheathed Cable, Type MI.
330-2. Definition. Mineral-Insulated, Metal-Sheathed Cable, Type MI. A factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquidtight and gastight continuous copper or alloy steel sheath.
II Installation
330-10. Uses Permitted. Type MI cable shall be permitted as follows:
(1) For services, feeders, and branch circuits
(2) For power, lighting, control, and signal circuits
(3) In dry, wet, or continuously moist locations; where installed in wet locations, Type MI cable shall comply with 300-6(c)
(4) Indoors or outdoors
(5) Where exposed or concealed
(6) Embedded in plaster, concrete, fill, or other masonry, whether above or below grade
(7) In any hazardous (classified) location
(8) Where exposed to oil and gasoline
(9) Where exposed to corrosive conditions not deteriorating to its sheath
(10) In underground runs where suitably protected against physical damage and corrosive conditions
(11) Where single-conductor cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together to minimize induced voltage on the sheath.
330-12. Uses Not Permitted. Type MI cable shall not be used where exposed to destructive corrosive conditions, unless protected by materials suitable for the conditions.
330-17. Through or parallel to Framing Members. Type MI cable shall comply with 300-4 where installed through studs, joists, rafters, or similar wood members.
330-24. Bending Radius. Bends in Type MI cable shall be made so that the cable will not be damaged. The radius of the inner edge of any bend shall not be less than shown as follows:
(1) Five times the external diameter of the metallic sheath for cable not more than 19 mm (3/4 in.) in external diameter
(2) Ten times the external diameter of the metallic sheath for cable greater than 19 mm (3/4 in.) but not more than 25 mm (1 in.) in external diameter
330-30. Securing and Supporting. Type MI cable shall be supported by one of the following means:
(1) Supported securely at intervals not exceeding 1.8 m (6 ft) by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable
Exception: Where cable is fished, support shall not be required.
(2) Supported in accordance with 318-8(b) where installed in cable trays
330-40. Boxes and Fittings.
(a) Fittings. Fittings used for connecting Type MI cable to boxes, cabinets, or other equipment shall be identified for such use. Where single-conductor cables enter ferrous metal boxes or cabinets, the installation shall comply with 300-20 to prevent inductive heating.
(b) Terminal Seals. Where Type MI cable terminates, a seal shall be provided immediately after stripping to prevent the entrance of moisture into the insulation. The conductors extending beyond the sheath shall be individually provided with an insulating material.
III. Construction Specifications
330-104. Conductors. Type MI cable conductors shall be of solid copper or nickel-clad copper with a resistance corresponding to standard AWG sizes.
330-108. Equipment Grounding. Where the outer sheath is made of copper, it shall provide an adequate path for equipment grounding purposes. Where made of steel, an equipment grounding conductor shall be provided
330-112. Insulation. The conductor insulation in Type MI cable shall be a highly compressed refractory mineral that provides proper spacing for all conductors.
330-116. Sheath. The outer sheath shall be of a continuous construction to provide mechanical protection and moisture seal.
SUBSTANTIATION: This revision to Article 320 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-70, 7-71, 7-72, 7-73, 7-79, 7-81, 7-85, and 7-89.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1381)

7- 70 - (330): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise "A. General" to "I. General"
Renumber and revise Section 330-1 as follows:
~~330-1.~~ 330-2. Definition. ~~Type MI mineral-insulated, metal-sheathed cable~~ Mineral-insulated, metal-sheathed cable (Type MI). ~~is a~~ A factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquidtight and gastight continuous copper or alloy steel sheath.
Renumber "330-2. Other Articles." as "330-3. Other Articles."
Revise "B. Installation" to "II. Installation"
Combine Sections 330-3, 330-10 and 330-16 and revise to read as follows:
~~330-3.~~ 330-10. Uses Permitted. Type MI cable shall be permitted as follows:
(1) For services, feeders, and branch circuits
(2) For power, lighting, control, and signal circuits
(3) In dry, wet, or continuously moist locations;
~~330-10. Wet Locations.~~ ~~Where~~ where installed in wet locations, Type MI cable shall comply with ~~Section~~ 300-6(c).
(4) Indoors or outdoors
(5) Where exposed or concealed
(6) Embedded in plaster, concrete, fill, or other masonry, whether above or below grade
(7) In any hazardous (classified) location
(8) Where exposed to oil and gasoline
(9) Where exposed to corrosive conditions not deteriorating to its sheath
(10) In underground runs where suitably protected against physical damage and corrosive conditions.
~~330-16. Single Conductors.~~
(11) Where single-conductor cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together to minimize induced voltage on the sheath.
(12) Where single-conductor cables enter ferrous enclosures, the installation shall comply with ~~Section~~ 300-20 to prevent heating from induction."
Renumber "330-4. Uses Not Permitted." as "330-12. Uses Not Permitted."

Revise "330-11. Through Joists, Studs, or Rafters." to "330-17. Through or Parallel to Framing Members."
Revise "330-13. Bends." to read as follows:
~~330-13. Bends.~~ 330-24. Bending Radius. Bends in Type MI cable shall be made so ~~as not to damage the cable.~~ that the cable will not be damaged. The radius of the inner edge of any bend shall not be less than shown as follows:
1. Five times the external diameter of the metallic sheath for cable not more than 3/4 in. (19 mm) in external diameter
2. Ten times the external diameter of the metallic sheath for cable greater than 3/4 in. (19 mm) but not more than 1 in. (25.4 mm) in external diameter
Revise "330-12. Supports." to "330-30. Securing and Supporting."
Combine 330-14 and 330-15 and revise to read as follows:
330-40. Boxes and Fittings.
(a) ~~330-14.~~ Fittings. Fittings used for connecting Type MI cable to boxes, cabinets, or other equipment shall be identified for such use. Where single-conductor cables enter ferrous metal boxes or cabinets, the installation shall comply with ~~Section~~ 300-20 to prevent inductive heating.
(b) ~~330-15.~~ Terminal Seals. Where Type MI cable terminates, a seal shall be provided immediately after stripping to prevent the entrance of moisture into the insulation. The conductors extending beyond the sheath shall be individually provided with an insulating material."
Revise "C. Construction Specifications" to "III. Construction Specifications"
Renumber "330-20. Conductors." as "330-104. Conductors."
Renumber "330-21. Insulation." as "330-112. Insulation."
Revise "330-22. Outer Sheath." to "330-116. Sheath."
SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.
A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.
For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-69a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1332)

7- 71 - (330-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a new Section:
330-1. Scope. This article covers the use, installation, and construction specifications for Mineral-Insulated, Metal-Sheathed Cable, Type MI.
Renumber 330-1 to 330-2.
Renumber 330-2 to 330-3.
Renumber 330-3 to 330-4.
Renumber 330-4 to 330-5.
SUBSTANTIATION: NEC Style Manual Section 2.2.1 requires that each article contain a statement of scope and that the scope statement be the first section of the Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-69a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1335)

7- 72 - (330-2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 330-2. Other Articles in its entirety.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3. Also Section 4.1.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-69a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1419)

7- 73 - (330-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 330-2 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-69a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1847)

7- 74 - (330-4): Accept in Principle
Note: The Technical Correlating Committee understands that the Panel Action text modifies 330-12 accepted in Proposal 7-69a.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 330-4 to read as follows:
330-4. Uses Not Permitted. Type MI cable shall not be used where exposed to destructive corrosive conditions, unless the metallic sheath is suitable for the conditions or is protected by materials suitable for the conditions.
SUBSTANTIATION: The proposed text is consistent with 334-4 for Type MC cable. There will be situations where the cable may be installed in a corrosive area but the particular corrosive material may not have a harmful effect on the metal covering used.
PANEL ACTION: Accept in Principle.
Revise 330-4 to read:
"Type MI cable shall not be used where exposed to conditions destructive and corrosive to the metallic sheath unless additionally protected by materials suitable for the conditions."
PANEL STATEMENT: The revised wording of the section addresses the concerns of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

Note: The sequence no. 7-75 was not used.

(Log #1848)

7- 76 - (330-10): Accept
Note: The Technical Correlating Committee understands that the action on this Proposal is incorporated into Proposal 7-69a.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 330-10.
SUBSTANTIATION: Article 300 already applies and it is not necessary to include the reference.
Section 4.1 of the 1999 National Electrical Code Style Manual stipulates "Do not use a reference if the requirement is already covered by 90.3."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1849)

7- 77 - (330-11): Accept
Note: The Technical Correlating Committee understands that this action deletes 330-17 in the rewrite in Proposal 7-69a.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 330-11.
SUBSTANTIATION: Article 300 already applies and it is not necessary to include the reference.
Section 4.1 of the 1999 National Electrical Code Style Manual stipulates "Do not use a reference if the requirement is already covered by 90.3."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #818)

7- 78 - (330-12 Exception No. 2 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception No. 2: Type MI cable installed as service-entrance conductors shall comply with Section 230-51(a) support requirements.
SUBSTANTIATION: Panel No. 4 stated in response to Proposal 4-94 in the 1995 ROP they intended Section 230-51(a) to apply to all cables used as service-entrance conductors. Section 334-10(e) appears to require this for Type MC cable.
PANEL ACTION: Reject.
PANEL STATEMENT: The support requirements as specified in 330-12(1) are considered adequate for the cable construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #467)

7- 79 - (330-12(1) and 330-13): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 330-12(1) - revise as follows:
"(1) Supported securely at intervals not exceeding 1.8 m (6 ft) ~~6 ft (1.83 m)~~ by straps, staples, hangers, or similar fittings designed and installed so as not to damage the cable"
330-13 - revise as follows:
"(1) Five times the external diameter of the metallic sheath for cable not more than 19 mm (3/4 in.) ~~3/4 in. (19 mm)~~ in external diameter
(2) Ten times the external diameter of the metallic sheath for cable greater than 19 mm (3/4 in.) ~~3/4 in. (19 mm)~~ but not more than 25 mm (1 in.) ~~1 in. (25.4 mm)~~ in external diameter"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-69a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

Note: The sequence no. 7-80 was not used.

(Log #819)

7- 81 - (330-14): Accept
Note: The Technical Correlating Committee understands that this action would delete the second sentence of 330-40(a) in Proposal 7-69a.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete the second sentence:
"~~Where single-conductor cables enter ferrous metal boxes or cabinets, the installation shall comply with Section 300-20 to prevent inductive heating.~~"
SUBSTANTIATION: Edit. This section is titled "fittings" Section 330-16 titled "single conductors" contains an identical sentence.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2419)

7- 82 - (330-15): Accept in Principle in Part
Note: The Technical Correlating Committee understands that the action will be included in 330-40(b) in Proposal 7-69a.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise to read:
330-15 Terminal Seals. Where Type MI cable terminates, ~~a~~ an end seal termination shall be ~~provided~~ installed immediately after stripping to prevent the entrance of moisture into the insulation. The conductor temperature at the termination shall not exceed the listed temperature rating of the end seal termination. The conductors extending beyond the sheath shall be individually provided with an insulating material.
SUBSTANTIATION: First sentence revised for clarity.
Second sentence added since it specifically applies to the installation and advises that the Listed temperature rating of the end seal termination must not be exceeded. While it is currently 90°C for end seal terminations that incorporate unimpregnated, organic, insulating materials, the listing temperature may be higher or lower than 90°C based on the materials used.
A companion proposal to revise 310-15(b)(7) has been submitted to coordinate with this revision.
PANEL ACTION: Accept in Principle in Part.
Change the word "termination" to "fitting" in the first sentence.
Delete the proposed second sentence.
PANEL STATEMENT: The terminology change is more descriptive for the end seal. The second sentence has been incorporated into new Section 330-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
STEWART: The change does not adequately cover termination temperature limitations. This needs to be done by referring to Fine Print Note No. 1 in Section 310-15(b).
TEMBLADOR: See my Comment on Affirmative on Proposal 7-88.

(Log #2440)

7- 83 - (330-15): Accept in Principle
SUBMITTER: Joseph A. Ross, Ross Electrical Assessments
RECOMMENDATION: Revise 330-15 as follows:
"Where Type MI cable terminates, a seal shall be provided immediately after stripping to prevent the entrance of moisture into the insulation. Termination fittings incorporating unimpregnated, organic, insulating materials shall be limited to 90°C (194°F) operation. The conductors extending beyond the sheath shall be individually provided with an insulating material."
SUBSTANTIATION: The termination seal that is referenced in Section 330-15 is actually part of the termination end seal that is referenced in Section 310-15(b)(7). See companion proposal that proposes the deletion of Section 310-15(b)(7) and the relocation of its text to Section 330-15.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns have been addressed by the panel's action on Proposal 7-88.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
TEMBLADOR: See my Comment on Affirmative on Proposal 7-88.

(Log #820)

7- 84 - (330-16): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Single Conductors. Where single-conductor cables are used, all ac circuit ~~phase~~ conductors ~~and, where used, the neutral conductor~~ shall be grouped together to minimize induced voltage on the sheath. (remainder unchanged)
SUBSTANTIATION: Edit. The requirement should apply specifically to ac as does Section 300-20. While "phase" may imply ac circuits it may also not imply a grounded conductor of a 2-wire circuit. "Circuit conductors" covers all conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing wording adequately covers the grouping requirement for all systems and the proposed wording would place a limitation on the use of this cable to AC systems only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1334)

7- 85 - (330-16): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete the second sentence of 330-16 so that it reads:
"Where single-conductor cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together to minimize induced voltage on the sheath. ~~Where single-conductor cables enter ferrous enclosures, the installation shall comply with Section 300-20 to prevent heating from induction.~~"
SUBSTANTIATION: The second sentence should be deleted since Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-69a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4202)

7- 86 - (330-16): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
"Where single-conductor cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together to minimize induced voltage on the sheath. The ampacities in Table 310-20 shall be permitted to apply to this condition. Where single-conductor cables enter ferrous enclosures, the installation shall comply with Section 300-20 to prevent heating from induction."
SUBSTANTIATION: Due in part to the 1996 NEC version of what is now Section 700-9(d), many who hadn't considered Type MI cable previously looked again in the context of installing an electrical circuit protective system. Some of these were quite large, and involve single-conductor cables for that reason. To this day installers and in-spectors are trying to get a handle on how to determine the ampacity of these cables under this condition.
Many manufacturer's representatives suggest Table 310-17. Many inspectors are saying Table 310-16, reasoning that the cable grouping is akin to a cable. This proposal suggests that the truth is somewhere be-tween these two positions. On the one hand, a grouped set of cables can't, for ampacity purposes, qualify as a single conductor in free air. On the other hand, we have the robustness of the insulation with respect to high temperature, and the excellent ability of the copper (or even steel as applicable) sheath to dissipate heat, and the fact that the insulation rating on the cable has to do with the termination seals and not the cable over its length.
Section 321-3(a) expressly recognizes the suitability of Type MI cable for use with messenger-supported wiring, which is the subject of Table 310-20. The ampacities in this table fall between those inTable 310-16 and 310-17. This is a reasonable compromise, especially since Table 310-20 has come out of exile in Appendix B. If CMP 7 has a better table to use, by all means feel free to substitute it for the one in this proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns have been addressed by the panel's action on Proposal 7-88.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
TEMBLADOR: See my Comment on Affirmative on Proposal 7-88.

(Log #1850)

7- 87 - (330-20): Accept
Note: The Technical Correlating Committee understands that the action will be included in 330-104 in Proposal 7-69a.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 330-20 as follows:
"Type MI cable conductors shall be of solid copper or nickel-clad copper with a resistance corresponding to standard AWG and kcmil sizes."
SUBSTANTIATION: Table 310-13 authorizes Type MI cable in sizes 18 AWG up to 500 kcmil.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2420)

7- 88 - (330-80 (New)): Accept in Principle
Note: The Technical Correlating Committee understands the entire new proposed Section 330-80 was accepted in addition to the new second paragraph added by the Panel Action.
The Technical Correlating Committee directs that this Proposal be forwarded to Code-Making Panels 1 and 6 for information.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Add a new Section 330-80 to read as follows:
330-80 Ampacity. The ampacity of Type MI cable shall be determined in accordance with 310-15.
The ampacities for Type MI cable installed in cable tray shall be determined in accordance with 318-11.
Where single Type MI conductors are grouped together in a triangular or square configuration, as required by 330-16, and installed on a messenger or as open runs with a maintained free air space of not less than 2.15 times one conductor diameter (2.15 x O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall not exceed the allowable ampacities of Table 310-17.
SUBSTANTIATION: To incorporate text consistent with that used in other cable articles.
The text in the last paragraph is consistent with 318-11(b)(4) for single conductors installed in a similar configuration in cable tray. The following comparison table shows that the ampacities in Table 310-17 are consistent with the IEEE ampacities for three single conductors triplexed in free air adjusted for 30°C ambient air temperature. The IEEE ampacities for no sun and no wind are appropriate since almost all installations of this type are inside buildings.
Installation methods will limit the temperature of the MI cable end seal termination to a maximum of 90°C as required by Section 310-15(b)(7) or to its listed temperature limit.

Allowable Ampacities of Single-Insulated Copper Conductors 0.6 to 5 kV Unshielded Single Conductor Extruded Dielectric Cable
Triplexed in Free Air

	IEEE Std 835	Adjusted to 30°C		NEC
	Page 31	Calculated	Rounded	Table
	(1)	(2)	(3)	310-17
Conductor temp.	90°C	90°C		90°C
Ambient temp.	40°C	30°C		30°C
AWG/kcmil				
12	36	39	40	40
10	48	53	55	55
8	66	72	75	80
6	89	97	100	105
4	120	131	135	140
3				165
2	162	177	180	190
1	195	214	215	220
1/0	226	248	250	260
2/0	264	289	290	300
3/0	308	337	340	350
4/0	359	393	395	405
250	405	444	445	455
300	456	500	500	505
350	504	552	555	570
400	550	602	605	615
500	634	695	695	700
600	714	782	785	780
700				855
750	815	893	895	885
800				920
900				985
1000	957	1048	1050	1055
1250				1200
1500				1325
1750				1445
2000				1560

Notes: (1) Based on no sun, wind at 0 ft/sec.
(2) Neher/McGrath formula
(3) Rounded up to next 0 or 5

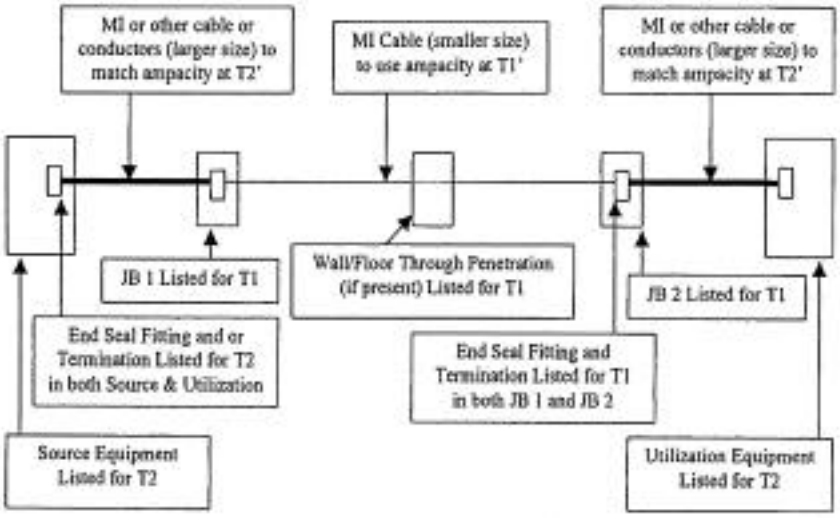
Ambient Temperature Corrections were based on the following Neher/McGrath formula:

$$I' = \sqrt{Tc - Ta' / Tc - Ta} \times 1$$

T_c = maximum conductor temperature used in the tables
T_a = ambient temperature used in the tables
I = ampacity shown in the tables for T_c and T_a
T_a' = new ambient temperature
I' = adjusted ampacity for ambient temperature T_a'

Source: IEEE Standard 835-1994, IEEE Standard Power Cable Ampacity Tables. Section 3.4.1, adjust for changes in ambient temeprature.
PANEL ACTION: Accept in Principle.
Add a new second paragraph to 330-80 to read:
"The conductor temperature at the end seal fitting shall not exceed the listed temperature rating of the end seal fitting."
PANEL STATEMENT: Panel 7 accepts the transfer of Proposal 6-90 from Panel 6. The text relocated from 310-15(b)(7), has been revised to reflect that the ampacity of the cable is independent of the temperature rating of the end seal terminations provided installation methods are utilized to limit the conductor temperature to not exceed the listed temperature rating of the end seal fitting. The new second paragraph has been worded to encompass the range of temperatures for which the end seal fittings may be listed. See panel's rewrite of Article 330 in Proposal 7-69a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
PROPST: I support the panel action and want to confirm that the ampacity described in this proposal does not apply to MI cable used for surface heat tracing as described elsewhere (426 and 427) in the NEC.
STEWART: This proposal does not address sheath temperature. If the single conductor in free air is operating at a 90 degree C conductor temperature, the conductor temperature where the singles are bundled together will be higher than 90 degrees C. What would the maximum sheath temperature be?
TEMBLADOR: We believe that the following schematic[1] provides an explanation of the actions by CMP 6, in particular, and by CMP 7 on Proposals 7-82, 7-83, 7-86, 6-88, 6-89, 6-90, 6-91, 6-92, 6-93, 6-94, 6-106 and 6-113 for 2002 NEC. Panel Actions by CMP 6 and CMP 7 should be reviewed to avoid an erroneous interpretation that can create confusion regarding the use of excellent thermal properties of MI cable. Also, at the same time compliance with the requirements of 110-14 shall not be comprised (See Proposal 1-227).
(Artwork shown on following page)



Amapcity of MI Cable or permitted arrangement of MI Cable (single conductor) between JB 1 an JB 2.

Ampacity shall not exceed, after permitted derating, the corresponding ampacity at T1 to comply with the listing requirement of terminations in JB 1 or JB 2 and associated MI Cable End Seal Fittings and any wall or floor through penetrating products, if present, in accordance with 110-14.

Ampacity of MI Cable or permitted arrangement of MI Cable (single conductor) or other conductors or cables between source and JB 1 an JB 2 and utilization:

Ampacity of connected conductors, after permitted derating, shall not exceed the corresponding values in Table 310-16 to comply with the requirements of 110-14.

1 The above schematic is based on: "Wire Temperature Termination Requirements Can Be Your "Terminator If You Don't Know All the Rules" By Mr. Jim Pauley - Square D Company (August 1995 Publication 0110HO9301R7/95).

(Log #1333)

7- 89 - (330-108 (New)): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Add a new Section:

330-108. Equipment Grounding. Where the outer sheath is made of copper, it shall provide an adequate path for equipment grounding purposes. Where made of steel, an equipment grounding conductor shall be provided.

Delete the second and third sentences of 330-22 (330-116 New).

SUBSTANTIATION: Text relocated from 330-22 (330-116 New) to provide consistency among the wire and cable articles. The phrase "the outer sheath" was added for clarity.

Deleted the phrase "in accordance with Article 250" since Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3. Also Section 4.1.1 prohibits referencing an entire Article

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-69a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

ARTICLE 331 — ELECTRICAL NONMETALLIC TUBING: TYPE ENT

(Log #1221)

8- 57 - (331): Accept in Principle

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Article 331 to read as follows

Article 331 Electrical Nonmetallic Tubing: Type ENT

A. General

331-1. Scope. This article covers the use, installation, and construction specifications for Electrical Nonmetallic Tubing (ENT) and associated fittings.

331-2. 331-2. ~~331-1.~~ Definition.

Electrical Nonmetallic Tubing (ENT). A nonmetallic pliable corrugated raceway of circular cross section with integral or associated couplings, connectors, and fittings ~~listed~~ for the installation of electric conductors. ~~It~~ ENT is composed of a material that is resistant to moisture and chemical atmospheres and is flame retardant.

A pliable raceway is a raceway that can be bent by hand with a reasonable force, but without other assistance.

~~Electrical nonmetallic tubing shall be made of material that does not exceed the ignitibility, flammability, smoke generation, and toxicity characteristics of rigid (nonplasticized) polyvinyl chloride.~~

~~331-3.~~ 331-2. ~~Other Articles.~~

Installations for ENT ~~electrical nonmetallic tubing~~ shall comply with ~~the~~ applicable provisions ~~of the applicable sections~~ of Article 300. ~~Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the raceway.~~

331-6. Listing Requirements. ENT and associated fittings shall be listed.

B. Installation

331-10.~~331-3.~~ Uses Permitted.

The use of ENT ~~electrical nonmetallic tubing~~ and fittings shall be permitted in the following:

(1) In any building not exceeding three floors above grade

(a) For exposed work, where not subject to physical damage

(b) Concealed within walls, floors, and ceilings

FPN: See Section 336-5(a)(1) for definition of first floor.

(2) In any building exceeding three floors above grade, ENT ~~electrical nonmetallic tubing~~ shall be concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors, and ceilings.

FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

(3) In locations subject to severe corrosive influences as covered in Section 300-6 and where subject to chemicals for which the materials are specifically approved

(4) In concealed, dry, and damp locations not prohibited by Section 331-12 ~~331-4.~~

(5) Above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies, except as permitted in Section 331-10(1)(a) ~~331-3(1)(a).~~

(6) Encased in poured concrete, or embedded in a concrete slab on grade where ENT is placed on sand or approved screenings, provided fittings identified for this purpose are used for connections

(7) For wet locations indoors as permitted in this section or in a concrete slab on or below grade, with fittings listed for the purpose

(8) 1/2 in. through 1 in. as listed manufactured prewired assembly

FPN: Extreme cold may cause some types of nonmetallic conduits to become brittle and, therefore, more susceptible to damage from physical contact.

331-12. ~~331-4.~~ Uses Not Permitted.

ENT ~~Electrical nonmetallic tubing~~ shall not be used in the following:

(1) In hazardous (classified) locations, except as permitted by Section 504-20 and Section 505-15(a)(1)

(2) For the support of fixtures and other equipment

(3) Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise

(4) For conductors whose insulation temperature limitations would exceed those for which the tubing is listed

(5) For direct earth burial

(6) Where the voltage is over 600 volts

(7) In exposed locations, except as permitted by Sections 331-10(1), 331-10(5) and 331-10(7). ~~331-3(1), 331-3(5), and 331-3(7)~~

(8) In theaters and similar locations, except as provided in Articles 518 and 520

(9) Where exposed to the direct rays of the sun, unless identified as sunlight resistant

331-20. ~~331-5.~~ Size.

(a) Minimum. ENT ~~Tubing~~ smaller than 1/2-in. ~~electrical~~ trade size shall not be used.

(b) Maximum. ENT ~~Tubing~~ larger than 2-in. ~~electrical~~ trade size shall not be used.

FPN: Metric trade numerical designations for ENT ~~electrical nonmetallic tubing~~ are 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, and 2 = 53.

331-22. ~~331-6.~~ Number of Conductors ~~in Tubing~~.

The number of conductors or cables ~~in a single tubing~~ shall not exceed that permitted by the percentage fill in Table 1, Chapter 9.

331-24.~~331-9.~~ Bends — How Made.

Bends ~~of electrical nonmetallic tubing~~ shall be made so that the tubing will not be damaged and that the internal diameter of the tubing will not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment, and the radius of the curve of the inner edge of such bends shall not be less than shown in Table ~~346-10~~ 346-24.

331-26.~~331-10.~~ Bends — Number in One Run.

There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.

331-28.~~331-7.~~ Trimming.

All cut ends ~~of tubing~~ shall be trimmed inside and outside to remove rough edges.

331-30. Securing and Supporting. ~~331-11. Supports.~~

ENT ~~Electrical nonmetallic tubing~~ shall be installed as a complete system as provided in Article 300 and shall be ~~secured~~ securely fastened in place and supported in accordance with (a) and (b).

(a) Securely Fastened. ENT shall be securely fastened at intervals not exceeding 3 ft (914 mm). ~~or, for horizontal runs, it shall be permitted to be supported by openings in framing members at intervals not exceeding 3 ft (914 mm).~~ In addition, ~~it~~ ENT shall be securely fastened in place within 3 ft (914 mm) of each outlet box, device box, junction box, cabinet, or fitting where it terminates.

Exception: Lengths not exceeding a distance of 6 ft (1.83 m) from a fixture terminal connection for tap connections to lighting fixtures shall be permitted without being secured.

(b) Supports. Horizontal runs of ENT supported by openings in framing members at intervals not exceeding 3 ft (914 mm) and securely fastened within 3 feet (914 mm) of termination points shall be permitted.

331-40. ~~331-12.~~ Boxes and Fittings.

~~Electrical nonmetallic tubing shall be used only with listed fittings.~~

Boxes and fittings shall comply with the applicable provisions of Article 370.

331-46 ~~331-14.~~ Bushings.

Where a tubing enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

FPN: See Section 300-4(f) for the protection of conductors size No. 4 or larger.

331-48. ~~331-8.~~ Joints.

All joints between lengths of tubing and between tubing and couplings, fittings, and boxes shall be by an approved method.

331-56. ~~331-13.~~ Splices and Taps.

Splices and taps shall be made only in accordance with Section 300-15. ~~junction boxes, outlet boxes, device boxes, or conduit bodies.~~ See Article 370 for rules on the installation and use of boxes and conduit bodies.

331-60. Grounding. Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the raceway.

C. Construction Specifications

331-100. Construction. ~~331-15. General~~

ENT ~~Electrical nonmetallic tubing~~ shall be made of material that does not exceed the ignitibility, flammability, smoke generation, and toxicity characteristics of rigid (nonplasticized) polyvinyl chloride.

~~Electrical nonmetallic tubing shall be clearly and durably marked at least every 10 ft (3.05 m) as required in the first sentence of Section 110-21. The type of material shall also be included in the marking. Tubing that has limited smoke-producing characteristics shall be permitted to be identified with the suffix LS. The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with Section 310-11.~~

ENT, as a prewired manufactured assembly, shall be provided in continuous lengths capable of being shipped in a coil, reel, or carton without damage.

331-120. Marking.

ENT shall be clearly and durably marked at least every 10 ft (3.05 m) as required in the first sentence of Section 110-21. The type of material shall also be included in the marking. Tubing that has limited smoke-producing characteristics shall be permitted to be identified with the suffix LS.

The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with Section 310-11.

SUBSTANTIATION:

The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements.

Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.

The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal. For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

Explanation of proposed renumbering and editorial changes;

(1) Title Acronym “ENT” added
(2) 331-1 New Scope added to conform with the style manual.
(3) 331-2
  (1) Definition renumbered from Section 331-1 to 331-2.
  (2) “ENT” (two places) and the text “A nonmetallic” added for clarity
  (3) “Electrical Nonmetallic Tubing” capitalized as it is a proper name of a product.
  (4) Listing requirements relocated to new Section 331-6.
  (5) Materials characteristics moved to Section 331-100.
(4) 331-3
(1) Other Articles renumbered from Section 331-2 to 331-3.
(2) Delete product name and replace with acronym “ENT”.
(3) Text revised for clarity.
(4) Grounding requirements moved to 331-60.
(5) 331-6 New section to relocate listing requirements for ENT and associated fittings. Listing requirements for the tubing came from 331-2 (99 NEC) and for the fittings from 331-12 (99 NEC).
(6) 331-10
  (1) Uses Permitted renumbered from Section 331-3 to 331-10.
  (2) Delete product name and replace with acronym “ENT” (two places).
  (3) Correct section references (two places).
(7) 331-12
  (1) Uses Not Permitted renumbered from Section 331-4 to 331-12.
  (2) Delete product name and replace with acronym “ENT”.
  (3) Correct section references.
(8) 331-20
  (1) Size renumbered from Section 331-5 to 331-20.
  (2) Delete product description or product name and replace with acronym “ENT” (three places).
  (3) The word “electrical” was deleted as it added nothing to the clarity of this section (two places).
(9) 331-22
  (1) Number of Conductors renumbered from 331-6 to 331-22.
  (2) Reword section adding reference to cables for clarity.
  (3) Removed the reference to tubing for clarity (two places).
(10) 331-24
  (1) Bends-How Made renumbered from 331-9 to 331-24.
  (2) Delete product name for clarity.
  (3) Corrected section reference.
(11) 331-26 Bends-Number in One Run renumbered from 331-10 to 331-26.
(12) 331-28
  (1) Trimming renumbered from 331-7 to 331-28.
  (2) Delete “ of tubing” for clarity.
(13) 331-30
  (1) Securing and Supporting renumbered from 331-11 to 331-30.
  (2) Title changed from “Supports” to “Securing and Supporting” since section addresses both subjects.
  (3) Deleted product name and replaced with acronym “ENT” (two places)
  (4) Seperated the Section into two parts for clarity.
  (5) Added text for clarity without changing the original requirement.
(14) 331-40
  (1) Boxes and Fittings renumbered from 331-12 to 331-40.
  (2) Listing requirement for fittings moved to 331-6.
(15) 331-46 Bushings renumbered from 331-14 to 331-46
(16) 331-48 Joints renumbered from 331-8 to 331-48.
(17) 331-56
  (1) Splices and Taps renumbered from 331-13 to 331-56.
  (2) Referenced 300-15 and deleted list of products for clarity.
(18) 331-60 New Section for the grounding requirements. Text moved from 331-2 (99 NEC).
(19) 331-100

(1) Construction renumbered and renamed from 331-15 General to 331-100 Construction.
(2) Deleted product name and replaced with acronym "ENT"
(3) Material characteristics moved from 331-1 (99 NEC).
(4) Moved marking requirements to 331-120.

(20) 331-120 New section for marking requirments moved from 331-15 (99 NEC).

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	**Common Numbering System for the Circular Raceway Articles**
	Article 3XX, <title>: <acronym>
	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.
3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.
3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete proposed Sections 331-3 and 331-40.
Delete the words "or cables" from proposed 331-22.
Delete the second sentence from proposed 331-56

PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.

Proposed Sections 331-3 ,331-40 and the second sentence of 331-56 are deleted as Section 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.

There was no technical substantiation provided to add the words "or cables" as part of the rewrite of 331-22.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1278)

8- 58 - (331): Accept

Note: The Technical Correlating Committee understands that the action on this Proposal is to be implemented on the sections as revised by the action on Proposal 8-57.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise as follows:

331-3 (2) FPN

FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of ~~121~~ 120°C (250°F) or an individual temperature of ~~163~~ 160°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

331-3 (8) Metric Designator 16 through 27 (Trade Size 1/2 through 1) ~~1/2 in. through 1 in.~~ as listed manufactured prewired assembly

331-5 (a) Minimum. Tubing smaller than metric designator 16 (trade size 1/2) ~~1/2 in. electrical trade size~~ shall not be used.

331-5 (b) Maximum. Tubing larger than metric designator 53 (trade size 2) ~~2 in. electrical trade size~~ shall not be used.

FPN: Metric trade numerical designations for electrical nonmetallic tubing are 16 = 1/2 ~~1/2 = 16~~, 21 = 3/4 ~~3/4 = 21~~, 27 = 1 ~~1 = 27~~, 35 = 1 1/4 ~~1 1/4 = 35~~, 41 = 1 1/2 ~~1 1/2 = 41~~, and 53 = 2 ~~2 = 53~~.

331-11

Electrical nonmetallic tubing shall be installed as a complete system as provided in Article 300 and shall be secured at intervals not exceeding 900 mm (3 ft) ~~3 ft (914 mm~~) or, for horizontal runs, it shall be permitted to be supported by openings in framing members at intervals not exceeding 900 mm (3 ft) ~~3 ft (914 mm)~~. In addition, it shall be securely fastened in place within 900 mm (3 ft) 3 ft (914 mm) of each outlet box, device box, junction box, cabinet, or fitting where it terminates.

Exception: Lengths not exceeding a distance of 1.8 m (6 ft) ~~6 ft (1.83 m)~~ from a fixture terminal connection for tap connections to lighting fixtures shall be permitted without being secured.

331-15 Electrical nonmetallic tubing shall be clearly and durably marked at least every 3 m (10 ft) ~~10 ft (3.05 m)~~ as required in the first sentence of Section 110-21. The type of material shall also be included in the marking. Tubing that has limited smoke-producing characteristics shall be permitted to be identified with the suffix LS. The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with Section 310-11.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.

In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.

In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #2181)

8- 59 - (331-1, 331-16 (New)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
A pliable raceway is a raceway that can be bent by hand with a reasonable force, but without other assistance.
~~Electrical nonmetallic tubing shall be made of material that does not exceed the ignitibility, flammability, smoke generation, and toxicity characteristics of rigid (non plasticized) polyvinyl chloride.~~
MOVE TO A NEW ARTICLE
331-16 Material [newly proposed]
Electrical nonmetallic tubing shall be made of material that does not exceed the ignitibility, flammability, smoke generation, and toxicity characteristics of rigid (nonplasticized) polyvinyl chloride.
SUBSTANTIATION: This paragraph is a rule not a definition. It should be moved from 331-1 to Part C. Construction Specifications. This would be consistent with other similar sections of the code, for example 334-22 and 346-16(b). Also, the NEC Style Manual 2.2.2 states, "Definitions shall not contain requirements...".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-57.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2218)

8- 60 - (331-1): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: The phrase "flame-tested" does not convey the requirement that the material contain flame-retardant properties. "Flame-retardant" is an understood and acceptable term in the industry.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
DOLLINS: See Ganatra's Explanation of Negative Vote on Proposal 6-3.

(Log #821)

8- 61 - (331-2 and Exception (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
"Where provided, an equipment bonding jumper shall be installed in accordance with Section 250-102."
Add a new Exception:
Exception: Where equipment, raceways, and enclosures are grounded by connection to the grounded circuit conductor as permitted in Section 250-142, an equipment grounding conductor shall not be required.
SUBSTANTIATION: Where ENT is interposed in a run of metal raceway and is 6 ft or less in length an EBJ on the outside should be permitted to maintain continuity of the equipment grounding conductor (raceways). A grounded circuit conductor is technically not an equipment grounding conductor; this section appears to negate or conflict with Section 250-142.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements for bonding and equipment grounding are specified in Article 250, and are not under the jurisdiction of CMP 8. The requirements of Article 250 for grounding and bonding apply throughout the Code and it is not necessary to repeat them in Article 331.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1420)

8- 62 - (331-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise as follows:
331-2. Other Articles. ~~Installations for electrical nonmetallic tubing shall comply with the provisions of the applicable sections of Article 300.~~ Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the raceway.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-57, specifically 331-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #375)

8- 63 - (331-3): Reject
SUBMITTER: Jerry Richardson, TFE, Inc.
RECOMMENDATION: Revise to read as follows:
331-3. Uses Permitted. One may use electrical nonmetallic tubing:
(1) In any structure with less than four floors above grade
(a) For exposed work, where physical damage is unlikely OR
(b) Concealed within a wall, floor, or ceiling
FPN: See Section 336-5(a)(1) for definition of first floor.
(2) In any structure that has more than three floors above grade, the walls, floors, and ceilings which conceal tubing must provide a 15-minute finish rating as evidenced in a listing of fire-rated assemblies.
FPN: For wood, the finish rating is the time needed for the stud or joist to rise 121°C, or reach 163°C (325°F) on the plane of the wood nearest the fire. Finish ratings do not apply to membrane ceilings.
(3) In locations where severe corrosives (as covered in Section 300-6) exist, and resistance to the chemical is specifically approved
(4) In concealed, dry, and damp locations not prohibited by Section 331-4
(5) Encased in poured concrete, or embedded in a concrete slab on grade where the tubing is placed on sand or approved screenings, if fittings identified for this purpose are used for connections
(7) For wet locations indoors as permitted in this section or in a concrete slab on or below grade, with fittings listed for the purpose
(8) 1/2 in. through 1 in. as a listed manufactured prewired assembly
FPN: Extreme cold may cause some types of nonmetallic tubing to become brittle and become more easily damaged.
SUBSTANTIATION: The 15-minute finish rating applies whether the surface is combustible or not. If the reader has instruments and ability to understand temperature rise and thermal resistance, Fahrenheit metrics are probably not needed.
PANEL ACTION: Reject.

PANEL STATEMENT: The proposal completelly rewrote Section 331-3 without substantiating all of the changes. 331-3(2) states that the 15 minute finish rating applies to combustible and non combustible walls. The first edition of the NEC inadvertently omitted the term "noncombustible" from 331-3(2) and was noted in the official NFPA NEC errata.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
BERMAN: The third sentence of the Panel Statement should have included a reference to the first printing of the 1999 edition of the NEC.

(Log #4094)

8- 64 - (331-3 and 331-4): Reject
SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc./Rep. AvalonBay Communities & Lincoln Property Co.
RECOMMENDATION: Revise text as follows:
331-3. Uses Permitted. The use of electrical nonmetallic tubing and fittings shall be permitted in the following:
(1) One- and two-family dwellings
(2) Multifamily dwellings and other structures, except as prohibited in Section 331-4.
~~(1) In any building not exceeding three floors above grade~~
~~(a) For exposed work, where not subject to physical damage~~
~~(b) Concealed within walls, floors, and ceilings~~
~~FPN: See Section 336-5(a)(1) for definition of first floor.~~
~~(2) In any building exceeding three floors above grade, electrical nonmetallic tubing shall be concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors, and ceilings.~~
~~FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.~~
(3) In locations subject to severe corrosive influences as covered in Section 300-6 and where subject to chemicals for which the materials are specifically approved.
(4) In concealed, dry, and damp locations not prohibited by Section 331-4
~~(5) Above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies, except as permitted in Section 331-3(1)(a).~~
(~~6~~ 5) Encased in poured concrete, or embedded in a concrete slab on grade where ENT is placed on sand or approved screenings, provided fittings identified for this purpose are used for connections
(~~7~~ 6) For wet locations indoors as permitted in this section or in a concrete slab on or below grade, with fittings listed for the purpose
(~~8~~ 7) 1/2 in. through 1 in. as listed manufactured prewired assembly
FPN: Extreme cold may cause some types of nonmetallic conduits to become brittle and, therefore, more susceptible to damage from physical contact.
331-4. Uses Not Permitted. Electrical nonmetallic tubing shall not be used in the following:
(1) In any multifamily dwelling or other structure exceeding three floors above grade
For the purpose of this article, the first floor of a building shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.
(~~1~~ 2) In hazardous (classified) locations, except as permitted by Section 504-20 and Section 505-15(a)(1)
(~~2~~ 3) For the support of fixtures and other equipment
(~~3~~ 4) Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise
(~~4~~ 5) For conductors whose insulation temperature limitations would exceed those for which the tubing is listed
(~~5~~ 6) For direct earth burial
(~~6~~ 7) Where the voltage is over 600 volts
(~~7~~ 8) In exposed locations, except as permitted by Sections 331-3(1), ~~331-3(5),~~ 331-3(2), and 331-3(~~7~~ 6)
(~~8~~ 9) In theaters and similar locations, except as provided in Articles 518 and 520
(~~9~~ 10) Where exposed to the direct rays of the sun, unless identified as sunlight resistant
SUBSTANTIATION: Article 331 was a new article in the 1984 NEC. In the 1984 NEC Section 331-3 was the same as Section 336-3. In the 1987 NEC Section 331-3 was revised to eliminate the three story limit on the use of ENT.
The use of ENT was recognized by the NEC, and permitted to be used in buildings above 3 stories, as a result of the U.S. Supreme Court case, from 1981-1988, Allied tube & Conduit v. Indian Head, Inc. (which decided that the actions of Allied Tube & Conduit during the 1980 NFPA Annual Meeting were not protected from antitrust liability), NEC-TCR-86-A Code Proposal 8-49, and NEC TCD-86 Comments 8-32 and 8-33.
NEC-TCR-86-A Code Proposal 8-49 used as substantiation the report entitled "The Use of ENMT, Fire Hazard Analysis," by Benjamin/Clarke Associates, Inc., dated 9/85, to accept the use of ENT above three stories when concealed behind a 15 minute finish rated thermal barrier.
In 1998, Sullivan Code Group prepared the report I have submitted entitled, "Type NM Cable Fire Hazard Analysis," based on the same type of analysis that was used by the Benjamin/Clarke Hazard Analysis for ENMT. The results of the Sullivan Report (which is based on cone calorimeter testing by Dr. Fred Mower, Fire Protection Engineering Department, University of MD, and a third party peer review by Dr. Fred Clarke, Benjamin Clarke Associates) concludes that the fire hazard (or lack thereof) of NM Cable is equivalent to ENMT.
Based on the results of this study, and the Panel 7 Committee's reluctance during prior Code cycles to remove the story limit on NM Cable, the Panel 8 Committee should reconsider its acceptance of ENT use in buildings over three stories in height.
By submitting this proposal, we are neither supporting nor opposing the use of ENT above three stories in height. We are only attempting to gain consistency in the NEC, and between Panel Committees, on electrical wiring methods.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter makes it clear that he does not oppose the use of ENT above three stories and provides no new substantiation to identify this use as a hazard.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2964)

8- 65 - (331-3(2), Exception (New)): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for comment on the toxicity issues relative to the use of ENT in buildings over three stories. The Technical Correlating Committee directs that Code-Making Panel 8 act on the technical merits of the proposal outside of presumed toxicity issues.
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
(2) In any building exceeding three floors above grade, electrical nonmetallic tubing shall be concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors, and ceilings.
Exception: When a fire sprinkler system(s) is installed in accordance with NFPA 13, Installation of Sprinkler Systems, on all floors, ENT is permitted to be used within walls, floors and ceilings exposed or concealed in buildings exceeding three floors above grade.
FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature of 163°C (325°F)

as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.
SUBSTANTIATION: PVC will not ignite unless exposed to a substantial flame energy. If a fire or flame energy is present, the fire sprinkler system would extinguish or detain the fire to allow the evacuation of the building. PVC will not support combustion on its own. PVC is self extinguishing. In other words, if the flame energy or source is removed or extinguished the PVC material would put itself out.
ENT has been acceptable to be used exposed or concealed in buildings less than three stories since the 1984 NEC. There has not been a single instance where ENT has been identified as having contributed to the spread of fire or smoke, personal injury, or fatality. This is an enviable safety record.
The finish rating requirement was included in the 1987 NEC when the three floor height limitation was deleted from Article 331. This requirement was added to the original proposal by the NFPA Toxicity Advisory Committee as a means to qualify the heat transfer resistance of the material which is used to conceal the ENT. Fire sprinkler systems will reduce the amount of heat transferred by either the concealed wall or exposed materials.
The fire sprinkler systems have proven to give occupants adequate time to exit a building when a fire is present. These systems have saved live's even though room furnishings are ignited, spreading flame and omitting toxic gasses and smoke.
PANEL ACTION: Reject.
PANEL STATEMENT: As stated in the substantiation, the addition of the wording pertaining to finish rating was developed as a result of the NFPA Toxicity Technical Advisory Committee. Until such time as the NFPA Toxicity Technical Advisory Committee deems the use of a sprinkler system to be an acceptable substitute for a 15 minute finish rating, it is necessary to retain the requirement. There was no substantiation provided to demonstrate the safety record of the product as stated by the submitter. The panel directs staff to submit this proposal and panel statement to the NFPA Toxicity Technical Advisory Committee for comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
KENDALL: The panel has been instructed by the Technical Correlating Committee to address the use of ENT pertaining to the application without addressing toxicity. The panel continues to use the issue of toxicity as a reason to restrict ENT when used in buildings exceeding three floors.

(Log #2965)

8- 66 - (331-3(5), Exception (New)): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for comment on the toxicity issues relative to the use of ENT in buildings over three stories. The Technical Correlating Committee directs that Code-Making Panel 8 act on the technical merits of the proposal outside of presumed toxicity issues.
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
(5) Above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies, except as permitted in Section 331-3(1)(a).
Exception: When a fire sprinkler system(s) is installed in accordance with NFPA 13, Installation of Sprinkler Systems, on all floors, ENT is permitted to be used above suspended ceilings without 15-minute finish rated thermal barrier material.
SUBSTANTIATION: PVC will not ignite unless exposed to a substantial flame energy. If a fire or flame energy is present, the fire sprinkler system would extinguish or detain the fire to allow the evacuation of the building. PVC will not support combustion on its own. PVC is self extinguishing. In other words, if the flame energy or source is removed or extinguished the PVC material would put itself out.
ENT has been acceptable to be used exposed or concealed in buildings less than three stories since the 1984 NEC. There has not been a single instance where ENT has been identified as having contributed to the spread of fire or smoke, personal injury, or fatality. This is an enviable safety record.
The finish rating requirement was included in the 1987 NEC when the three floor height limitation was deleted from Article 331. This requirement was added to the original proposal by the NFPA Toxicity Advisory Committee as a means to qualify the heat transfer resistance of the material which is used to conceal the ENT. Fire sprinkler systems will reduce the amount of heat transferred by either the concealed wall or exposed materials.
The fire sprinkler systems have proven to give occupants adequate time to exit a building when a fire is present. These systems have saved live's even though room furnishings are ignited, spreading flame and omitting toxic gasses and smoke.
PANEL ACTION: Reject.
PANEL STATEMENT: As stated in the substantiation, the addition of the wording pertaining to finish rating was developed as a result of the NFPA Toxicity Technical Advisory Committee. Until such time as the NFPA Toxicity Technical Advisory Committee deems the use of a sprinkler system to be an acceptable substitute for a 15 minute finish rating, it is necessary to retain the requirement. There was no substantiation provided to demonstrate the safety record of the product as stated by the submitter. The panel directs staff to submit this proposal and panel statement to the NFPA Toxicity Technical Advisory Committee for comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
KENDALL: The panel has been instructed by the Technical Correlating Committee to address the use of ENT pertaining to the application without addressing toxicity. The panel continues to use the issue of toxicity as a reason to restrict ENT when used in buildings exceeding three floors.

(Log #3171)

8- 67 - (331-4(10) (New)): Accept in Principle
Note: The Technical Correlating Committee understands that this becomes (10) of 331-12 and also modifies 331-10(1)(a) of Proposal 8-57.
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Add a new Use Not Permitted to section 331-4 and number appropriately.
(10) Where subject to physical damage unless identified for such use.
SUBSTANTIATION: This is the same language that appears in Section 347-3(c) of the 1999 NEC®. Section 331-3(1)(a) only covers physical damage where exposed in buildings of three stories or less. Physical characteristics of ENT are less than Sch. 40 and the NEC should be clear relative to physical damage.
PANEL ACTION: Accept in Principle.
Amend the proposal to read:
(10) Where subject to physical damage.
Amend Section 331-3(1)(a) to read:
For exposed work where not prohibited by 331-4.
PANEL STATEMENT: T he submitters proposal to require ENT identified for use where subject to physical damage is not substantiated.
Section 331-3(1)(a) has been amended to eliminate redundant language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #335)

8- 68 - (331-4(3)): Reject
SUBMITTER: Mike Theisen, St. Cloud, MN
RECOMMENDATION: Reinsert the original first sentence in the 1996 NEC, which must have been inadvertently edited out of the 1999 NEC.
Where subject to ambient temperatures exceeding those for which the tubing is listed.
SUBSTANTIATION: The phrase “ambient temperature” normally indicates more than just a high temperature. In Minnesota and other northern climates, the ambient temperature can be below -20°F for

extended periods of time. At these low temperatures, ENT is very fragile.
PANEL ACTION: Reject.
PANEL STATEMENT: The current language in 331-4(3) was a fine print note in the 1996 NEC. Because the FPN contained mandatory requirements it was made into a Code rule. The language "Where subject to ambient temperatures exceeding those for which the tubing is listed" was applicable to the highest temperature rating of ENT. Therefore, it would not be applicable to problems associated with lower temperature ranges. The FPN following 331-3(8) draws attention of the user to cold weather installations.
The removal of the language from the 1999 NEC was based on Comment 8-155.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3034)

8- 69 - (331-5): Accept in Principle
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise text as follows:
(a) Minimum. ENT ~~Tubing~~ smaller than 1/2 16 ~~-in. electrical trade size~~ shall not be used.
(b) Maximum. ENT ~~Tubing~~ larger than 2 53 ~~-in. electrical trade size~~ shall not be used.
FPN: The Trade Sizes and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-1(c).
~~FPN: Metric trade numerical designations for electrical nonmetallic tubing are 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, and 2 = 53.~~
SUBSTANTIATION: To correlate with proposal submitted by NEMA to CMP 3 to add a table showing current trade sizes and metric designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code which is no longer needed. Metric designators for trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code.
PANEL ACTION: Accept in Principle.
The Panel accepts in principle the addition of the new FPN to read as follows:
"FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions. "
The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of "Tubing" with the acronym "ENT" and the deletion of "in. electrical trade size" by action on Proposals 8-57 and 8-58.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP 3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-57 and 8-58.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3068)

8- 70 - (331-9): Accept in Principle
Note: The Technical Correlating Committee understands that this action replaces the accepted text in 331-24 in Proposal 8-57.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise second sentence of this section to read:
Bends shall be permitted to be made manually without auxiliary equipment, and the radius of the curve ~~of the inner edge~~ to the centerline of such bends shall not be less than shown in Table 346-10 using the column "Other Benders."
SUBSTANTIATION: This change is necessary to correlate with the proposal to revise Table 346-10. This text clarifies that measurements are to be made to the centerline and provides radii consistent with other conduits.
PANEL ACTION: Accept in Principle.
Change the word "Benders" to "Bends" in the propsed language.
PANEL STATEMENT: See panel action and statement on Proposal 8-245.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2166)

8- 71 - (331-13): Accept
Note: The Technical Correlating Committee understands that this action replaces the accepted text in 331-56 in Proposal 8-57.
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise to read as follows:
Splices and taps shall be made only in junction boxes, outlet boxes, device boxes, or conduit bodies. ~~See Article 370 for rules on the installation and use of boxes and conduit bodies.~~
FPN: See Article 370 for rules on the installation and use of boxes and conduit bodies.
SUBSTANTIATION: This deleted sentence is an explanatory reference to another NEC rule; therefore, it should be a fine print note. The NEC Style Manual 4.1 states, "Explanatory references shall be in fine print notes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1061)

8- 72 - (331-14, FPN): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: 331-14, FPN - change "No. 4" to "4 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2824)

8- 73 - (331-15): Accept
Note: The Technical Correlating Committee understands that this action regarding the replacement of the third sentence revises the accepted text in 331-120 in Proposal 8-57.
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise 331-15 as follows:
331-15. General. Electrical nonmetallic tubing shall be clearly and durably marked at least every 10 ft (3.05 m) as required in the first sentence of Section 110-21. The type of material shall also be included in the marking. ~~Tubing that has limited smoke producing characteristics shall be permitted to be identified with the suffix LS.~~ Marking for limited smoke shall be permitted on the tubing that has limited smoke-producing characteristics. The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with Section 310-11.
ENT, as a prewired manufactured assembly, shall be provided in continuous lengths capable of being shipped in a coil, reel, or carton without damage.
SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).
Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico,

"LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.

Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.

Although the section does not deal with wire and cable products, this proposal is made for this section to address the change in h abbreviation for limited smoke marking.

The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 333 — ARMORED CABLE

(Log #CP710)

7- 89a - (333): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 333 to comply with NEC Style Manual.

ARTICLE 333 -- Armored Cable: Type AC

I General

333-1 Scope. This article covers the use, installation, and construction specifications for Armored Cable, Type AC.

333-2. Definition.

Armored Cable, Type AC. A fabricated assembly of insulated conductors in a flexible metallic enclosure. See 333-100.

II. Installation

333-10. Uses Permitted. Where not subject to physical damage, Type AC cable shall be permitted:
(1) For branch circuits and feeders
(2) In both exposed a concealed work
(3) In cable trays where identified for such use
(4) In dry locations
(5) Embedded in plaster finish on brick or other masonry, except in damp or wet locations
(6) To be run or fished in the air voids of masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness

333-12. Uses Not Permitted. Type AC cable shall not be used:
(1) In theaters and similar locations, except where permitted in
(2) 518-4
(2) In motion picture studios
(3) In hazardous (classified) locations except where permitted in:
  (a) 501-4(b), Exception
  (b) 502-4(b), Exception No. 1
  (c) 504-20
(4) Where exposed to corrosive fumes or vapors
(5) On cranes or hoists, except where permitted in 610-11(c)
(6) In storage battery rooms
(7) In hoistways, or on elevators, or escalators, except where permitted in 620-21
(8) In commercial garages except where permitted in 511-4 and 511-6

333-15. Exposed Work. Exposed runs of cable shall closely follow the surface of the building finish or of running boards. Exposed runs shall also be permitted to be installed on the underside of joists where supported at each joist and located so as not to be subject to physical damage.

333-17. Through or Parallel to Framing Members. Type AC cable shall comply with 300-4 where installed through or parallel to studs, joists, rafters, or similar wood or metal members.

333-23. In Accessible Attics. Type AC cables in accessible attics or roof spaces shall be installed as specified in (a) and (b).

(a) Where Run Across the Top of Floor Joists. Where run across the top of floor joists, or within 2.1 m (7 ft.) of floor or floor joists across the face of rafters or studding, in attics and roof spaces that are accessible, the cable shall be protected by substantial guard strips that are at least as high as the cable. Where this space is not accessible by permanent stairs or ladders, protection shall only be required within 1.8 m (6 ft.) of the nearest edge of the scuttle hole or attic entrance.

(b) Cable Installed Parallel to Framing Members. Where the cable is installed parallel to the sides of rafters, studs, or floor joists, neither guard strips nor running boards shall be required, and the installation shall also comply with 300-4(d).

333-24. Bending Radius. Bends in Type AC cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than five times the diameter of the Type AC cable.

333-30. Securing and Supporting. Type AC cable shall be secured by staples, cable ties, straps, hangers, or similar fittings designed and installed so as not to damage the cable at intervals not exceeding 1.4 m (4 1/2 ft) and within 300 mm (12 in.) of every outlet box, junction box, cabinet, or fitting.

(a) Horizontal Runs. Type AC cable installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1.6 mm (1/16 in.) thick, shall be considered secured where the support intervals do not exceed 1.4 m (4 1/2 ft.) and the armored cable is securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other armored cable termination.

(b) Unsupported. Type AC cable shall be permitted to be unsupported where the cable is:
(1) Fished between access points, where concealed in finished buildings or structures and supporting is impracticable;
(2) Not more than 600 mm (2 ft.) in length at terminals where flexibility is necessary; or
(3) Not more than 1.8 m (6 ft.) in length from an outlet for connections within an accessible ceiling to lighting fixtures or equipment.

(c) Cable Tray Installations. Type AC cable installed in cable trays shall comply with 318-8(b).

333-40. Boxes and Fittings. At all points where the armor of AC cable terminates, a fitting shall be provided to protect wires from abrasion, unless the design of the outlet boxes or fittings is such as to afford equivalent protection, and, in addition, an insulating bushing or its equivalent protection shall be provided between the conductors and the armor. The connector or clamp by which the Type AC cable is fastened to boxes or cabinets shall be of such design that the insulating bushing or its equivalent will be visible for inspection. Where change is made from Type AC cable to other cable or raceway wiring methods, a box, fitting, or conduit body shall be installed at junction points as required in 300-15.

333-80. Ampacity. The ampacity shall be determined by 310-15.

(a) Thermal Insulation. Armored cable installed in thermal insulation shall have conductors rated at 90ºC (194ºF). The ampacity of cable installed in these applications shall be that of 60ºC (140ºF) conductors

(b) Cable Tray. The ampacity of Type AC cable installed in cable tray shall be determined in accordance with 318-11

III Construction Specifications

333-100. Construction. Type AC cable shall have an armor of flexible metal tape and shall have an internal bonding strip of copper or aluminum in intimate contact with the armor for its entire length.

333-104. Conductors. Insulated conductors shall be of a type listed in Table 310-13 or those identified for use in this cable. In addition, the conductors shall have an overall moisture-resistant and fire-retardant fibrous covering. For Type ACT, a moisture-resistant fibrous covering shall be required only on the individual conductors..

333-108. Equipment Grounding. Type AC cable shall provide an adequate path for equipment grounding as required by 250-2(d).

333-120. Marking. The cable shall be marked in accordance with 310-11, except that Type AC shall have ready identification of the manufacturer by distinctive external markings on the cable sheath throughout its entire length.

SUBSTANTIATION: This revision to Article 333 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-90, 7-91, 7-92, 7-93, 7-95, 7-97, 7-98, 7-99, 7-105, and 7-106.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1382)

7- 90 - (333): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise text to read as follows:

Article 333 Armored Cable: Type AC

~~A.~~ I. General.

~~333-1.~~ 333-2. Definition.

Armored Cable (Type AC). ~~cable is a~~ A fabricated assembly of insulated conductors in a flexible metallic enclosure. See Section ~~333-19.~~ 333-100.

~~333-2.~~ 333-3. Other Articles. Type AC cable shall comply with this article and also with the applicable provisions of other articles in this Code, especially Article 300.

~~B.~~ II. Installation.

~~333-3.~~ 333-10. Uses Permitted. Except where otherwise specified in this Code and where not subject to physical damage, Type AC cable shall be permitted for branch circuits and feeders in both exposed and concealed work and in cable trays where identified for such use.

Type AC cable shall be permitted in dry locations and embedded in plaster finish on brick or other masonry, except in damp or wet locations. It shall be permissible to run or fish this cable in the air voids of masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness.

~~333-4.~~ 333-12. Uses Not Permitted. Type AC cable shall not be used where prohibited elsewhere in this Code, including the following:

1. In theaters and similar locations, except as provided in Article 518, Places of Assembly
2. In motion picture studios
3. In any hazardous (classified) location except as permitted by Sections 501-4(b), Exception, 502-4(b), Exception No. 1, and 504-20
4. Where exposed to corrosive fumes or vapors
5. On cranes or hoists, except as provided in Section 610-11(c)
6. In storage battery rooms
7. In hoistways or on elevators, except as provided in Section 620-21
8. In commercial garages where prohibited in Article 511

~~333-11.~~ 333-15. Exposed Work. Exposed runs of cable shall closely follow the surface of the building finish or of running boards. Exposed runs shall also be permitted to be installed on the underside of joists where supported at each joist and located so as not to be subject to physical damage.

~~333-10.~~ 333-17. Through or Parallel to Framing Members. Type AC cable shall comply with Section 300-4 where installed through or parallel to studs, joists, rafters, or similar wood or metal members.

~~333-12.~~ 333-23. In Accessible Attics. Type AC cables in accessible attics or roof spaces shall be installed as specified in (a) and (b).

(a) Where Run Across the Top of Floor Joists. Where run across the top of floor joists, or within 7 ft (2.13 m) of floor or floor joists across the face of rafters or studding, in attics and roof spaces that are accessible, the cable shall be protected by substantial guard strips that are at least as high as the cable. Where this space is not accessible by permanent stairs or ladders, protection shall only be required within 6 ft (1.83 m) of the nearest edge of the scuttle hole or attic entrance.

(b) Cable Installed Parallel to Framing Members. Where the cable is installed parallel to the sides of rafters, studs, or floor joists, neither guard strips nor running boards shall be required, and the installation shall also comply with Section 300-4(d).

~~333-8.~~ 333-24. Bending Radius. ~~All bends~~ Bends in Type AC cable shall be made so that the cable will not be damaged~~, and the~~ The radius of the curve of the inner edge of any bend shall not be less than five times the diameter of the ~~Type AC~~ cable.

~~333-7.~~ 333-30. ~~Support~~ Securing and Supporting. Type AC cable shall be secured by staples, cable ties, straps, hangers, or similar fittings designed and installed so as not to damage the cable at intervals not exceeding 4 1/2 ft (1.37 m) and within 12 in. (305 mm) of every outlet box, junction box, cabinet, or fitting.

(a) Horizontal Runs. Type AC cable installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1/16 in. (1.59 mm) thick, shall be considered secured where the support intervals do not exceed 4 1/2 ft (1.37 m) and the armored cable is securely fastened in place by an approved means within 12 in. (505 mm) of each box, cabinet, conduit body, or other armored cable termination.

(b) Unsupported. Type AC cable shall be permitted to be unsupported where the cable is

1. Fished between access points, where concealed in finished buildings or structures and supporting is impracticable;
2. Not more than 2 ft (610 mm) in length at terminals where flexibility is necessary; or
3. Not more than 6 ft (1.83 m) in length from an outlet for connections within an accessible ceiling to lighting fixtures or equipment.

(c) Cable Tray Installations. Type AC cable installed in cable trays shall comply with Section 318-8(b).

~~333-9.~~ 333-40. Boxes and Fittings. At all points where the armor of AC cable terminates, a fitting shall be provided to protect wires from abrasion, unless the design of the outlet boxes or fittings is such as to afford equivalent protection, and, in addition, an insulating bushing or its equivalent protection shall be provided between the conductors and the armor. The connector or clamp by which the Type AC cable is fastened to boxes or cabinets shall be of such design that the insulating bushing or its equivalent will be visible for inspection. Where change is made from Type AC cable to other cable or raceway wiring methods, a box, fitting, or conduit body shall be installed at junction points as required in Section 300-15.

333-80. Ampacity. The ampacity shall be determined by Section 310-15.

Armored cable installed in thermal insulation shall have conductors rated at 90°C (194°F). The ampacity of cable installed in these applications shall be that of 60°C (140°F) conductors.

~~C.~~ III. Construction Specifications

~~333-19.~~ 333-100. Construction. Type AC cable shall have an armor of flexible metal tape. The insulated conductors shall be in accordance with Section ~~333-20~~ 333-104. Cables of the AC type shall have an internal bonding strip of copper or aluminum in intimate contact with the armor for its entire length.

~~333-20.~~ 333-104. Conductors. Insulated conductors shall be of a type listed in Table 310-13 or those identified for use in this cable. In addition, the conductors shall have an overall moisture-resistant and fire-retardant fibrous covering. For Type ACT, a moisture-resistant fibrous covering shall be required only on the individual conductors. ~~The ampacity shall be determined by Section 310-15.~~

~~Armored cable installed in thermal insulation shall have conductors rated at 90°C (194°F). The ampacity of cable installed in these applications shall be that of 60°C (140°F) conductors.~~

~~333-21.~~ 333-108. Equipment Grounding. Type AC cable shall provide an adequate path for equipment grounding as required by Section 250-2(d).

~~333-22.~~ 333-120. Marking. The cable shall be marked in accordance with Section 310-11, except that Type AC shall have ready identification of the manufacturer by distinctive external markings on the cable sheath throughout its entire length.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.

A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel Code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

The last three sentences of existing Section 333-20 were relocated to new Section 333-80.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1336)

7- 91 - (333-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a new Section 333-1 as follows:
333-1. Scope. This article covers the use, installation, and construction specifications for Armored Cable Type, AC.
Renumber existing 333-1 to 333-2
333-2 to 333-3
333-3 to 333-4
SUBSTANTIATION: NEC Style Manual requires that each article contain a statement of scope and that the scope statement be the first section of the Article. See NEC Style Manual 2.2.1 and 2.2.2.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1338)

7- 92 - (333-2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete Section 333-2 (333-3 New)
~~333-2. Other Articles. Type AC cable shall comply with this article and also with the applicable provisions of other articles in this Code, especially Article 300.~~
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1421)

7- 93 - (333-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 333-2 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #825)

7- 94 - (333-3): Accept
Note: The Technical Correlating Committee understands that this action deletes 333-10(1) in Proposal 7-89a.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence:
"Type AC cable shall be permitted ~~for branch circuits and feeders~~ in both exposed and concealed work, and in cable trays where identified for such use."
SUBSTANTIATION: Edit. Literal limitation to use as branch circuits and feeders suggests this cable is not suitable for other uses, e.g., control and signal circuits. It has been suggested that the Code must be looked at as a whole, to sometimes define intent. Sections 330-3 and 334-3 specifically indicate Types MI and MC cables are suitable for control and signal circuits, and Section 336-4 does not specify specific cable use. This indicates intent is not to permit use of Type AC cable for other than branch circuits or feeders.
Branch circuits may end at an outlet to which Type AC cable is connected to supply utilization equipment with tap conductors which may not be considered as a branch circuit.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1339)

7- 95 - (333-3): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise existing 333-3 (333-10 New) to convert text to a list and to remove redundant reference to the Code.
~~333-3.~~ 333-10. Uses Permitted. ~~Except where otherwise specified in this Code and~~ Where not subject to physical damage, Type AC cable shall be permitted:
(1) For ~~for~~ branch circuits and feeders
(2) In ~~in~~both exposed and concealed work
(3) In ~~and in~~ cable trays where identified for such use~~. Type AC cable shall be permitted~~
(4) In ~~in~~ dry locations
(5) Embedded ~~embedded~~in plaster finish on brick or other masonry, except in damp or wet locations~~.~~
(6) ~~It shall be permissible to~~ To be run or fished ~~this cable~~ in the air voids of masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness~~.~~
SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that where possible lists or tables be used to present requirements, rather than long text descriptions.
"Except where otherwise specified in this Code and" was deleted as it applies generally, it is redundant, vague, and unenforceable and Section 90-3 adequately covers this requirement. See NEC Style Manual 4.1.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4093)

7- 96 - (333-3 and 333-4): Reject
SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc./Rep. AvalonBay Communities & Lincoln Property Co.
RECOMMENDATION: Revise text to read as follows:
~~333-3. Uses Permitted. Except where otherwise specified in this Code and where not subject to physical damage. Type AC cable shall be permitted for branch circuits and feeders in both exposed and concealed work and in cable trays where identified for such use. Type AC cable shall be permitted in dry locations and embedded in plaster finish on brick or other masonry, except in damp or wet locations. It shall be permissible to run or fish this cable in the air voids of masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness.~~
333.3. Uses Permitted. The use of Type AC shall be permitted in the following:
(1) One- and two-family dwellings
(2) Multifamily dwellings and other structures, except as prohibited in Section 331.4
(3) Cable trays, where the cables are identified for the use.
FPN: See Section 310.10 for temperature limitation of conductors.
33.4. Uses Not Permitted. Type AC cable shall not be used where prohibited elsewhere in this Code, including the following:
(1) In any multifamily dwelling or other structure exceeding three floor above grade.
For the purpose of this article, the first floor of a building shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.

(~~1~~ 2) In theaters and similar locations, except as provided in Article 518, Places of Assembly
(~~2~~ 3) In motion picture studios
(~~3~~ 4) In any hazardous (classified) location except as permitted by Sections 501.4(b), Exception, 502.4(b), Exception No. 1, and 504.20.
(~~4~~ 5) Where exposed to corrosive fumes or vapors.
(~~5~~ 6) On cranes or hoists, except as provided in Section 610.11(c)
(~~6~~ 7) In storage battery rooms
(~~7~~ 8) In hoistways or on elevators, except as provided in Section 620.21
(~~8~~ 9) In commercial garages where prohibited in Article 511.

SUBSTANTIATION: The report I submitted, NBSIR 78-1415, Fire Endurance Tests of Residential Walls Containing Branch Circuit Wiring-Preliminary Findings, substantiates that there is no significant different in the performance of different cable types. The two cable types used in this study were Type NM and Type AC. In addition, the Panel 7 Committee has the report from the NEC Task Group on NM cable along with the negative ballot comments. The representative for NEMA on this task group noted in his negative ballot comments for Proposals 336-4 and 336-5 the following (directly quoted from his comments):

C. Question of Flame Retardation

3) Delete statement or revise to read "Potential to be a source of ignition."

Substantiation: Any wiring method can be a potential source of ignition. There was no evidence presented that NM cable presented a higher or lower potential than other wiring methods to be a source of ignition. Many fires are caused by arcing at the termination's which is independent of the wiring method used.

Revise 3rd paragraph as follows: "The issue where Nonmetallic Sheathed Cable fails because of damage or overload and generates an arcing fault is of concern. ~~Some task group members remain convinced that an arcing fault in Nonmetallic Sheathed Cable is more likely to start a fire then a similar fault in most other wiring methods.~~ The task group did not come to agreement on the extent of this hazard or propose new requirements to address it."

Substantiation: There was no substantiation to support such a statement, only speculation.

D, Question of Smoke Density

Revise to read "The Task Group determined that large quantities of exposed Nonmetallic-Sheathed Cable could contribute move to the smoke density of a fire ~~than most other branch circuit wiring methods~~. The actual impact of this on individual fires has not been determined. The typical areas where Nonmetallic-Sheathed Cable would be exposed in large quantities would include dropped or suspended ceilings, or electrical distribution rooms or areas, ~~large attics and basements~~. Smoke density is ~~of serious~~ a concern because it can affect the ability of the occupants to evacuate the building. The Task Group believes that requirements to limit the exposed use of Nonmetallic-Sheathed Cable in any expanding use would address this issue."

Substantiation: The first sentence as revised above is accurate; the original sentence is not. The Task Group had no data comparing NM cable to other wiring methods. NM cable has been used for many years exposed in attics and basements of one- and two-family dwellings as well as multifamily dwellings and other structures not exceeding three floors above grade with no reported problems. Also, what constitutes a large quantity? The term is subject to wide interpretation. The last sentence could construed to mean that exposed use should be limited in all cases.

E. Production of Toxic Products of Combustion

Revise to read "The Task Group agreed that Nonmetallic-Sheathed Cable, like all other wiring methods, produces toxic products of combustion when exposed to flame. The Task Group notes that the use of toxic products of combustion ~~needs to be addressed~~ should be considered in any expanded use of Type NM cable."

Substantiation: All wiring methods except Type MI cable produce toxic products of combustion when exposed to flame. Toxicity research funded by NEMA for New York State indicated that there is no statistically significant difference between the nonmetallic materials used in all wiring methods. Except for the addition of a nonmetallic jacket, the insulated conductors used in NM cable are identical to those used in other wiring methods. In fact, insulated conductors with more nonmetallic materials (thicker insulation) are frequently used in other cable types and wiring methods. Lacking any data, the Task Group does not know if the issue "needs to be addressed", it certainly "should be considered".

Based on the results of the NBS Report comparing Type NM with Type AC and finding no differences in fire characteristics between these cables, the NEC Task Group's Report, and the position of NEMA on the safety of all wiring methods, the Panel 7 Committee should reconsider its acceptance of Type AC use in buildings over three stories in height.

By submission of this proposal, we are neither supporting nor opposing the use of Type AC above three stories in height. We are only attempting to gain consistency in the NEC on electrical wiring methods.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's proposal has not documented any problems resulting from the current permitted uses for Type AC cable that would support the proposed restrictions on those uses.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NEGATIVE: 2
NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

RODGERS: I am voting negative on the panel action on this proposal. I believe the panel should have accepted this proposal in principle. In the submitter's substantiation, there is no difference between the characteristics in type NM and AC cable, they should be treated the same.

SCHUMACHER: I am voting negative on the panel action on this proposal. While the submitter admits that this is a frivolous proposal with his last sentence, I agree with his substantiation that if there is no difference between the characteristics in Type NM cable, and type AC cable and they should be treated the same. I believe the panel should have accepted this in principle, because type AC cable should be allowed in any building up to three stories, and not limited to residential.

(Log #1340)

7- 97 - (333-4): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise 333-4 (333-12 New) to read as follows:

333-4. Uses Not Permitted. Type AC cable shall not be used ~~where prohibited elsewhere in this Code, including the following:~~

(1) In theaters and similar locations, except where permitted ~~as provided~~ in 518-4 ~~Article 518, Places of Assembly~~
(2) In motion picture studios
(3) In ~~any~~ hazardous (classified) locations except where ~~as~~ permitted in ~~by Sections~~
(a) 501-4(b), Exception~~,~~
(b) 502-4(b), Exception No. 1~~, and~~
(c) 504-20
(4) Where exposed to corrosive fumes or vapors
(5) On cranes or hoists, except where permitted ~~as provided~~ in ~~Section~~ 610-11(c)
(6) In storage battery rooms
(7) In hoistways, or on elevators or escalators, except where permitted ~~as provided~~ in ~~Section~~ 620-21
(8) In commercial garages except where permitted in 511-4 and 511-6 ~~where prohibited in Article 511.~~

SUBSTANTIATION: The phrase in the first sentence was deleted since 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3.

NEC Style Manual Section 4.1.1 prohibits referencing an entire Article unless additional conditions are specified. Referencing parts within Articles is permitted.

Section 4.1.2 states that references shall include only the number of the rule being referenced; the word section, subsection, and paragraph shall not be used.

"As provided" was replaced with "where permitted" to aid in word clarity in accordance with NEC Style Manual Section 3.3.4.

(7) was revised to correctly reference the equipment addressed in 620-21.

(8) was revised to use positive language in accordance with NEC Style Manual Section 3.3.1(4).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #468)

7- 98 - (333-7 and 333-12): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 333-7 - revise as follows:
"333-7. Support. Type AC cable shall be secured by staples, cable ties, straps, hangers, or similar fittings designed and installed so as not to damage the cable at intervals not exceeding 1.4 m (4 1/2 ft) ~~4 1/2 ft (1.37 m)~~ and within 300 mm (12 in.) ~~12 in. (305 mm)~~ of every outlet box, junction box, cabinet, or fitting."
333-7(b) - revise as follows:
"(b) Unsupported. Type AC cable shall be permitted to be unsupported where the cable is
(1) Fished between access points, where concealed in finished buildings or structures and supporting is impracticable;
(2) Not more than 600 mm (2 ft) ~~2 ft (610 mm)~~ in length at terminals where flexibility is necessary; or
(3) Not more than 1.8 m (6 ft) ~~6 ft (1.83 m)~~ in length from an outlet for connections within an accessible ceiling to lighting fixtures or equipment."
333-12 - change "7 ft (2.13 m)" to "2.1 m (7 ft)" and change "6 ft (1.83 m)" to "1.8 m (6 ft)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #469)

7- 99 - (333-7(a)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 333-7(a) - revise as follows:
"(a) Horizontal Runs. Type AC cable installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1.59 mm (1/16 in.) ~~1/16 in. (1.59 mm)~~ thick, shall be considered secured where the support intervals do not exceed 1.4 m (4 1/2 ft) ~~4 1/2 ft (1.37 m)~~ and the armored cable is securely fastened in place by an approved means within 300 mm (12 in.) ~~12 in. (505 mm)~~ of each box, cabinet, conduit body, or other armored cable termination."
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The thickness of the steel plate is not rounded since the dimension shown is standard industry practice.
The "505 mm" is an error and should have been "305 mm".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1407)

7- 100 - (333-7(a)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Horizontal Runs. Type AC cable installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members ~~and protected by a steel plate at least 1/16 in. (1.59mm) thick~~ shall be considered secured where the support intervals do not exceed 4 1/2 ft (1.37mm) and the armored cable is securely fastened in place by an approved means within 12 in. ~~(505mm)~~ (305mm) of each box, cabinet, conduit body, or other armored cable termination.
SUBSTANTIATION: Steel plate protection is presently required regardless of the distance of the hole from the edge of the framing member. Section 333-10 requires compliance with Section 300-4 which relates to physical protection, while this section appears primarily related to support. Uniformity between sections would be user friendly. (See my proposal for Section 300-4(a)(1)).
PANEL ACTION: Accept in Part.
Accept the editorial correction. Reject the remainder of the proposal.
PANEL STATEMENT: The current wording sufficiently covers the requirements for support of horizontal cable installations. The steel plate is essential to holding the cable in place where run through notches.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #822)

7- 101 - (333-7(b)(3)): Accept
Note: The Technical Correlating Committee understands that the action will be included in 333-30(b)(3) in Proposal 7-89a.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(3) Not more than 6 ft (1.83 m) in length ~~from an outlet~~ for connection within an accessible ceiling to lighting fixtures or other equipment.
SUBSTANTIATION: Edit. Although the outlet can be considered the fixture or equipment it can be construed as an outlet box, conduit body, etc. separate from the fixture or equipment, which would preclude the 6 ft permission where the cable is a continuous run to a panelboard longer than 6 ft but with a support within 6 ft of the fixture. Section (b)(2) does not use the phrase "from an outlet".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
TRAINOR: From the Panel discussion, it appears that the intent was to permit AC cable in a suspended ceiling to be run to a lighting fixture so long as it was supported within 6 ft of the fixture. I concur with the intent. Unfortunately, the wording change accepted will also allow 6 ft of unsupported AC cable from one lighting fixture to another. I do not believe that was the intent of the Panel or the submitter. I recommend that this proposal be rejected. See my comment on Proposal 7-102.

(Log #2907)

7- 102 - (333-7(b)(3)): Accept in Principle
SUBMITTER: Mark R. Hilbert, Wolfeboro, NH
RECOMMENDATION: Add the words: "or from the last point of secure attachment to a structural member or other" after the words "accessible ceiling."
The revised sentence would read: Not more than 6 ft (1.38 m) in length from an outlet for connections within an accessible ceiling or from the last point of secure attachment to a structural member or other, to lighting fixtures or equipment.
SUBSTANTIATION: The revised wording of this sentence would allow for six feet of flexibility for a cable that does not originate at an outlet within the accessible ceiling. For example, it would allow for a cable to be run from a switch within a wall to a light fixture within an accessible ceiling. Currently, there is no language which permits this installation method. However, it is common to see this method in the

field. I am not aware of any problems due to the use of this installation method.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 7-101.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
TRAINOR: From the Panel discussion and action on Proposal 7-101, it appears that the intent was to permit AC cable in a suspended ceiling to be run directly to a lighting fixture so long as it was supported within 6 ft of the fixture. This is a significant change from the present requirement which only allows 6 ft of unsupported AC cable where it is installed from an outlet to a fixture. I concur with the intent. Unfortunately, the wording change accepted will also allow 6 ft of unsupported AC cable from one lighting fixture to another. I do not believe that was the intent of the Panel or the submitter. I recommend that this proposal be amended to replace the words "from an outlet" with the words "from the last point of support". The amended text of 333-7(b)(3) would then read:
Not more than 6 ft (1.83 m) in length from the last point of support for connection within an accessible ceiling to lighting fixtures or other equipment. This will permit what the Panel apparently intended. It also permits AC cable from fixture to fixture but requires support of the cable between fixtures.

(Log #823)

7- 103 - (333-9): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise last sentence:
"Where a change is made from Type AC cable to other cable, ~~or~~ raceway, or open wiring methods, a box, fitting, or conduit body shall be installed at junction points as required in Sections 300-15 and 300-16.
SUBSTANTIATION: Edit. Section 300-16 specifically addresses a transition from Type AC cable to open wiring. Inclusion of reference to open wiring transition would make this section more complete.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's proposed text is already covered by Section 300-16 and the cross reference is not necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #824)

7- 104 - (333-11): Accept
Note: The Technical Correlating Committee understands the action will be included 333-15 of Proposal 7-89a.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
"Exposed runs of cable, except as provided in Section 300-11(a), shall closely follow the surface of the building finish or of running boards." (remainder unchanged)
SUBSTANTIATION: Edit. To allow for routing between support wires above suspended ceilings, where this cable is permitted. This is provided for Type NM cable in Section 336-6.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1337)

7- 105 - (333-19): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete the second sentence of existing Section 333-19. (333-100 New)
333-19. 333-100. Construction. Type AC cable shall have an armor of flexible metal tape. ~~The insulated conductors shall be in accordance with Section 333-20~~ 333-104. Cables of the AC type shall have an internal bonding strip of copper or aluminum in intimate contact with the armor for its entire length.
SUBSTANTIATION: The requirement is already covered in Section 333-20 (333-104 New)
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1341)

7- 106 - (333-80): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Section 333-80 (New) to read as follows:
333-80. Ampacity. The ampacity shall be determined by Section 310-15.
(a) Thermal Insulation. Armored cable installed in thermal insulation shall have conductors rated at 90ºC (194ºF). The ampacity of cable installed in these applications shall be that of 60ºC (140ºF) conductors.
(b) Cable Tray. The ampacity of Type AC cable installed in cable tray shall be determined in accordance with 318-11.
SUBSTANTIATION: To incorporate text consistent with that used in the other cable articles. The requirement for determining ampacities for installations in cable trays was added to correlate with the permission to use Type AC in cables trays per Section 318-3 and the determination of ampacity in Section 318-11.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-89a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

ARTICLE 334 — METAL-CLAD CABLE

(Log #470)

7- 107 - (334): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 334-10 - change "6 ft (1.83 m)" to "1.8 m (6 ft)" and change "12 in. (305 mm)" to "300 mm (12 in.)"
334-10(a)(2) - change "12 in. (305 mm)" to " 300 mm (12 in.)"
334-10(b) - change "6 ft (1.83 m)" to "1.8 m (6 ft)"
334-11(a) - revise as follows:
"(a) Smooth Sheath.
(1) Ten times the external diameter of the metallic sheath for cable not more than 19 mm (3/4 in.) ~~3/4 in. (19 mm)~~ in external diameter
(2) Twelve times the external diameter of the metallic sheath for cable more than 19 mm (3/4 in.) ~~3/4 in. (19 mm)~~ but not more than 38 mm (1 1/2 in.) 1 ~~1/2 in. (38 mm)~~ in external diameter
(3) Fifteen times the external diameter of the metallic sheath for cable more than 38 mm (1 1/2 in.) ~~1 1/2 in. (38 mm)~~ in external diameter"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #CP711)

7- 107a - (334): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: CMP 7

RECOMMENDATION: Rewrite Article 334 to comply with NEC Style Manual.

ARTICLE 334 -- Metal-Clad Cable: Type MC

I General

334-1. Scope. This article covers the use, installation, and construction specifications of Metal- Clad Cable, Type MC.

334-2. Definition.

Metal Clad Cable, Type MC. A factory assembly of one or more insulated circuit conductors with or without optical fiber members enclosed in an armor of interlocking metal tape, or a smooth or corrugated metallic sheath.

II Installation

334-10. Uses Permitted.

(a) General Uses. Where not subject to physical damage, Type MC cables shall be permitted as follows:

(1) For services, feeders, and branch circuits
(2) For power, lighting, control, and signal circuits
(3) Indoors or outdoors
(4) Where exposed or concealed
(5) Direct buried where identified for such use
(6) In cable tray
(7) In any raceway
(8) As open runs of cable
(9) As aerial cable on a messenger
(10) In hazardous (classified) locations as permitted in Articles 501, 502, 503, 504, and 505
(11) In dry locations and embedded in plaster finish on brick or other masonry except in damp or wet locations
(12) In wet locations where any of the following conditions are met:
(1) The metallic covering is impervious to moisture.
(2) A lead sheath or moisture-impervious jacket is provided under the metal covering.
(3) The insulated conductors under the metallic covering are listed for use in wet locations.

(b) Specific Uses. Type MC cable shall be installed in compliance with Articles 300, 490, 725, and 770-52 as applicable and in accordance with the following:

(1) Cable Tray. Type MC cable installed in cable tray shall comply with Article 318.

(2) Direct Buried. Direct-buried cable shall comply with 300-5 or 300-50, as appropriate.

(3) Installed as Service-Entrance Cable. Type MC cable installed as service-entrance cable shall comply with Article 230.

(4) Installed Outside of Buildings or as Aerial Cable. Type MC cable installed outside of buildings or as aerial cable shall comply with Article 225 and Article 321.

334-12. Uses Not Permitted. Type MC cable shall not be used where exposed to the following destructive corrosive conditions, unless the metallic sheath is suitable for the conditions or is protected by material suitable for the conditions:

(1) Direct burial in the earth
(2) In concrete
(3) Where exposed to cinder fills, strong chlorides, caustic alkalis, or vapors of chlorine or of hydrochloric acids

334-17. Through or Parallel to Framing members. Type MC cable shall comply with 300-4 where installed through or parallel to joists, studs, rafters, or similar wood or metal members

334-23. In Accessible Attics. The installation of Type MC cable in accessible attics or roof spaces shall also comply with 333-12.

334-24. Bending Radius. Bends in Type MC Cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than shown in (a) through (c).

(a) Smooth Sheath.

(1) Ten times the external diameter of the metallic sheath for cable not more than 19 mm (3/4 in.) in external diameter
(2) Twelve times the external diameter of the metallic sheath for cable more than 19 mm (3/4 in.) but not more than 38 mm (1 1/2 in.) in external diameter
(3) Fifteen times the external diameter of the metallic sheath for cable more than 38 mm (1 1/2 in.) in external diameter

(b) Interlocked-Type Armor or Corrugated Sheath. Seven times the external diameter of the metallic sheath.

(c) Shielded Conductors. Twelve times the overall diameter of one of the individual conductors or seven times the overall diameter of the multiconductor cable, whichever is greater.

334-30. Securing And Supporting.

(a) Supported Cables. Type MC cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).

(1) Horizontal Runs. Cables installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1.6 mm (1/16 in.) thick shall be considered supported and secured where such support does not exceed 1.8 m (6 ft) intervals.

(2) At Terminations. Cables containing four or fewer conductors, sized not larger than 10 AWG shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination.

(b) Unsupported Cables. Type MC cable shall not be required to be supported and secured where the cable is fished between access points, where concealed in finished buildings or structures and supporting is impracticable, or where used in lengths not more than 1.8 m (6 ft) from an outlet for connections within an accessible ceiling to lighting fixture(s) or equipment.

334-40. Boxes and Fittings. Fittings used for connecting Type MC cable to boxes, cabinets, or other equipment shall be listed and identified for such use. Where single-conductor cables enter ferrous metal boxes or cabinets, the installation shall comply with 300-20 to prevent inductive heating.

334-80. Ampacity. The ampacity of Type MC cable shall be in accordance with 310-15 or 310-60.

Exception No. 1: The ampacities for Type MC cable installed in cable tray shall be determined in accordance with 318-11 and 318-13.

Exception No. 2: The ampacities of No. 18 and No. 16 conductors shall be in accordance with Table 402-5.

FPN: See 310-10 for temperature limitation of conductors.

III Construction Specifications

334-104. Conductors. The conductors shall be of copper, aluminum, or copper-clad aluminum, solid or stranded. The minimum conductor size shall be No. 18 copper and No. 12 aluminum or copper-clad aluminum

334-108. Equipment Grounding. Type MC cable shall provide an adequate path for equipment grounding as required by Article 250.

334-112. Insulation. The insulated conductors shall comply with (a) or (b).

(a) 600 Volts. Insulated conductors in sizes 18 and 16 AWG shall be of a type listed in Table 402-3, with a maximum operating temperature not less than 90ºC (194ºF), and as permitted by 725-27. Conductors larger than 16 AWG shall be of a type listed in Table 310-13 or of a type identified for use in Type MC cable.

(b) Over 600 Volts. Insulated conductors shall be of a type listed in Tables 310-61 through 310-64.

334-116. Sheath. The metallic covering shall be one of the following types: smooth metallic sheath, corrugated metallic sheath, interlocking metal tape armor. The metallic sheath shall be continuous and close fitting. Supplemental protection of an outer covering of corrosion-resistant material shall be permitted and shall be required where such protection is needed. The sheath shall not be used as a current-carrying conductor.

FPN: See 300-6 for protection against corrosion.

SUBSTANTIATION: This revision to Article 334 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-107, 7-109, 7-110, 7-111, 7-112, 7-113, 7-115, 7-115, 7-127 and 7-128.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1062)

7- 108 - (334): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise Article 334 as follows:

334-10(a) - change “No. 10” to “10 AWG”
334-10(a)(2) - change “No. 10” to “10 AWG”

334-13, Exception No. 2 - change "No. 18 and No 16" to "18 and 16 AWG"
334-20 - change "No. 18 copper and No. 12 aluminum" to "18 AWG copper and 12 AWG aluminum"
334-12(a) - change:
"No. 18 and No. 16" to "18 and 16 AWG"
"No. 16" to "16 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1383)

7- 109 - (334): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise text to read as follows:

Article 334 — Metal-Clad Cable Type MC

~~A.~~ 1. General.

~~334-1.~~ 334-2. Definition.

Metal-Clad Cable (Type MC). ~~cable is a~~ A factory assembly of one or more insulated circuit conductors with or without optical fiber members enclosed in an armor of interlocking metal tape, or a smooth or corrugated metallic sheath.

~~334-2.~~ 334-3. Other Articles. Metal-clad cable shall comply with this article and also with the applicable provisions of other articles in this Code, especially Article 300.

Type MC cable shall be permitted for systems in excess of 600 volts, nominal. See Section 300-2(a).

~~B~~ 1I. Installation.

~~33 3.~~ 334-10. Uses Permitted.

(a) General Uses. Unless specifically prohibited elsewhere in this Code and where not subject to physical damage, Type MC cables shall be permitted as follows:

1. For services, feeders, and branch circuits
2. For power, lighting, control, and signal circuits
3. Indoors or outdoors
4. Where exposed or concealed
5. Direct buried where identified for such use
6. In cable tray
7. In any raceway
8. As open runs of cable
9. As aerial cable on a messenger
10. In hazardous (classified) locations as permitted in Articles 501, 502, 503, 504, and 505
11. In dry locations and embedded in plaster finish on brick or other masonry except in damp or wet locations
12. In wet locations where any of the following conditions are met:
a. The metallic covering is impervious to moisture.
b. A lead sheath or moisture-impervious jacket is provided under the metal covering.
c. The insulated conductors under the metallic covering are listed for use in wet locations.

(b) Specific Uses. ~~334-10. Installation.~~ Type MC cable shall be installed in compliance with Articles 300, 490, 725, and Section 770-52 as applicable and in accordance with the following.

~~(c)~~ 1. Cable Tray. Type MC cable installed in cable tray shall comply with Article 318.

~~(d)~~ 2. Direct Buried. Direct-buried cable shall comply with Sections 300-5 or 300-50, as appropriate.

~~(e)~~ 3. Installed as Service-Entrance Cable. Type MC cable installed as service-entrance cable shall comply with Article 230.

~~(f)~~ 4. Installed Outside of Buildings or as Aerial Cable. Type MC cable installed outside of buildings or as aerial cable shall comply with Article 225 and Article 321.

~~334-4.~~ 334-12. Uses Not Permitted. Type MC cable shall not be used where exposed to destructive corrosive conditions, such as direct burial in the earth, in concrete, or where exposed to cinder fills, strong chlorides, caustic alkalis, or vapors of chlorine or of hydrochloric acids, unless the metallic sheath is suitable for the conditions or is protected by material suitable for the conditions.

~~334-10(g).~~ 334-17. Through or Parallel to Framing Members. ~~Joists, Studs, and Rafters.~~ Type MC cable shall comply with Section 300-4 where installed through or parallel to joists, studs, rafters, or similar wood or metal members.

~~334-10(h).~~ 334-23. In Accessible Attics. The installation of Type MC cable in accessible attics or roof spaces shall also comply with Section 333-12.

~~334-11.~~ 334-24. Bending Radius. ~~All bends~~ Bends in Type MC cable shall be made so that the cable will not be damaged~~, and the~~ The radius of the curve of the inner edge of any bend shall not be less than shown in (a) through (c).

(a) Smooth Sheath.
1. Ten times the external diameter of the metallic sheath for cable not more than 3/4 in. (19 mm) in external diameter
2. Twelve times the external diameter of the metallic sheath for cable more than 3/4 in. (19 mm) but not more than 1 1/2 in. (38 mm) in external diameter
3. Fifteen times the external diameter of the metallic sheath for cable more than 1 1/2 in. (38 mm) in external diameter

(b) Interlocked-Type Armor or Corrugated Sheath. Seven times the external diameter of the metallic sheath.

(c) Shielded Conductors. Twelve times the overall diameter of one of the individual conductors or seven times the overall diameter of the multiconductor cable, whichever is greater.

~~334-10(a)~~ 334-30. Securing and Supporting.

(a) Supported Cables. Type MC cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m). Cables containing four or fewer conductors, sized no larger than No. 10 shall be secured within 12 in. (305 mm) of every box, cabinet, fitting, or other cable termination.

(1) Horizontal Runs. Cables installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1/16 in. (1.59 mm) thick shall be considered supported and secured where such support does not exceed 6-ft (1.83-m) intervals.

(2) At Terminations. Cables containing four or fewer conductors, sized not larger than No. 10 shall be secured within 12 in. (305 mm) of every box, cabinet, fitting, or other cable termination.

~~334-10(b)~~

(b) Unsupported Cables. Type MC cable shall not be required to be supported and secured where the cable is fished between access points, where concealed in finished buildings or structures and supporting is impracticable, or where used in lengths not more than 6 ft (1.83 m) from an outlet for connections within an accessible ceiling to lighting fixture(s) or equipment.

~~334-12~~ 334-40. Boxes and Fittings. Fittings used for connecting Type MC cable to boxes, cabinets, or other equipment shall be listed and identified for such use. Where single-conductor cables enter ferrous metal boxes or cabinets, the installation shall comply with Section 300-20 to prevent inductive heating.

~~334-13~~ 334-80. Ampacity. The ampacity of Type MC cable shall be in accordance with Sections 310-15 or 310-60.

Exception No. 1: The ampacities for Type MC cable installed in cable tray shall be determined in accordance with Sections 318-11 and 318-13.

Exception No. 2: The ampacities of No. 18 and No. 16 conductors shall be in accordance with Table 402-5.

FPN: See Section 310-10 for temperature limitation of conductors.

~~C.~~ III. Construction Specifications.

~~334-20.~~ 334-104. Conductors. The conductors shall be of copper, aluminum, or copper-clad aluminum, solid or stranded.

The minimum conductor size shall be No. 18 copper and No. 12 aluminum or copper-clad aluminum.

~~334-23.~~ 334-108. Equipment Grounding. Type MC cable shall provide an adequate path for equipment grounding as required by Article 250.

~~334-21.~~ 334-112. Insulation. The insulated conductors shall comply with (a) or (b).

(a) 600 Volts. Insulated conductors in sizes No. 18 and No. 16 shall be of a type listed in Table 402-3, with a maximum operating temperature not less than 90°C (194°F), and as permitted by Section

725-27. Conductors larger than No. 16 shall be of a type listed in Table 310-13 or of a type identified for use in Type MC cable.

(b) Over 600 Volts. Insulated conductors shall be of a type listed in Tables 310-61 through 310-64.

~~334-22.~~ 334-116. ~~Metallic~~ Sheath. The metallic covering shall be one of the following types: smooth metallic sheath, corrugated metallic sheath, interlocking metal tape armor. The metallic sheath shall be continuous and close fitting.

Supplemental protection of an outer covering of corrosion-resistant material shall be permitted and shall be required where such protection is needed. The sheath shall not be used as a current-carrying conductor.

FPN: See Section 300-6 for protection against corrosion.

~~334-24.~~ 334-120. Marking. The cable shall be marked in accordance with Section 310-11.

SUBSTANTIATION: The proposed article re-write was developed as part of a larger effort by the NEC Usability Committee to re-format existing raceway, cable and wiring articles. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as state in the NEC Style Manual 2.4.1. It is hoped that the parallel code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

To the extent that this was possible in this article, this has been done. It is not the intent or purpose of this re-write to change the actual intent of the existing article requirements. The only new material in this proposal is the proposed new article scope which has been added to conform with the NEC Style Manual 2.2.1

A companion proposal has also been submitted which re-structures the article to a greater degree by splitting existing Code requirements into new sections to better adhere to the new article format. In some cases this is done with an alternate article re-write while in other cases, individual proposals have been submitted. These proposals are also intended to further enhance the structure and format of the article but in some cases existing code text requirements had to be revised or altered to meet the re-formatting needs. For this reason the proposals are separate which will allow the Code Making Panels to individually consider each proposal.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

Log #1342)

7- 110 - (334-1): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Add 334-1 (New) as follows:

334-1. Scope. This article covers the use, installation, and construction specifications of Metal-Clad Cable, Type MC.

Renumber existing Sections accordingly.

SUBSTANTIATION: NEC Style Manual Section 2.2.1 requires that each Article contain a Scope.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1343)

7- 111 - (334-2): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Delete the first sentence of Section 334-2.

SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3. Also, Section 4.4.1 prohibits referencing an entire Article.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1422)

7- 112 - (334-2): Accept in Principle

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Delete 334-2 in its entirety.

SUBSTANTIATION: 1999 National Electrical Code Style Manual:

Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."

Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1344)

7- 113 - (334-3): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise the first sentence of existing 334-3 as follows:

334-3. Uses Permitted. ~~Unless specifically prohibited elsewhere in this Code and~~ Where not subject to physical damage, Type MC cables shall be permitted as follows:

SUBSTANTIATION: "Unless specifically prohibited elsewhere in this Code" was deleted as it applies generally, it is redundant, vague, and unenforceable and Section 90-3 adequately covers this requirement. See NEC Style Manual 4.1.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #3297)

7- 114 - (334-3(12)(c)): Reject

SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn.

RECOMMENDATION: Revise text to read as follows:

334-3. Uses Permitted.

12. In wet locations where any of the following conditions are met:

(a) The metallic covering is impervious to moisture.

(b) A lead sheath or moisture-impervious jacket is provided under the metal covering.

(c) The insulated conductors under the metallic covering with an overall moisture impervious jacket are listed for use in wet locations.

SUBSTANTIATION: The requirements of 12(a) and 12(b) of 334-3 keep water from entering the cable core. The requirement of 12(c) permits water to enter the cable core of the interlocked armor type MC cable. The section should be revised to require an overall moisture impervious jacket over the metal coverings to prevent water from entering the cable core where it could migrate to conductor terminations.

PANEL ACTION: Reject.

PANEL STATEMENT: There has been no technical substantiation to require an overall jacket when the conductors are rated for wet locations. The present wording of this section sufficiently covers the requirements for Type MC cable in wet locations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1345)

7- 115 - (334-4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Rearrange the text in 334-4 (334-12 New) to read as follows:
334-4. Uses Not Permitted. Type MC cable shall not be used where exposed to the following destructive corrosive conditions ~~, such as~~ unless the metallic sheath is suitable for the conditions or is protected by material suitable for the conditions
(1) Direct ~~direct~~ burial in the earth~~,~~
(2) In ~~in~~ concrete~~, or~~
(3) Where ~~where~~ exposed to cinder fills, strong chlorides, caustic alkalis, or vapors of chlorine or of hydrochloric acids
SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that if possible, use lists or tables to present requirements, rather than long text descriptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1150)

7- 116 - (334-9(b)): Reject
SUBMITTER: Robert Deyab, II, Kohlage Electric Inc.
RECOMMENDATION: Same language as Section 333-9.
"Boxes and Fittings at all points where the armor of MC cable terminates, a fitting shall be provided to protect wires from abrasion, unless the design of the outlet boxes or fittings is such to afford equivalent protection shall be provided between the conductors and the armor (sheath). The connector or clamp by which the MC cable is fastened to boxes or cabinets shall be of such design that the insulating bushing... or its equivalent will be visible for inspection. Where change is made from Type MC cable to other cable or raceway wiring methods, a box, fitting, or conduit body shall be installed at junction points as required in Section 300-15."
SUBSTANTIATION: It seems to me and several colleagues that this language should appear in text as mandatory. Coils of MC (small gauge #12 and 14) come with antishot bushings from factory, and, most inspectors require these devices of termination!
PANEL ACTION: Reject.
PANEL STATEMENT: Anti-short bushings are not required for Type MC cable in accordance with the listing of the product. The termination fittings approved for use with Type MC cable are designed such that the wires will not come in contact with the cut edge of the armor; the throat of the fitting is small enough to prevent contact with the armor. Type MC termination fittings perform the same function for Type MC cable as Type AC terminations plus the anti-short bushing do for Type AC cable.
While Type AC and Type MC cable with interlocking armor may appear to be similar, the coils of cable referred to are Type AC cable which do require an anti-short bushing and the bushings are supplied by the cable manufacturer with each coil.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
TEMBLADOR: We suport the Panel Action. Further, there is a construction difference between Type AC and MC Cable. The conductor assembly in Type MC includes an overall polyester wrap between the armor and the conductors. In addition, listing of a fitting means that the fitting and the armor do not damage the conductors.

(Log #1851)

7- 117 - (334-10): Reject
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise as follows:
Type MC cable shall be installed in compliance with ~~Articles 300, 490, 725,~~ 490-34, 725-B, and ~~Section~~ 770-52 as applicable and in accordance with the following.
Delete (c), (d), (e), (f), and (g).
Renumber (h) as (c) and delete the word "Section" in the last line.
SUBSTANTIATION: Article 300 already applies and it is not necessary to include the reference.
Section 4.1 of the 1999 National Electrical Code Style Manual stipulates "Do not use a reference if the requirement is already covered by 90.3."
1999 National Electrical Code Style Manual:
Section 4.1.1 states that "References shall not be made to an entire article unless additional conditions are specified."
Section 4.1.2 stipulates that "...references shall include only the number of the rule being referenced; the word section, subsection, and paragraph shall not be used."
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns have been addressed by the panel's action on Proposal 7-109.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #471)

7- 118 - (334-10(a)(1)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 334-10(a)(1) - revise as follows:
"(1) Horizontal Runs. Cables installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1.59 mm (1/16 in.) ~~1/16 in. (1.59 mm)~~ thick shall be considered supported and secured where such support does not exceed 1.8 m (6 ft) ~~6 ft (1.83 m) intervals.~~"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The thickness of the steel plate is not rounded since the dimension shown is standard industry practice.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1406)

7- 119 - (334-10(a)(1), (b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a)(1) Horizontal Runs. Cables installed in other than vertical runs through bored or punched holes in wood or metal framing members ~~and protected by a steel plate at least 1/16 in. (1.59 mm) thick~~ shall be considered supported and secured where such support does not exceed 6 ft. (1.83m) intervals.
(b) Unsupported Cables. Type MC cable shall not be required to be supported and secured where the cable is fished between access points, where concealed in finished buildings or structures and supporting is impracticable, ~~or where used in lengths not more than 6 ft. (1.83m) from an outlet~~ nor within 12 in. (305 mm) of termination of the initial supply for the connections within an accessible ceiling to a lighting fixture(s) or other equipment.
SUBSTANTIATION: In (a)(1), a protection plate is required regardless of the distance of the hole from the edge of the framing member. Subsection (g) requires compliance with Section 300-4 which relates to physical protection, while this section appears to primarily relate to support. There should be uniformity between requirements.
In (b), the comma after "access points" is deleted as it suggests the following phrase "where concealed in finished buildings..." is a separate condition which stands alone.
The word "outlet" infers a box or point on the wiring system, which may preclude application to a direct unbroken run from a panelboard for example. On the other hand a junction at a fixture may be considered an "outlet" and negates the 12 in. fastening requirement. The intent for fastening requirements for 6 ft. or less cables between fixtures is not clear.

Since the 6 ft. distance is a general support requirement, (b) appears intended to address the 12 in. fastening distance requirement, which the proposal explicitly addresses. If the intent is to exempt the 12 in. fastening requirement for cables, interconnecting fixtures or equipment, the phrase "of the initial supply" can be deleted.

Since fixtures are equipment, by definition, the word "other" is added for clarity.

(See my proposal for Section 300-4(a)(1)).

PANEL ACTION: Reject.

PANEL STATEMENT: The current wording sufficiently covers the requirements for support of horizontal cable installations. The steel plate is essential to holding the cable in place where run through notches.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2859)

7- 120 - (334-10(a)(1)): Reject

SUBMITTER: Bill F. Neitzel, Madison, WI

RECOMMENDATION: Revise the text of 3340-10(a)(1) to read:

(1) Horizontal Runs. Cables installed in other than vertical runs through bored or punched holes in wood or metal framing members shall be considered supported and secured where such support does not exceed 6 ft (1.83 m) intervals. Cables are required to be protected from damage as required in Section 300-4.

SUBSTANTIATION: Protection of conductors and cables is covered in Section 300-4. The current wording appears to indicate all horizontal runs are required to have nail plate protection regardless of how it is installed. The wording is confusing. Protection of MC in shallow grooves is already covered in 300-4(e).

PANEL ACTION: Reject.

PANEL STATEMENT: The current wording sufficiently covers the requirements for support of horizontal cable installations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

Log #827)

7- 121 - (334-10(a)(2), (e)): Accept in Part

Note: The Technical Correlating Committee understands that the action deletes 334-30(a)(2) in Proposal 7-107a. In addition, the Technical Correlating Committee directs the Panel to address the Style Manual issues as they relate to the rewrite of 334-30. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete (a)(2); revise (e):

"INSTALLED as SERVICE- ~~ENTRANCE CABLE~~ CONDUCTORS. Type MC cable installed as service- ~~entrance cable~~ conductors shall comply with Article 230."

SUBSTANTIATION: Edit. Section (a)(2) is already covered in (a). Service-entrance cable is a specific type cable (Type SE) which Type MI cannot become. Section 334-3 permits installation in a raceway. Where so installed as service-lateral conductors they are service conductors but not service-entrance cable.

PANEL ACTION: Accept in Part.

Accept the deletion of 334-10(a)(2). Reject the remainder of the proposal.

PANEL STATEMENT: The panel accepts the editorial correction. The proposal to change "service entrance cable" to "service conductors" is rejected as this section defines the application of the product and does not redesignate the cable type.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2908)

7- 122 - (334-10(b)): Accept in Principle in Part

Note: The Technical Correlating Committee understands that the action on this Proposal will be included in 334-30(b) on Proposal 7-107a.

SUBMITTER: Mark R. Hilbert, Wolfeboro, NH

RECOMMENDATION: Delete the word "or" after the word "impracticable."

Add the words: "or from the last point of secure attachment to a structural member or other" after the words "accessible ceiling."

The revised sentence would read: Type MC cable shall not be required to be supported and secured where the cable is fished between access points, where concealed in finished buildings or structures and supporting is impracticable, where used in lengths not more than 6 ft (1.38 m) from an outlet for connections within an accessible ceiling or from the last point of secure attachment to a structural member or other, to lighting fixture(s) or equipment.

SUBSTANTIATION: The revised wording of this sentence would allow for six feet of flexibility for a cable that does not originate at an outlet within the accessible ceiling. For example, it would allow for a cable to be run from a switch within a wall to a light fixture within an accessible ceiling. Currently, there is no language which permits this installation method. However, it is common to see this method in the field. I am not aware of any problems due to the use of this installation method.

PANEL ACTION: Accept in Principle in Part.

Reject the deletion of the word "or".

Revise Section 334-10(b) to read:

"Type MC cable shall not be required to be supported and secured where the cable is fished between access points, where concealed in finished buildings or structures and supporting is impracticable or where used in lengths not more than 6 ft (1.38 m) for connections within an accessible ceiling to lighting fixture(s) or equipment."

PANEL STATEMENT: The panel rejects the deletion of the word "or" as this section is expressing two separate conditions. The panel has accepted in principle the submitter's second concept by deleting the words "from an outlet". This correlates with a change made to Section 333-7(b)(3) by Proposal 7-101.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 1

NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

TRAINOR: From the panel discussion and similiar action on Proposal 7-101, it appears that the intent was to permit MC cable in a suspended ceiling to be run directly to a lighting fixture so long as it was supported within 6 ft of the fixture. This is a significant change from the present requirement which only allows 6 ft of unsupported MC cable where it is installed from an outlet to a fixture. I concur with the intent. Unfortunately, the wording change accepted will also allow 6 ft of unsupported MC cable from one lighting fixture to another. I do not believe that was the intent of the panel or the submitter. I recommend that this proposal be amended to replace the words "from an outlet" with the words "from the last point of support." The amended text of 334-10(b) would then read: "Where used in lengths not more than 6 ft (1.83m) from the last point of support for connection within an accessible ceiling to lighting fixtures or other equipment." This will permit what the panel apparently intended. It also permits MC cable from fixture to fixture but requires support of the cable between fixtures.

(Log #826)

7- 123 - (334-12): Accept

Note: The Technical Correlating Committee understands that the action on this Proposal deletes the second sentence in 334-40 on Proposal 7-107a.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete second sentence:

"~~Where single-conductor cables enter ferrous metal boxes or cabinets, the installation shall comply with Section 300-20 to prevent inductive heating.~~"

SUBSTANTIATION: Edit. Section 300-3(b) appears to prohibit a single-conductor cable for circuit wiring, whether ac or dc. The UL white book indicates listed cable contains two or more conductors. If single-conductor cable is allowed for dc, under Section 90-4, Section 300-20 doesn't apply.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel does not concur with the submitter's substantiation. The section has been deleted as part of the TCC usability effort.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2468)

7- 124 - (334-12): Reject
SUBMITTER: John R. Hartigan, Roseville, MI
RECOMMENDATION: Add new text as follows:
An insulated bushing or equivalent protection shall be provided between the conductors and the armor at all fittings.
SUBSTANTIATION: The armor outer coverings is not always cut with an approved stripping tool. Tools such as "dikes" and "hacksaws" are used also. Even with approved tools there can be sharp edges on the armor. The circuit can be shorted out especially while installing the MC cable into fittings. The installation of the "anti-short" bushings that are already supplied with the rolls of MC cable, and use recommended by the manufacturers would provide insulation for a safer installation.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Anti-short bushings are not required for Type MC cable in accordance with the listing of the product. The termination fittings approved for use with Type MC cable are designed such that the wires will not come in contact with the cut edge of the armor; the throat of the fitting is small enough to prevent contact with the armor. Type MC termination fittings perform the same function for Type MC cable as Type AC terminations plus the anti-short bushing do for Type AC cable.
While Type AC and Type MC cable with interlocking armor may appear to be similar, the coils of cable referred to are Type AC cable which do require an anti-short bushing and the bushings are supplied by the cable manufacturer with each coil.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
TEMBLADOR: See my Comment on Affirmative on Proposal 7-116.

(Log #4428)

7- 124a - (334-12): Reject
SUBMITTER: Alan Chessman, Flag Electric
RECOMMENDATION: Add the following text:
Anti-Shorts shall be used when installing all MC cable.
SUBSTANTIATION: As an apprentice of Local 96 I do not understand why the manufacturer would send out the anti-shorts with the reels of MC cable if they do not intend for using them at all times.
PANEL ACTION: Reject.
PANEL STATEMENT: Anti-short bushings are not required for Type MC cable in accordance with the listing of the product. The termination fittings approved for use with Type MC cable are designed such that the wires will not come in contact with the cut edge of the armor; the throat of the fitting is small enough to prevent contact with the armor. Type MC termination fittings perform the same function for Type MC cable as Type AC terminations plus the anti-short bushing do for Type AC cable.
While Type AC and Type MC cable with interlocking armor may appear to be similar, the coils of cable referred to are Type AC cable which do require an anti-short bushing and the bushings are supplied by the cable manufacturer with each coil.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
TEMBLADOR: See my Comment on Affirmative on Proposal 7-116.

(Log #2421)

7- 125 - (334-13): Accept in Principle
Note: The Technical Correlating Committee understands the entire Proposal was accepted except for Panel's revision to (1) of the Proposal. The Technical Correlating Committee also understands that this revision is to 334-80 of Proposal 7-107a.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 334-13 to read as follows:
334-13. Ampacity. The ampacity of Type MC cable shall be determined in accordance with ~~Sections~~ 310-15 or 310-60 for 14 AWG and larger conductors and in accordance with Table 402-5 for 18-16 AWG conductors.
The ampacities for Type MC cable installed in cable tray shall be determined in accordance with 318-11 and 318-13.
~~Exception No. 1: The ampacities for Type MC cables installed in cable tray shall be determined in accordance with Sections 318-11 and 318-13.~~
~~Exception No. 2: The ampacities of No. 18 and No. 16 conductors shall be in accordance with Table 402-5.~~
~~FPN: See Section 310-10 for temperature limitation of conductors.~~
Where single Type MC conductors are grouped together in a triangular or square configuration, as required by 334-14 (New), and installed on a messenger or as open runs with a maintained free air space of not less than 2.15 times one conductor diameter (2.15 x O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of the conductors shall not exceed the allowable ampacities of:
(1) two or three single insulated conductors rated 0 through 2000 volts supported on a messenger in accordance with 310-15(b).
(2) Tables 310-67 and 310-68 for conductors rated over 2000 volts
SUBSTANTIATION: For clarity and to incorporate text consistent with that used in other cable articles. The Exceptions were converted to requirements in accordance with NFPA Manual of Style Section 2.3.5.2.
The word "Section" was deleted in accordance with NEC Style Manual Section 4.1.2.
The FPN was deleted since 90-3 adequately covers this requirement. The 1999 NEC Style Manual Section 4.1 states "Do not use a reference if the requirement is already covered by 90-3."
The text in the last paragraph is consistent with 318-11(b)(4) and 318-13(b)(3) for single conductors installed in similar configurations in cable tray. The following comparison table shows that the ampacities in Table 310-20 are conservative since they are equal to and, in most cases, lower than either the IEEE values or the Table 310-17 values adjusted to 40°C ambient air temperature. Tables 310-67 and 310-68 already specifically address single conductor cables triplexed in air. Table shown on next page.
PANEL ACTION: Accept in Principle.
Revise the proposed item (1) to read:
(1) Table 310-20 for conductors rated 0 through 2000 volts.
PANEL STATEMENT: The direct reference to the specific table enhances the usability of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1852)

7- 126 - (334-14 (New)): Accept
Note: The Technical Correlating Committee directs the Panel to clarify the Panel Action relative to the location and title of the proposed language in Proposal 7-107a. This action will be considered by the Panel as a Public Comment.
The Technical Correlating Committee refers this Proposal to Code-Making Panel 3 for information.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Add a new 334-14 to read:
"Where single-conductor cables are used, all phase conductors and, where used, the neutral conductor shall be grouped together to minimize induced voltage on the sheath."
SUBSTANTIATION: Single conductor Type MC cables have not been listed or used until recently. This requirement is the same requirement that applies to single conductor Type MI cable in 330-16.
It is not necessary to include the second sentence in 330-16 since it is adequately covered by 90-3 and Section 4.1 of the 1999 National Electrical Code Style Manual stipulates "Do not use a reference if the requirement is already covered by 90.3."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

Allowable Ampacities of Single-Insulated Copper Conductors 0.6 to 5 kV Unshielded Single Conductor Extruded Dielectric Cable
Triplexed in Free Air

	IEEE Std 835[1] Page 31		NEC Table 310-20	NEC Table 310-17	
Conductor temp.	90°C		90°C	90°C	
Ambient temp.	**40°C**		**40°C**	**30°C**	**40°C**
Sun	**None**	**Full**			(x 0.91)
Wind	**0 ft/sec**	**2 ft/sec**			
AWG/kcmil					
12	36	43		40	36
10	48	57		55	50
8	66	76	66	80	73
6	89	100	89	105	96
4	120	132	117	140	127
3			138	165	150
2	162	175	158	190	173
1	195	203	185	220	200
1/0	226	234	214	260	237
2/0	264	269	247	300	273
3/0	308	310	287	350	319
4/0	359	357	335	405	369
250	405	396	374	455	414
300	456	444	419	505	460
350	504	488	464	570	519
400	550	529	503	615	560
500	634	603	580	700	637
600	714	671	647	780	710
700			714	855	778
750	815	759	747	885	805
800			773	920	837
900			826	985	896
1000	957	879	879	1055	960
1250				1200	1092
1500				1325	1206
1750				1445	1315
2000				1560	1420

[1]Souce: IEEE Std 835-1994, IEEE Standard Power Cable Ampacity Tables

(Log #CP701)

7- 126a - (334-22): Accept

Note: The Technical Correlating Committee understands that action on this Proposal will be included as the third sentence in 334-116 on Proposal 7-107a.

SUBMITTER: CMP 7

RECOMMENDATION: In section 334-22 of the existing 1999 text insert a new second paragraph to read:

A non-magnetic sheath or armor shall be used on single conductor Type MC.

Move existing second paragraph to third paragraph.

SUBSTANTIATION: Single conductor Type MC cable has been permitted in the NEC without language to specifically address the construction of the single conductor type.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1853)

7- 127 - (334-24): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Delete 334-24. Marking. in its entirety.

SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3 and 4 apply generally.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

ARTICLE 336 — NONMETALLIC-SHEATHED CABLE

(Log #472)

7- 128 - (336): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 336-6(b) - change "6 in. (152 mm)" to "150 mm (6 in.)"

336-18 - revise second sentence as follows:

"Cable shall be secured in place at intervals not exceeding 1.4 m (4 1/2 ft) ~~4 1/2 ft (1.37 m)~~ and within 300 mm (12 in.) ~~12 in. (305 mm)~~ from every cabinet, box, or fitting."

336-18, Exception No. 2 - revise as follows:

"Exception No. 2: A wiring device identified for the use, without a separate outlet box, incorporating an integral cable clamp shall be permitted where the cable is secured in place at intervals not exceeding 1.4 m (4 1/2 ft) ~~4 1/2 ft (1.37 m)~~ and within 300 mm (12 in.) ~~12 in. (305 mm)~~ from the wiring device wall opening, and there shall be at least a 300 mm (12 in.) ~~12 in. (305 mm)~~ loop of unbroken cable or 150 mm (6 in.) ~~6 in. (152 mm)~~ of a cable end available on the interior side of the finished wall to permit replacement."

336-18, Exception No. 3 - change "4 1/2 ft (1.37 m)" to "1.4 m (4 1/2 ft)"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-107a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #CP712)

7- 128a - (336): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

Further, the Technical Correlating Committee directs that the definition in 336-12(a)(1) be moved to 336-2 Definitions to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 7

RECOMMENDATION: Rewrite Article 336 to comply with NEC Style Manual.

ARTICLE 336 -- Nonmetallic-Sheathed Cable: Types NM, NMC, and NMS

I General

336-1. Scope. This article covers the use, installation, and construction specifications of nonmetallic-sheathed cable.

336-2. Definition.

Nonmetallic-Sheathed Cable. A factory assembly of two or more insulated conductors having an outer sheath of nonmetallic material.

II Installation.

336-10. Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following:

(1) One- and two-family dwellings

(2) Multifamily dwellings and other structures, except as prohibited in 336-5

(3) Cable trays, where the cables are identified for the use

FPN: See 310-10 for temperature limitation of conductors.

(a) Type NM. Type NM cable shall be permitted:

(1) For both exposed and concealed work in normally dry locations

(2) To be installed or fished in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness

(b) Type NMC. Type NMC cable shall be permitted:

(1) For both exposed and concealed work in dry, moist, damp, or corrosive locations

(2) In outside and inside walls of masonry block or tile

(3) In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1.6 mm (1/16-in.) thick, and covered with plaster, adobe, or similar finish

(c) Type NMS. Type NMS cable shall be permitted:

(1) For both exposed and concealed work in normally dry locations

(2) To be installed or fished in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness

(3) To be used as permitted in Article 780

336-12. Uses Not Permitted.

(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used:

(1) In a multifamily dwelling or other structure exceeding three floors above grade

For the purpose of this article, the first floor of a building shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.

(2) As service-entrance cable

(3) In commercial garages having hazardous (classified) locations as defined in 511-3

(4) In theaters and similar locations, except where permitted in 518-4

(5) In motion picture studios

(6) In storage battery rooms

(7) In hoistways or on elevators or escalators.

(8) Embedded in poured cement, concrete, or aggregate

(9) In hazardous (classified) locations, except where permitted in:

(a) 501-4(b), Exception.

(b) 502-4(b), Exception No. 1

(c) 504-20

(10) Types NM and NMS. Types NM and NMS cable shall not be used:

(a) Where exposed to corrosive fumes or vapors

(b) Where embedded in masonry, concrete, adobe, fill, or plaster

(c) In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish

336-15. Exposed Work. In exposed work, except as provided in 300-11(a), the cable shall be installed as specified in (a) through (c).

(**a) To Follow Surface.** The cable shall closely follow the surface of the building finish or of running boards.

(**b) Protection from Physical Damage.** The cable shall be protected from physical damage where necessary by conduit, electrical metallic tubing, Schedule 80 PVC rigid nonmetallic conduit, pipe, guard strips, listed surface metal or nonmetallic raceway, or other means. Where passing through a floor, the cable shall be enclosed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC rigid nonmetallic conduit, listed surface metal or nonmetallic raceway, or other metal pipe extending at least 150 mm (6 in.) above the floor.

(c) In Unfinished Basements. Where the cable is run at angles with joists in unfinished basements, it shall be permissible to secure cables not smaller than two No. 6 or three No. 8 conductors directly to the lower edges of the joists. Smaller cables shall either be run through bored holes in joists or on running boards.

336-17. Through or Parallel to Framing Members. Types NM, NMC, or NMS cable shall comply with 300-4 where installed through or parallel to joists, studs, rafters, or similar wood or metal members.

336-23. In Accessible Attics. The installation of cable in accessible attics or roof spaces shall also comply with 333-12.

336-24. Bending Radius. Bends in Type NM, NMC, and NMS cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend during or after installation, shall not be less than five times the diameter of the cable.

336-30. Securing and Supporting. Nonmetallic-sheathed cable shall be secured by staples, cable ties, straps, or similar fittings designed and installed so as not to damage the cable. Cable shall be secured in place at intervals not exceeding 1.4 m (4 1/2 ft.) and within 300 mm (12 in.) from every cabinet, box, or fitting. Flat cables shall not be stapled on edge. Cables run through holes in wood or metal joists, rafters, or studs shall be considered to be supported and secured.

FPN: See 370-17(c) for support where nonmetallic boxes are used.

Exception No. 1: For concealed work in finished buildings or finished panels for prefabricated buildings where such supporting is impracticable, it shall be permissible to fish cable between access points.

Exception No. 2: A wiring device identified for the use, without a separate outlet box, incorporating an integral cable clamp shall be permitted where the cable is secured in place at intervals not exceeding 1.4 m (4 1/2 ft.) and within 300 mm (12 in.) from the wiring device wall opening, and there shall be at least a 300mm (12 in.) loop of unbroken cable or 150 mm (6 in.) of a cable end available on the interior side of the finished wall to permit replacement.

Exception No. 3: Lengths not more than 1.4 m (4 1/2 ft.) from an outlet for connection within an accessible ceiling to lighting fixture(s) or equipment.

336-40. Boxes and fittings.

(a) Boxes of Insulating Material. Nonmetallic outlet boxes shall be permitted as provided in 370-3.

(**b) Devices of Insulating Material.** Switch, outlet, and tap devices of insulating material shall be permitted to be used without boxes in exposed cable wiring and for rewiring in existing buildings where the cable is concealed and fished. Openings in such devices shall form a close fit around the outer covering of the cable and the device shall fully enclose the part of the cable from which any part of the covering has been removed. Where connections to conductors are by binding-screw terminals, there shall be available as many terminals as conductors.

(c) Devices with Integral Enclosures. Wiring devices with integral enclosures identified for such use shall be permitted as provided in 300-15(e).

336-80. Ampacity. The ampacity of Types NM, NMC, and NMS cable shall be determined in accordance with 310-15. The ampacity shall be in accordance with the 60º C (140º F) conductor temperature rating. The 90º C (194º F) rating shall be permitted to be used for ampacity derating purposes provided the final derated ampacity does not exceed that for a 60º C (140º F) rated conductor.

III Construction Specifications

336-100. Construction. The outer cable sheath of nonmetallic-sheathed cable shall be a nonmetallic material.

336-104. Conductors. The insulated power conductors shall be sizes 14 through 2 AWG with copper conductors or sizes 12 through 2 AWG with aluminum or copper-clad aluminum conductors. The signaling conductors shall comply with 780-5.

336-108. Equipment Grounding. In addition to the insulated conductors, the cable shall be permitted to have an insulated or bare conductor for equipment grounding purposes only. Where provided, the grounding conductor shall be sized in accordance with Article 250.

336-112. Insulation. The insulated power conductors shall be one of the types listed in Table 310-13 that is suitable for branch circuit wiring or one that is identified for use in these cables. Conductor insulation shall be rated at 90º C (194º F).

FPN: Types NM, NMC, and NMS cable identified by the markings NM-B, NMC-B, and NMS-B meet this requirement

336-116. Sheath. The outer sheath of nonmetallic-sheathed cable shall comply with:

(1) Type NM. The overall covering shall be flame retardant and moisture resistant.

(2) Type NMC. The overall covering shall be flame retardant, moisture resistant, fungus resistant, and corrosion resistant.

(3) Type NMS. The overall covering shall be flame-retardant and moisture-resistant. The sheath shall be applied so as to separate the power conductors from the communications and signaling conductors. The signaling conductors shall be permitted to be shielded. An optional outer jacket shall be permitted.

FPN: For composite optical cable, see 770-4 and 770-52.

SUBSTANTIATION: This revision to Article 336 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-129, 7-132, 7-133, 7-134, 7-142, 7-144, 7-160, 7-175, 7-182 and 7-192.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1384)

7- 129 - (336): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise “A. General” to “I. General”

Revise 336-2 as follows:

336-2. Definition.

Nonmetallic-sheathed cable . ~~is a~~ A factory assembly of two or more insulated conductors having an outer sheath of moisture-resistant, flame-retardant, nonmetallic material.

Revise “336-4. Uses Permitted.” to “336-10. Uses Permitted.”

Revise “336-5. Uses Not Permitted.” to “336-12. Uses Not Permitted.”

Revise “B. Installation” to “II. Installation”

Revise 336-6 as follows:

~~336-6. Exposed Work — General~~ to 336-15. Exposed Work. In exposed work, except as provided in Section 300-11(a), the cable shall be installed as specified in (a) through ~~(d)~~ (c).

(a) To Follow Surface. The cable shall closely follow the surface of the building finish or of running boards.

(b) Protection from Physical Damage. The cable shall be protected from physical damage where necessary by conduit, electrical metallic tubing, Schedule 80 PVC rigid nonmetallic conduit, pipe, guard strips, listed surface metal or nonmetallic raceway, or other means. Where passing through a floor, the cable shall be enclosed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC rigid nonmetallic conduit, listed surface metal or nonmetallic raceway, or other metal pipe extending at least 6 in. (152 mm) above the floor.

(c) In Unfinished Basements. Where the cable is run at angles with joists in unfinished basements, it shall be permissible to secure cables not smaller than two No. 6 or three No. 8 conductors directly to the lower edges of the joists. Smaller cables shall either be run through bored holes in joists or on running boards.

~~(d) In Accessible Attics. The installation of cable in accessible attics or roof spaces shall also comply with Section 333-12.~~

Revise “336-9. Through or Parallel to Framing Members” to “336-17. Through or Parallel to Framing Members.”

Add a new section: “336-23 In Accessible Attics. The installation of cable in accessible attics or roof spaces shall also comply with Section 333-12.”

Revise “336-16. Bends.” to “336-24. Bending Radius.”

Revise “336-18. Supports.” to “336-30. Securing and Supporting.”

Revise 336-20, 336-21 and 336-25 as follows:

336-40. Boxes and Fittings.

~~336-20.~~ (a) Boxes of Insulating Material

Nonmetallic outlet boxes shall be permitted as provided in Section 370-3.

~~336-21.~~ (b) Devices of Insulating Material.

Switch, outlet, and tap devices of insulating material shall be permitted to be used without boxes in exposed cable wiring and for rewiring in existing buildings where the cable is concealed and fished. Openings in such devices shall form a close fit around the outer covering of the cable and the device shall fully enclose the part of the cable from which any part of the covering has been removed.

Where connections to conductors are by binding-screw terminals, there shall be available as many terminals as conductors.

~~336-25.~~ (c) Devices with Integral Enclosures.

Wiring devices with integral enclosures identified for such use shall be permitted as provided in Section 300-15(e).

Revise “336-26. Ampacity.” to “336-80. Ampacity.”

Revise “C. Construction Specifications” to “III. Construction Specifications”

Revise “336-30. General.” to “336-100. Construction.”

Revise “336-31. Marking.” to “336-120. Marking.”

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.

A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc.

The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel Code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #3165)

7- 130 - (336): Reject

SUBMITTER: Tim Andrassy, Steel Tube Inst.

RECOMMENDATION: Revise Article so that Sections 336-1 through 336-5 read as follows:

336-1. Scope. This article covers the use, installation, and construction specifications of nonmetallic sheathed cable.

A. General

336-2. Definition

1. Nonmetallic-sheathed cable is a factory assembly of two or more insulated conductors having an outer sheath of moisture-resistant, flame-retardant, nonmetallic material. Where designated NMC, the cable is also fungus and corrosion resistant. Where designated NMS the cable is a factory assembly of insulated power, communications, and signaling conductors enclosed within a common sheath.

2. Types of Construction are defined as detailed in the Table 503 of the International Building Code 2000. Groups are Assembly (A), Business (B), Educational (E), Factory (F), Hazardous (H), Institutional (I), Mercantile (M), Residential (R), Storage (S), Utility (U) and Misc. (U)

336-3. Other Articles. Installations of nonmetallic-sheathed cable shall comply with the other applicable provisions of this Code, especially Articles 300 and 310.

336-4. Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following:

1.Detached ~~O~~one-and two-family dwellings.

2. Multifamily dwellings not exceeding the height and areas permitted in Types II, III, IV, and V construction. ~~and other structures, except as prohibited in Section 336-5.~~

~~3. Cable trays, where the cables are identified for the use~~

3. Structures incidental to the use of residential occupancies.

4. Structures classified as Business or Mercantile, Educational, or Institutional occupancies in the International Building Code 2000 that are permitted to be Types IV or V construction.

5. As temporary wiring in accordance with Article 305.

6. In other structures not prohibited in Section 336-5 or elsewhere in this Code.

~~FPN: See Section 310-10 for temperature limitation of conductors~~

(a) Type NM. Type NM cable shall be permitted for both exposed and concealed work in normally dry locations. It shall be permissible to install or fish Type NM cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness.

(b) Type NMC. Type NMC cable shall be permitted as follows:

1. For both exposed and concealed work in dry, moist, damp, or corrosive locations

2. In outside and inside walls of masonry block or tile

3. In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1/16-in. (1.59-mm) thick, and covered with plaster, adobe, or similar finish

(c) Type NMS. Type NMS cable shall be permitted for both exposed and concealed work in normally dry locations. It shall be permissible to install or fish Type NMS cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness. Type NMS cable shall be used as permitted in Article 780.

336-5. Uses Not Permitted

(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used in the following:

1. In structures required to be of Type I construction.

2~~1.~~ In any multifamily dwelling except as permitted in Section 336-4(2).

3. In Business, Mercantile, Educational, or Institutional structures except as permitted in Section 336-4(4).

4~~2~~. As service-entrance cable.

5~~3.~~ In commercial garages having hazardous (classified) locations as provided in Section 511-3.

6. In Places of Assembly except as provided in Section 518-4(b).

7~~4.~~ In theaters, motion picture studios, and similar locations, except as provided in Section 520-5(c).~~except as provided in Article 518, Places of Assembly.~~

~~5. In motion picture studios~~

8~~6.~~ In storage battery rooms.

9~~7.~~ In hoistways.

10~~8.~~ Embedded or encased in poured cement, concrete, or aggregate.

11~~9.~~ In any hazardous (classified) location, except as permitted by Sections 501-4(b), Exception, 502-4(b), Exception, and 504-20.

12. In health care facilities except as permitted in Article 517.

13. As open runs in the cavities created by dropped or suspended ceilings in other than detached one and two-family dwellings, or in other structures where the open run is only a single cable.

(b) Types NM and NMS. Types NM and NMS cable shall not be installed in the following:

1. Where exposed to corrosive fumes or vapors.

2. Where embedded or encased in masonry, concrete, adobe, fill, or plaster.

3. In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish.

Note: The Scope through Uses Not Permitted has been submitted for revision as one proposal because the full range of changes in these sections is clearer and better correlated that way. Changes to other sections of Article 336 have been submitted separately. If possible Table 503 of the IBC should be included in the Article. NFPA 220 was considered, but is not as complete and not as widely used.

SUBSTANTIATION: 336-2.1 – Clarifying N/M, NMS, and Nonmetallic-Sheathed Cable makes the Article more user friendly. Where this information appears elsewhere in Article 336, proposals to delete have been submitted.

336-2.2 – Reference to types of construction provides a consistent means for identifying area and height of buildings in which Nonmetallic Sheathed Cable is permitted. The International Building Code was recently adopted as a melding of requirements for the three Model Codes. In the past, there was no way to use building types because of differences in the three codes. Now, even if the IBC has not been adopted in a jurisdiction, the height and area are defined in a specific identifiable Table that should not conflict with NFPA 220. It is becoming ever more important to correlate the NEC with the IBC to discourage amendments to the NEC in that document. The ICC members are counting on Panel 7 to clarify Article 336, and this is an important step.

336-4.2 – The Article 336 Task Group that met this summer agreed to use of N/M cable in multi-family Types III, IV, and V construction. For all practical purposes, the referenced Table 503 would limit the number of stories to four, even in Type II; therefore Type II has been included in 336-4. The height of a building remains a concern relative to safe egress of occupants and potential for construction site damages. The building code deems it necessary to limit the number of stories for fire safety. Where more stories are permitted the Table requires Type I noncombustible structures. These hi-rise structures should not have concealed spaces filled with combustibles.

Existing 336-4.3 has been deleted. Article 318 covers cable tray and requires identification of conductors permitted to be used in cable tray. This support method is redundant in Article 336 and as written could be interpreted to override Article 318.

336-4.3 (new) – Structures incidental to residential use should be permitted. Use of the word "incidental" should preclude the concern expressed by some that a building on the property might be used as a repair garage, for example. This item limits the out buildings to being related to residential use such as parking and storage.

336-4.4 (new) – Type V is combustible construction of limited area and Type IV is heavy timber. Numerous jurisdictions already amend the Code to prohibit N/M in "Commercial" work altogether. This rule will cover use of N/M in "Mom & Pop" and other small businesses, while still providing the level of safety desirable in most commercial work. The terms "business" and "mercantile" are proposed because they are used for Table 503 of the IBC, and "commercial" is not defined. "Educational" and "institutional" are limited due to the need to lower risk in these structures. Accepting this Section would eliminate numerous local amendments to the NEC.

FPN: This FPN is proposed to be deleted as it is redundant. Article 310 is specifically noted in Section 336-3.

336-4.5 (new) – To correlate with Article 305.

336-4.6 (new) – To grant permission for structures not specifically covered as Permitted or Not Permitted.

336-5.a.1 – As stated in Uses Permitted substantiation, buildings required to be noncombustible should not have wall and ceiling concealed spaces filled with combustible open power wiring which contains a built-in source of ignition. Besides smoke detection delay in these spaces, sprinklers are not required in many concealed areas. DuPont has presented testing at the 1999 NFPA Symposium that shows some cables can propagate fire even in under-ventilated spaces with explosion possible. Depending on the quantity of conductors, the fire resistance rating could be compromised in the event of a concealed space fire. Type I buildings are frequently very large/very tall and the potential for construction damage is increased.

336-5.a.2 – Completes 336-4.2.

336-5.a.3 – Completes 336-4.5

336-5.a.4 and 5 – Renumbered only.

336-5.a.6 and 7 – Places of Assembly and motion picture studios have been separated to correlate with the appropriate Articles as contained in the Code. This should have been done in earlier editions.

336-5.a.8 and 9 – Renumbered only.

336-5.a.10 – During the 1999 Code cycle, CMP 8 interpreted "embedded" and "encased" to mean different things. This was not supported by a Code proposal, nor was it correlated with the intent of these terms throughout the Code. This proposed change is to ensure N/M cable is neither partially nor completely in concrete.

336-5.a.11 – Renumbered only.

336-5.a.12 – This reference is needed to assure the limitations in Article 517 are appropriately applied.

336-5.a.13 - Although consensus was not reached on the total report, long discussion by the N/M Task Group resulted in a strong feeling by a number of members that N/M in ceiling cavities should be protected. Grid ceilings are considered exposed locations by the NEC. As such, wiring in the cavities is often subjected to abuse by other trades during construction and maintenance. In steel truss construction the cable can be damaged by slag, joints, and edges. This proposal has been written so as to permit single runs of cable, such as to a light fixture, in order not to be overly restrictive. Such application would automatically be self-limiting and should present little hazard. However, bundles of cable are of concern.

336-5.b.2 – Same as item 10 of 336-5.a.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal expands the use of Type NM cable and also places restrictions on existing uses of Type NM cable without any technical substantiation. Mandatory references to other documents does not comply with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2219)

7- 131 - (336-2): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: The term "flame-retardant" is used throughout the Code as a means of expressing to the user that the material resists ignition or the spread of flames, albeit the test methods are often not defined. The term "flame tested" is similarly undefined, but can be understood to mean a test which does not necessarily measure the ability of a material to resist ignition or flame propagation. Some articles of the NEC offer information regarding the tests deemed appropriate for the required level of resistance to ignition or flame propagation. Others rely on the product standard to provide such information. The panel suggests that specific proposals be made wherever the generic reference to "flame retardant" is not sufficient.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign
COMMENT ON AFFIRMATIVE:
STEWART: The panel statement is correct. Changing the words "flame tested" is an undefined term that would lead to improper testing for the intended application.
TEMBLADOR: See comment on Ravi Gantra's Proposal 6-3.

(Log #1348)

7- 132 - (336-3): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 336-3.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3. Also, Section 4.4.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1423)

7- 133 - (336-3): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 336-3 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1350)

7- 134 - (336-4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise existing 336-4 (336-10 New) to convert text to a list.
~~336-4.~~ 336-10. Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following:
1. One- and two-family dwellings
2. Multifamily dwellings and other structures, except as prohibited in Section 336-5
3. Cable trays, where the cables are identified for the use
FPN: See Section 310-10 for temperature limitation of conductors.
(a) Type NM. Type NM cable shall be permitted:
(1) For both exposed and concealed work in normally dry locations
(2) ~~It shall be permissible to~~ To be installed or fished ~~Type NM cable~~ in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness
(b) Type NMC. Type NMC cable shall be permitted ~~as follows~~:
(1) ~~1.~~ For both exposed and concealed work in dry, moist, damp, or corrosive locations
(2) ~~2.~~ In outside and inside walls of masonry block or tile
(3) ~~3.~~ In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1/16-in. (1.59-mm) thick, and covered with plaster, adobe, or similar finish
(c) Type NMS.
Type NMS cable shall be permitted:
(1) ~~for~~ For both exposed and concealed work in normally dry locations
(2) ~~It shall be permissible to~~ To be installed or fished ~~Type NMS cable~~ in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness
(3) ~~Type NMS cable shall~~ To be used as permitted in Article 780.
SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that where possible lists or tables be used to present requirements, rather than long text descriptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3243)

7- 135 - (336-4 and 336-5): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.
The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM cable use and develop any appropriate comments.
SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council
RECOMMENDATION: Revise text to read as follows:
336-4 Uses Permitted.
(a) Type NM, Type NMC, and Type NMS. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following:
(1) One- and two-family dwellings.

(2) Multifamily dwellings ~~and other structures~~ permitted to be of Types III, IV, and V construction except as prohibited in Section 336-5.

(3) Other structures permitted to be of Types III, IV, and V construction except as prohibited in Section 336-5. Cables shall be concealed within walls, floors, or ceilings that provide a thermal barrier of material that has at least a fifteen-minute finish ratings as identified in listings of fire rated assemblies.

FPN No. 1: Building constructions are defined in NFPA 220, Standard on Types of Building Construction, 1998, or the applicable building code or both.

FPN No. 2: See Appendix F for determination of building types (Table 3-1 from NFPA 220).

(4 ~~3~~) Cable trays, where the cables are identified for the use.

FPN: See Section 310-10 for temperature limitations of conductors.

(b) Type NM. Type NM cable shall be permitted for both exposed and concealed work in normally dry locations except as prohibited in (a)(3) above. It shall be permissible to install or fish Type NM cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness.

(c) Type NMC. Type NMC cable shall be permitted as follows:

1. For both exposed and concealed work in dry, moist, damp, or corrosive locations except as prohibited in (a)(3) above.
2. In outside and inside walls of masonry block or tile.
3. In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1/16-in. (1.59-mm) thick, and covered with plaster, adobe, or similar finish.

(d ~~c~~) Type NMS. Type NMS cable shall be permitted for both exposed and concealed work in normally dry locations except as prohibited in (a)(3) above. It shall be permissible to install or fish Type NMS cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness. Type NMS cable shall be used as permitted in Article 780.

336-5. Uses Not Permitted.

(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used in the following:

~~(1) In any multifamily dwelling or other structure exceeding three floors above grade. For the purpose of this article, the first floor of a building shall be that floor that has 50 percent from one of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.~~

(1) As open runs in dropped or suspended ceilings in other than one- and two-family and multi-family dwellings.

(2) As service-entrance cable.

(3) In commercial garages having hazardous (classified) locations as provided in Section 511-3.

(4) In theaters and similar locations, except as provided in Article 518, Places of Assembly.

(5) In motion picture studios.

(6) In storage battery rooms.

(7) In hoistways.

(8) Embedded in poured cement, concrete, or aggregate.

(9) In any hazardous (classified) locations, except as permitted by Sections 501-4(b), Exception 502-4(b), Exception, and 504-20.

(b) Types NM and NMS. Types NM and NMS cable shall not be installed in the following:

1. Where exposed to corrosive fumes or vapors.
2. Where embedded in masonry, concrete, adobe, fill, or plaster.
3. In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish.

SUBSTANTIATION: This proposal was developed by the Task Group on Nonmetallic-Sheathed Cable based on their review of appropriate uses for Nonmetallic-Sheathed Cable. The task group noted that their evaluation of Nonmetallic-Sheathed Cable was based on the assumption that the cable would be constructed in accordance with criteria contained in UL Standard for Safety 719. The review of current installation requirements and the development of new requirements were also based on this assumption. The task group noted that all major manufacturers of Nonmetallic-Sheathed Cable presently obtain listing for their cables on voluntary basis so that a requirement for Nonmetallic-Sheathed Cable to be listed is necessary to establish uniform cable construction standards and assure that the installation requirements relate directly to the capability of the cables.

NHMC is submitting this proposal to forward the work of the Task Group on Nonmetallic-Sheathed to Panel 7.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal expands the use of Type NM cable by permitting it to be installed in dwelling units and other structures over 3-floors by the reference to use in Types III, IV and V construction. The submitter has not provided technical substantiation for this expanded use. Additionally in 336-4(a)(3) and 336-5(a)(1) of the proposal, restrictions have been placed on existing uses of Type NM cable without any technical substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 2

NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

NICKSON: I do not agree with the panel action to reject based on the panel statement that technical substantiation was not included to support the expanded use. The proposal resulted from the work of the Task Group on Nonmetallic Sheathed Cable and was submitted by MNHC to bring the issue to the table. The task group report was included as substantiation and attached to Proposal 7-137.

TRAINOR: The International Association of Electrical Inspectors endorses the work of the Task Group on Nonmetallic-Sheathed Cable. The proposals prepared by the task group are based on a thorough review of the safety issues related to the use of Nonmetallic-Sheathed Cable. The issues reviewed included:

The possibility of physical damage both during and after installation.

The potential for misuse or abuse.

The lack of flame retardant properties.

The generation of smoke and other toxic products of combustion when subjected to flame.

The proposals prepared by the task group establish installation requirements that provide for the safe use of the product when installed in conformance with the requirements. The task group has noted that misuse or abuse of the product is not a code issue. This product, like all others, is designed for a specific use with the expectation that it will be used in the manner intended. The ongoing reluctance to accept expanded uses of Nonmetallic-Sheathed Cable seems to be based on a concern that misuse and abuse is common now and that expanded use will result in more of the same. Although that is possible, this clearly is an enforcement issue and needs to be dealt with at that level.

Clearly Nonmetallic-Sheathed Cable performs its intended function perfectly well when it is properly installed and maintained. There are millions of homes wired with Nonmetallic-Sheathed Cable. The vast majority of these homes have never had a wiring problem of any kind. Nonmetallic-Sheathed Cable has been used in tens of thousands of apartment buildings and continues to function perfectly year after year. For a supposedly fragile wiring method, Nonmetallic-Sheathed Cable has an admirable safety record.

It is also noted that this task group proposal provides more effective safeguards for the use of Nonmetallic-Sheathed Cable in “other structures”. Multifamily dwellings of three floors or less will typically be of wood frame construction, Type V Non-rated or 1 Hour Rated depending on the size of the structure. It seems apparent that the three floor rule was designed to permit Nonmetallic-Sheathed Cable to be used in wood frame construction because it was considered safe in that application. However, the inclusion of the phrase “and other structures” has been a source of controversy for as long as it has been in the code. This phrase presently permits Nonmetallic-Sheathed Cable to be used in “other structures” of any type of construction so long as they do not exceed three floors. The potential for physical damage is mush greater in this application than in wood frame construction. Also it is much more likely that there will be large quantities of exposed Nonmetallic-Sheathed Cable in such structures which could be exposed to flame. This Panel proposal establishes separate and different requirements for other structures. It will effectively limit Nonmetallic-Sheathed Cable to other structures of wood frame construction. It also requires Nonmetallic-Sheathed Cable to be concealed in walls, floors and ceilings which addresses most of the flame retardant and toxic smoke issues by significantly reducing the possible exposure to flame. It prohibits open runs of

Nonmetallic-Sheathed Cable in dropped or suspended ceilings for these same reasons.

This proposal permits the expanded use of Nonmetallic-Sheathed Cable in applications where it has a history of safe and effective use. It also adds appropriate restrictions on the use of Nonmetallic-Sheathed Cable in other structures to maintain a necessary level of safety. The International Association of Electrical Inspectors recommends that this proposal be accepted.

COMMENT ON AFFIRMATIVE:

SCHUMACHER: I believe that this proposal comes as close to a solution to the NM cable problem as anything so far but it still needs a lot of work. The task group on NM cable was making a lot of progress, but didn't have enough time to complete its work. Type NM cable is a wiring system with a specific purpose, and that purpose needs to be defined in this code.

(Log #3300)

7- 136 - (336-4): Reject

SUBMITTER: Frank Ricketti, Deerfield Beach, FL

RECOMMENDATION: Revise as follows:

336-4. Uses Permitted. Type NM, NMC, and Type NMS cables shall be permitted to be used in the following:

1. One- and two-family dwellings.

~~2. Multifamily dwellings and other structures except as prohibited in Section 336-5.~~

3. Cable trays, where the cables are identified for the use.

FPN: See Section 310-10 for temperature limitations of conductors.

SUBSTANTIATION: I attended the Southern Section IAEI meeting in Ft. Lauderdale. They told a story about how the Dallas Cowboys player (name deleted) lost his home to a fire. They said that the fire started when he drove a nail through NM cable when he was trying to hang a picture. We hear about such incidents because it happened to a celebrity. How many other times does this or other type damage occur to NM that we don't hear about? NM is a fragile wiring method that is suitable for one and two family dwellings only because it would limit any potential problems to isolated dwellings and a limited number of occupants.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided technical substantiation to place the additional restrictions on Type NM cable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #4095)

7- 137 - (336-4 and 336-5): Reject

Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.

The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM cable use and develop any appropriate comments.

SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council

RECOMMENDATION: Revise text to read as follows:

336-4. Uses Permitted.

(a) Type NM, Type NMC and Type NMS. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following:

(1) One and Two Family dwellings.

(2) Multifamily dwellings ~~and other structures~~ permitted to be of Types III, IV, and V construction except as prohibited in Section 336.5.

(3) Other structures permitted to be of Types III, IV, and V construction except as prohibited in Section 336.5. Cables shall be concealed within walls, floors, or ceilings that provide a thermal barrier of material that has at least a fifteen-minute finish rating as identified in listings of fire rated assemblies.

FPN No. 1: Building constructions are defined in NFPA 220, Standard on Types of Building Construction, 1998, or the applicable building code or both.

FPN No. 2: See Appendix F for determination of building types (Table 3-1 from NFPA 220).

(~~3~~ 4) Cable trays, where the cables are identified for the use.

FPN: See Section 310.10 for temperature limitation of conductors.

(b) Type NM. Type NM cable shall be permitted for both exposed and concealed work in normally dry locations except as prohibited in (a)(3) above. It shall be permissible to install or fish Type NM cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness.

(c) Type NMC. Type NMC cable shall be permitted as follows:

1. For both exposed and concealed work in dry, moist, damp, or corrosive locations except as prohibited in (a)(3) above.

2. In outside and inside walls of masonry block or tile.

3. In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1/16-in. (1.59-mm) thick, and covered with plaster, adobe, or similar finish.

(d ~~c~~) Type NMS. Type NMS cable shall be permitted for both exposed and concealed work in normally dry locations except as prohibited in (a)(3) above. It shall be permissible to install or fish Type NMS cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness. Type NMS cable shall be used as permitted in Article 780.

336.5 Uses Not Permitted

(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used in the following:

~~(1) In any multifamily dwelling or other structure exceeding three floors above grade. For the purpose of this article, the first floor of a building shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.~~

(1) As open runs in dropped or suspended ceilings in other than one- and two-family and multifamily dwellings.

(2) As service-entrance cable.

(3) In commercial garages having hazardous (classified) locations as provided in Section 511.3.

(4) In theaters and similar locations, except as provided in Article 518, Places of Assembly.

(5) In motion picture studios.

(6) In storage battery rooms.

(7) In hoistways.

(8) Embedded in poured cement, concrete, or aggregate.

(9) In any hazardous (classified) location, except as permitted by Sections 501.4(b), Exception 502.4(b), Exception, and 504.20.

(b) Types NM and NMS. Types NM and NMS cable shall not be installed in the following:

1. Where exposed to corrosive fumes or vapors.

2. Where embedded in masonry, concrete, adobe, fill, or plaster.

3. In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish.

SUBSTANTIATION: This proposal was developed by the Task Group on Nonmetallic-Sheathed Cable based on their review of appropriate uses for Nonmetallic-Sheathed Cable. The task group noted that their evaluation of Nonmetallic-Sheathed Cable was based on the assumption that the cable would be constructed in accordance with the criteria contained in UL Standard for Safety 719. The review of current installation requirements and the development of new requirements were also based on this assumption. The task group notes that all major manufacturers of Nonmetallic-Sheathed Cable presently obtain listing for their cables on voluntary basis so that a requirement for Nonmetallic-Sheathed Cable to be listed is necessary to establish uniform cable construction standards and assure that the installation requirements relate directly to the capability of the cables.

NMHC is submitting this proposal to forward the work of the Task Group on Nonmetallic Sheathing to Panel 7.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: There is concern that the requirements of the use of Type NM cable will now be dependent upon the use of building codes for proper interpretation of types of construction.

The substantiation provided with this proposal does not provide a comparison with the wiring methods that are currently used in the applications for which the expanded use of Type NM cable is being proposed.

The Task Group report, which is the substantiation for the proposal, noted that there are potential hazards involving the use of Type NM cable that have not been adequately reviewed. These include:

1. The compatibility of NM cable with modern building code requirements and construction methods and materials other than wood frame construction.

2. The NFPA Research Foundation's study of Incapacitation and the possible contribution of PVC to this issue.

3. The potential contribution to Electromagnetic Interference which is of particular concern in commercial and industrial applications.

The task group report also states "Of ongoing concern is the behavior of Nonmetallic-Sheathed Cable under fault or overload conditions. The task group disagrees on the extent to which nonmetallic sheathed cable becomes an ignition source under these conditions. Any expanded use of Nonmetallic -sheathed Cable would need to address this issue effectively."

It should be noted that the Task Group Report did not receive consensus support from the members of the Task Group.

The proposed 336-4(a)(3) second sentence and 336-5(a)(1) impose additional restrictions on the use of Type NM cable without sufficient technical substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 2

NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

NICKSON: The panel action to reject is based on statements taken out of context from the Task Group Report on Nonmetallic Sheathed Cable which are not related to the issue of expanded use of nonmetallic sheathed cable in residential structures.

TRAINOR: See my Explanation of Negative on Proposal 7-135. The International Association of Electrical Inspectors recommends that this proposal be accepted.

COMMENT ON AFFIRMATIVE:

SCHUMACHER: I believe that this proposal comes as close to a solution to the NM cable problem as anything so far but it still needs a lot of work. The task group on NM cable was making a lot of progress, but didn't have enough time to complete its work. Type NM cable is a wiring system with a specific purpose, and that purpose needs to be defined in this code.

(Log #4347)

7- 138 - (336-4 and 336-5): Reject

Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.

The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM cable use and develop any appropriate comments.

SUBMITTER: Lawrence Brown, Nat'l Assn. of Home Builders

RECOMMENDATION: Revise text to read as follows:

336.4. Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used ~~in the following:~~ except as prohibited in Section 336.5, and in cable trays, where the cables are identified for the use.

(1) One- and two-family dwellings

~~(2) Multifamily dwellings and other structures, except as prohibited in Section 336-5.~~

~~(3) Cable trays, where the cables are identified for the use~~

(a) No changes to subsection (a)

(b) No changes to subsection (b)

(c) No changes to subsection (c)

* Move FPN to after (c)

FPN: See Section 310.10 for temperature limitations of conductors.

336.6. Uses Not Permitted.

(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used in the following:

~~(1) In any multifamily dwelling or other structure exceeding three floors above grade.~~

~~For the purpose of this article, the first floor of a building shall that floor that has 50 percent or more of the exterior wall surface area with or above finish grade. One additional level that is the first floor and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.~~

Renumber existing subparagraphs.

(1) As service-entrance cable

(2) In commercial garages having hazardous (classified) locations as provided in Section 551.3

(3) In theaters and similar locations, except as provided in Article 518, Places of Assembly

(4) In motion picture studios

(5) In storage battery rooms

(6) In hoistways

(7) Embedded in poured cement, concrete, or aggregate

(8) In any hazardous (classified) location, except as permitted by Section 501.4(b), Exception, 502.4(b), Exception, and 504.20.

SUBSTANTIATION: There is no basis or supporting data to limit the Installation of Nonmetallic Sheathed Cable in relationship to the height of a building. With the continuing development of code requirements in all model building codes, the restriction to a height of three floors above grade is no longer necessary. Firestopping is required at all floor/ceiling levels, ceiling/roof levels, and at the top and bottom in concealed horizontal and vertical spaces such as those in stud spaces. This prevents the spread of fire from one floor or fire area to another. The allowable height and area of a building directly relates to the "Type of Construction" and required fire protection mandated by the building codes. Buildings four stories and more above ground level are required to be of noncombustible construction. Buildings with a height of 75 feet or more above fire department access are required to be protected throughout by a fire sprinkler system. In other words, the restriction of Installing Nonmetallic Sheathed Cable in a building in relationship to its height are unfounded. The State of Michigan has exempted this restriction for over 30-years. No data exists for that state that shows a fire or life-safety hazard. It is time to recognize the realities of the built environment and delete this restriction.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal introduces additional restrictions on Type NM cable without sufficient technical substantiation.

See panel action and statement on Proposal 7-137.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

ABSTENTION: 1

NOT RETURNED: 1 Ensign

EXPLANATION OF ABSTENTION:

NICKSON: The panel statement for rejection based on more restrictive provisions does not identify the provisions they feel are more restrictive and give the proponent sufficient information as to why the technical data is not sufficient.

(Log #4373)

7- 139 - (336-4, 336-5): Reject

Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.

The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM cable use and develop any appropriate comments.

SUBMITTER: Joseph A. Hertel, Safety and Buildings Div., State of Wisconsin

RECOMMENDATION: Revise text to read as follows:

336.4. Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following:

(1) One-and two-family dwellings

~~(2) Multifamily dwellings and other structures, except as prohibited in Section 336-5.~~ In any building exceeding three floors above grade, nonmetallic-sheathed cable shall be concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. The 15-minute finish rated thermal barrier shall be permitted to be used for combustible walls, floors, and ceilings.

336.5. Uses Not Permitted.

~~(1) In any multifamily dwelling or other structure exceeding three floors above grade.~~

SUBSTANTIATION: Currently Section 331-3, of the NEC uses this language to recognize the use of Electrical Nonmetallic Tubing in a building of any height. The same rule should apply to nonmetallic-sheathed cables used in a building of any height. To my knowledge there has been no documentation of problems with the use of ENT in these buildings. There is no significant difference in the amount of combustible material in a nonmetallic-sheathed cable or nonmetallic raceway system and therefore no reason to restrict the use of NM cables to buildings of less than three floors.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation provided with this proposal does not provide a comparision with the wiring methods that are currently used in the applications for which the expanded use of Type NM cable is being proposed.
See panel action and statement on Proposal 7-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
NICKSON: The panel references back to the rejection of Proposal 7-137 as justification is insufficient in that the rejection for 7-137 was based on statements taken out of context from the Task Group Report on Nonmetallic Sheathed Cable. The panel has also not provided the proponent with proper guidance as to why the technical data supplied does not provide the comparison of wiring methods and what testing is needed to provide the information the panel needs to act on the proposal.

(Log #25)

7- 140 - (336-4(a),(b)): Reject
NOTE: The following proposal consists of Comment 7-143 on Proposal 7-74 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 7-74 was:
Revise Section 336-4 to read as follows:
336-4. Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in one- and two-family dwellings, multifamily dwellings, and other associated structures, except as prohibited in Section 336-5. Where installed in cable trays, cables shall be identified for this use.
Each branch-circuit shall serve only one living unit, shall not extend beyond that living unit, and shall originate in a panel located on or within that living unit. Such panel shall serve only that living unit.
(FPN): See Section 310-10 for temperature limitation of conductors.
(a) Type NM. Type NM cable shall be permitted for both exposed and concealed work in normally dry locations. It shall be permissible to install or fish Type NM cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness.
(b) Type NMC. Type NMC cable shall be permitted:
(1) For both exposed and concealed work in dry, moist, damp, or corrosive locations.
(2) In outside and inside walls of masonry block or tile.
(3) In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1/16-in. (1.59-mm) thick, and covered with plaster, adobe, or similar finish.
(c) Type NMS. Type NMS cable shall be permitted for both exposed and concealed work in normally dry locations. It shall be permissible to install or fish Type NMS cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness. Type NMS cable shall be used as permitted in Article 780.
SUBMITTER: David F. Scarelli, Fairport, NY
RECOMMENDATION: Add new text to read:
336(a) 1, NMS 2, NMSC 3, NMSS
336(b) Conductors:
Insert: Line type Fire Protective Signaling Switch
(FPN): 780-6 (a) Hybrid Cable.
SUBSTANTIATION: John Hall Jr.'s (NFPA Fire Analysis Research Division), "Selections from the U.S. Fire Problem Overview Report through 1992 Leading Causes and Other Patterns and Trends-Homes, Hotels and Motor Homes," states "Annual Property losses at $8.4 Billion, Lives 8,554. There are 996,000 Fires with 41,170 Injuries." Electrical distribution systems are responsible for approximately 10 percent of this loss.
Our communication of this concern with electricians, building maintenance people, the Rochester Fire Marshall's Office and the Rochester Building Code Enforcement Offices disclose that the major cause of NM-Cable destruction is damage at installation (cuts, nails, screws, staples driven in too far, etc.) and occupant circuit breaker abuse. Manufacturers specify the testing of ground fault detectors at least once a month to keep them from fusing together.
A nail driven through an NM-cable causes a milli-amp current to cross-flow around the nail to the return line. Energy is converted by the nail from electrical to thermal. A hot spot is created within the jacket and remains undetected until it burns its way through and ignites the distilled gasses which travels through the wall cavity.
The proposed NMS-cable was tested at the ITEK Laboratories, and witnessed by David F. Scarelli (submitter).
1. The NMS-cable conductors were raised to 90°C and the 150°C and held for 1 hour at each interval respectively. Hi-peak and temporary-overload conditions were thus assimilated. The signal portion of the NMS-cable was not activated. The NMS-cable was returned to its normal cycle with no ill-effects.
2. A roofing nail was driven through the NMS-cable and the voltage raised. When a milli-amp current flow measured, internal glowing occurred with light smoke and corona filling the air. The jacket contained its integrity when the alarm sounded. The power was disconnected. A circuit breaker could not detect this fault since the current flow as below its rating. A fire would have been created.
3. The NMS-cable was then wired through an electrical box and shorted. The voltage was raised, the box began to destruct, and the wire insulations began to melt along with the PVC jacket. The plastics were self-extinguishing and dripped off the conductors to the floor. The power was disconnected. A functional circuit breaker would have opened the circuit, but since there would not have been an alarm with an NM-cable the occupant would have just re-set the circuit breaker. If the occupant did not realize there was an electrical short become irritated and forced the circuit to remain permanently closed. The plastics would then drip off the conductors which would then short out at the staples, ties wall stud and floor joist passage holes igniting the structure all the way back to the power panel. The NMC-cable's alarm system alarmed the occupants and shut down the power. Existing fire protection devices detect fires after they start, not before.
When a fire originates in the other areas specified in the NFPA Report secondary fires are not considered. Electrical boxes in the wall and ceilings are consumed by fire before the 15 minute rated drywall is. The insulations are there-by melted leaving shorted conductors. If the circuit breaker is fused or bashed a secondary fire, through the branch circuit power panel is stopped by the main switch located in the cellar.
The above scenario dictated that the electrical distribution could be credited with an additional 10 to 20 percent of the life and property losses.
The NM-cable is a fine product. It is very low in cost until it meets the distribution houses. The houses squeeze the wire and cable Industry until it cannot afford to raise its costs 1/10 of 1 cent per foot.
The NMS-cable would raise the market price of a house less than .1 percent of its construction cost. It would save the repair and rebuilding due to fire damage up to 100 percent every time that horn sounds. The occupants would be very grateful for the early warning from a safe product.
The NMS-cable would automatically put a fire detector into every electrical box in the Building.
NOTE: The wire and cable industry is well aware of the NMS-cable. They have admitted its MERIT but fear market loss due to the slight cost increase over the current NM-cable. They have attained their market positions by increasing their efficiencies and cutting their profit margins from the copper mines to the shipping dock. If they want to survive, they may have to follow the now ever present American Motto: "Make it Fast-Make it Cheap" syndrome and the next NFPA Report will be a shameful one.
Conclusion: The NM-cable must be modified to contain an integral fire warning system to make it as safe as it can be.
The NMS-cable must be a regulated product before the wire and cable industry will manufacture it. If it is totally rejected, how will we account for the 8,500 of our men, women, and children who will perish to fire each and every year.
Who knows who these people will be?
We wish to bring to the Committees' attention "Regulations Governing Committee Projects" Section 4-2 Evaluation of Emergency Nature paragraphs (c), (d), and (e).
NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is not clear on the submitter's intent. The proposal does not provide sufficient information for the panel to incorporate new text.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
NICKSON: The panel statement that the intent of the proposal is not clear is insufficient in that the proposal is quite clear in its intent. Additionally, the panel does not give the proponent sufficient guidance on what is not sufficient in the justification.

(Log #1449)

7- 141 - (336-4(a)): Accept
Note: The Technical Correlating Committee understands the action on the Proposal deletes the text "...where such walls...dampness" in 336-10(a)(2) of Proposal 7-128a.
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Delete the last 13 words so that it will read as follows:
(a) Type NM. Type NM cable shall be permitted for both exposed and concealed work in normally dry locations. It shall be permissible to install or fish type NM cable in air voids in masonry block or tile walls.
SUBSTANTIATION: The purpose of this change is to put wording in the positive instead of negative. I have submitted another proposal to put the deleted words into 336-5(b)(4) (Uses Not Permitted) where it should be. The words that I have deleted are as follows: "where such walls are not exposed or subject to excessive moisture or dampness". This part of the sentence should be moved to 336-5(b)(4) (New). I have also submitted another proposal similar to this one for 336-4(c) (Uses permitted for Type NMS). Both of these should be deleted and combined into one new one as I have proposed in 336-5(b)(4)(New) under uses NOT permitted.
PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #473)

7- 142 - (336-4(b)(3)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 336-4(b)(3) - revise as follows:
"(3) In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1.59 mm (1/16 in.) ~~1/16 in. (1.59 mm)~~ thick, and covered with plaster, adobe, or similar finish"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The thickness of the steel plate is not rounded since the dimension shown is standard industry practice.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1450)

7- 143 - (336-4(c)): Accept
Note: The Technical Correlating Committee understands the action on the Proposal deletes the text "...where such walls...dampness" in 336-10(c)(2) of Proposal 7-128a.
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Delete the negative words so that it will read as follows:
(c) Type NMS. Type NMS cable shall be permitted for both exposed and concealed work in normally dry locations. It shall be permissible to install or fish type NMS cable in air voids in masonry block or tile walls. Type NMS cable shall be used as permitted in Article 780.
SUBSTANTIATION: The purpose of this change is to put wording in the positive instead of negative. I have submitted another proposal to put the deleted words into 336-5(b)(4) (Uses Not Permitted) where it should be. The words that I have deleted are as follows: "where such walls are not exposed or subject to excessive moisture or dampness". This part of the sentence should be moved to 336-5(b)(4)(New). I have also submitted another proposal similar to this one for 336-4(a) (Uses permitted for Type NM). Both of these should be deleted and combined into one new one as I have proposed in 336-5(b)(4)(New) under uses NOT permitted.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1351)

7- 144 - (336-5): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 336-5 (336-12 New) to read as follows:
336-5. Uses Not Permitted.
(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used ~~in the following~~:
(1) In a multifamily dwelling or structure exceeding three floors above grade.
For the purpose of this article, the first floor of a building shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.
(2) As service-entrance cable
(3) In commercial garages having hazardous (classified) locations as defined ~~provided~~ in ~~Section~~ 511-3
(4) In theaters and similar locations, except where permitted in 518-4 ~~as provided in Article 518, Places of Assembly~~
(5) In motion picture studios
(6) In storage battery rooms
(7) In hoistways, or on elevators or escalators
(8) Embedded in poured cement, concrete, or aggregate
(9) In ~~any~~ hazardous (classified) locations, except where ~~as~~ permitted in ~~by Sections~~
(a) 501-4(b), Exception ~~,~~
(b) 502-4(b), Exception No.1~~, and~~
(c) 504-20
(b) Types NM and NMS. Types NM and NMS cable shall not be used ~~installed~~:
(1) Where exposed to corrosive fumes or vapors
(2) Where embedded in masonry, concrete, adobe, fill, or plaster
(3) In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish.
SUBSTANTIATION: "As provided" was replaced with "where permitted" to aid in word clarity in accordance with NEC Style Manual Section 3.3.4.
NEC Style Manual Section 4.1.1 prohibits referencing an entire Article unless additional conditions are specified. Referencing parts within Articles is permitted.
(7) was revised to provide consistent text in all the wire and cable articles.
(9)(b) was revised to show the specific reference in 502-4(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3247)

7- 145 - (336-5): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.
The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM Cable use and develop any appropriate comments.
SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council
RECOMMENDATION: Revise text to read as follows:
336-5. Uses Not Permitted.

(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used in the following:

(1) In any multifamily dwelling or other structure exceeding three floors above grade.

Exception: Type NM, NMC, and NMS, cables shall be permitted in buildings with multifamily dwellings exceeding three floors above grade when the cable is concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-min finish rating as identified in listings of fire rated assemblies. When installed above suspended ceilings, the suspended ceiling shall provide a thermal barrier of material that has at least a 15-min finish rating as identified in listings of fire-rated assemblies.

SUBSTANTIATION: Intent: Approval of this proposal would allow the use of nonmetallic sheathed electrical cable in R-2 occupancies (apartments) exceeding three stories in height.

Substantiation: 1. Nonmetallic-sheathed cable has a long and successful safety record: Nonmetallic-sheathed cabled has been in use since 1928 (70+ years), in communities throughout the country in single family, multifamily, and commercial applications (many being higher than three-stories). If the product were truly unsafe it would be obvious. In these 70+ years no one has ever presented any evidence showing that nonmetallic-sheathed cable is unsuitable for any residential application. Objections to the removal of the three-story limitation have been based only on hypothetical concerns and dated research. No evidence has been presented to demonstrate that there are any "real-world" problems. In contrast, this proposal is fully substantiated based on statistical evidence and quantitative analysis.

2. The three-story limit on the use of NM cable cannot be substantiated based on fire- or fire-safety: The NEC has only limited Type NM cable to buildings not exceeding three-stories since the 1974 edition, and even when the limit was adopted, there was not real evidence of problems with the product.

Some jurisdictions, particularly the State of Michigan and the Commonwealth of Massachusetts, rejected the NEC three-story limit, and thereby, they have never restricted the use of nonmetallic-sheathed cable base on building height. Consequently, nonmetallic-sheathed cable is already in widespread use in buildings exceeding three stories in height, and there have been no reported fire- or life-safety problems reported.

Fire loss data: Fire loss data from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) for the period 1993 to 1997 indicates that approximately 1.5 percent of all apartment fires are caused by electrical wiring. This figure includes all wiring methods, not just nonmetallic-sheathed cable. Based on this, it is fairly evident that electrical wiring of any kind is not a big factor affecting overall fire safety in R-2 occupancies regardless of the wiring method used. The possibility of electrical wiring in apartments being a contributing factor in fire has virtually been eliminated in the 1999 NEC by the inclusion in Section 210-2 requirements for arc-fault circuit interrupter(s) in all branch circuits serving dwelling unit bedrooms.

It is also worth noting that the percentage of wiring fires in commercial occupancies, such as assembly and office uses, tends to be more than double that of R-2 uses, even though one would expect these other occupancies to make greater use of supposedly superiors wiring methods such as armored cable and wiring in conduit.

Fire spread through rated assemblies is not a problem: Fire tests sponsored by the U.S. Department of Housing and Urban Development (HUD) concluded that there is "no significant difference" in the fire performance of nonmetallic sheathed versus armored cable with respect to fire spread through rated assemblies. Consequently, arguments proposing that nonmetallic-sheathed cable might increase the chance of fire spread from unit to unit through fire-rated walls are unfounded.

Nonmetallic-sheathed cable does not present an ignition source problem: It has been well documented in recent years that nonmetallic-sheathed cable does not present an ignition source problem. NFPA 921, Guide for Fire and Explosion Investigation, makes it clear that electrical conductors, including nonmetallic-sheathed cable, are not common sources of ignition. Fire data supports this conclusion. See NFPA 921-98, Sections 14-11.4, 14-11.5, A-14.11.4, and Appendix B on referenced publications.

There is no unique fire hazard associated with nonmetallic-sheathed cable versus other acceptable wiring methods: Fire research conducted by the University of Maryland Department of Fire Protection Engineering indicated that there is no particular fire hazard associated with nonmetallic-sheathed cable versus wiring that is installed in electrical nonmetallic tubing (ENT). The research report concluded:

"1) Type NM cable will not decrease the level of life safety within a building of any height when located in ceiling and wall spaces separated from the interior of the building by a 15 minute finish rating (i.e., 1/2 in. thick gypsum wall board), and on this basis should not arbitrarily be limited to three stories in height," and

"2) In terms of building firesafety, these results indicate that Type NM cable, like ENT (which is not limited to three stories by the National Electrical Code), will not contribute to the hazard of fire when the cable is separated from the interior of the building by a 15-minute finish rating."

Consideration that wiring methods employing ENT are not restricted in a building with respect to building height, there is no basis for restricting the use of nonmetallic-sheathed cable since the fire performance of these two products is not substantially different in terms of overall impact on building fire safety.

3. The three-story limit on the use of NM cable cannot be substantiated based on toxicity: All wiring methods except Type MI cable produce toxic products of combustion when exposed to flame. Toxicity research funded by NEMA for New York State indicated that there is no statistically significant difference between the nonmetallic-material used in all wiring methods. Except for the addition of a nonmetallic jacket, the insulated conductors used in NM cable are identical to those used in other wiring methods. In fact, insulated conductors with more nonmetallic material are frequently used in other cable and wiring methods.

Considering that other wiring methods using nonmetallic insulation are not restricted in a building with respect to building height, there is no basis for restricting the use of nonmetallic-sheathed cable since the toxicity performance of these two products is not substantially different in terms of overall impact on building fire safety.

It is also important to note that all buildings affected by removal of the three-story limit on nonmetallic-sheathed cable in R-2 uses will be required by the IBC to be sprinklered throughout. Thereby, fires in occupied spaces will typically be controlled before involving concealed spaces, where wiring will be located, and fires originating in concealed spaces are statistically infrequent.

Conclusion. It is apparent that there is no safety benefit to be gained by limiting the use of nonmetallic-sheathed cable to buildings that are three-stories or less in height. In addition the objections to the expanded use of nonmetallic-sheathed cable have never been supported by any technical justification. The reported problems are based only on hypothetical concerns without any supporting data or research.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel rejects the proposal based on the following responses to the submitter's documentation:

Attachment #1-The Task Group report, which is the substantiation for the proposal, noted that there are potential hazards involving the use of Type NM cable that have not been adequately reviewed. These include:

1. The compatibility of NM cable with modern building code requirements and construction methods and materials other than wood frame construction.

2. The NFPA Research Foundation's study of Incapacitation and the possible contribution of PVC to this issue.

3. The potential contribution to Electromagnetic Interference which is of particular concern in commercial and industrial applications.

The task group report also states "Of ongoing concern is the behavior of Nonmetallic-Sheathed Cable under fault or overload conditions. The task group disagrees on the extent to which nonmetallic-sheathed cable becomes an ignition source under these conditions. Any expanded use of Nonmetallic -sheathed Cable would need to address this issue effectively."

It should be noted that the Task Group Report did not receive consensus support from the members of the Task Group.

Attachment #2-In attachment 2 there are two parts, the first part is a letter with corresponding data covering various types of conduits (Schedule 40, Schedule 80, and Electrical Nonmetallic Tubing). This is not relevant to the use of Type NM cable.

The second item provides toxicity results of PVC without interpreting the data relative to the safety or dangers of the test results.

Attachment #3-A primary stated purpose of the tests was to determine the effect on the fire endurance of a one-hour fire-rated wall due to the installation of NM or AC cable." The fire-rating was reduced in both instances. Various "suppositions" are offered as to the reasons. The report notes in paragraph 4 of the Introduction that the UL test is "a type of ease of ignition test." "It cannot be used for evaluating the effect of electrical wires on the fire resistance of a fire barrier."

Attachment #4-This documentation is addressing two subjects. The first is the likelihood of a staple igniting the insulation on the conductor or the wood to which it was stapled. Table A from Statistical Report on Fire Losses Attributed to Electrical Wiring in Apartments and Other Structures" prepared by Jeffrey M. Shapiro P.E., International Code Consultants was submitted. This table indicates that there were an average of 1759 fixed wiring structure fires in high rise and low rise apartments and in buildings other than homes reported by US fire departments that caused an average of nine civilian deaths from 1993-1997. This data only supports what was contained in the task group's report concerning the other potential hazards involved in the expanded use of Type NM cable. The second part of Attachment 4 basically discusses different types of fire stops which does not provide substantiation for the proposal.

Attachment #5-The test submitted does not provide conclusive data as there are not firm test conditions. The cone calorimeter is not an accepted method of fire testing electrical wire and cable. Wire and cable is tested for flame propagation and, in some cases, for smoke release using actual flame tests on wire and cable products. The cone calorimeter measures heat release, not flame propagation.

Present restrictions for the use of Type NM Cable attest to the fact that it is a safe product provided it is used in accordance with the NEC. Evidence is required by a committee of NFPA responsible for a particular standard or any portion thereof to make a change in the existing requirements. It is not the responsibility of the responsible technical committee to substantiate the existing requirements. Submitter is required to provide the necessary and sufficient technical substantiation for a proposed change.

The Panel does not have any knowledge as to the substantiation used by the Commonwealth of Massachusetts and the State of Michigan in amending the three floor restriction since it first appeared in the NEC.

Fire loss data does not differentiate the specific wiring methods used for Fixed Wiring.

Fire spread of individual products is not compared using test methods applicable to wire and cable products.

Fire Hazard Analysis comparison of Type NM Cable versus wiring in ENT does not compare all other differences in the two wiring methods.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 3

NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

NICKSON: Among other things, a portion of the panel action to reject is based on statements taken out of context from the Task Group Report on Nonmetallic Sheathed Cable which are not related to the issue of expanded use of nonmetallic sheathed cable in residential structures.

NUTT: The three-story limit on the use of NM cable cannot be substantiated based on fire-or fire-safety:

The NEC has only limited Type NM cable to buildings not exceeding three-stories since the 1974 edition, and even when the limit was adopted, there was not real evidence of problems with the product. Some jurisdictions, particularly the State of Michigan and the Commonwealth of Massachusetts, rejected the NEC three-story limit, and thereby, they do not restrict the use of nonmetallic-sheathed cable based on building height. Consequently, nonmetallic-sheathed cable is already in widespread use in buildings exceeding three stories in height, and there have been no fire safety problems reported.

Fire loss data from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) for the period 1993 to 1997 indicates that approximately 1.5 percent of all apartment fires are caused by electrical wiring. This figure includes all wiring methods, not just nonmetallic-sheathed cable. Based on this, it is fairly evident that electrical wiring of any kind is not a big factor affecting overall fire safety in R-2 occupancies regardless of the wiring method used.

The positive experience of the two states mentioned and the lack of data supporting the restricted use of NM, NMC and NMS compels the elimination of the restriction on NM, NMC, and NM cables.

PROPST: I do not agree with the panel's action to reject this proposal and I do not agree that the panel's substantiation provides adequate justification for the action. I believe that the presentation to the panel along with the two statistical reports provided by Mr. Jeffrey Shapiro ("Statistical Report on Fire Losses Attributed to Electrical Wiring in Apartments and Other Structures" dated January 20, 2000 by Jeff Shapiro, and "Statistical Report Structure Fires in High-Rise and Low-Rise Apartments and in Buildings Other Than Homes, by Equipment Involved" dated January 2000, by Jeff Shapiro) provides more than adequate evidence that a safety problem does not currently exist and that the existing code wording to restrict the use of NM cable is an attempt to address a perceived problem that falls well below accepted levels of risk. I recommend that the panel "accept in principle" Proposal 7-145 with the following modifications presented by Mr. Shapiro during the code panel discussions:

Section 336-5. Uses Not Permitted.

(a) Types NM, NMC and NMS. Types NM, NMC, and NMS cables shall not be used in the following:

(1) In any multifamily dwelling or other structure exceeding three floors above grade.

Exception: Type NM, NMC, and NMS cables shall be permitted in buildings with multifamily dwellings exceeding three floors above grade when in compliance with all of the following:

1. Cables are located in concealed spaces separated from occupiable building areas by materials providing a thermal barrier with a finish rating of not less than 15 minutes, and
2. Cables are located in portions of the building used for residential purposes and do not extend between floors, except within a single dwelling unit.

COMMENT ON AFFIRMATIVE:

FAHRENTHOLD: Code panels, as representatives of NFPA in editing the NEC, must always remember that the purpose of this code is "the practical safeguarding of persons and property from hazards arising from the use of electricity." Safety must remain our goal. The submitter for this proposal states that "nonmetallic sheath cable has a long and successful safety record." He provided us with statistical data from the U.S. Fire Administration's National Fire Incident Reporting System for the periods 1993-1997. This data indicates that there were an average of 1,759 fires attriuted to "fixed wiring" in apartment buildings during that period. The data also states that these fires caused an average of 9 civilian deaths and 74 civilian injuries. The submitter implies that this is an acceptable amount of fires, deaths and injuries. I submit that one (1) fire, one (1) death, or one (1) injury is not acceptable. Our goal should be zero in all three categories. The use of nonmetallic sheath cable should be limited to wood frame structures and any wood frame structure over three floors using nonmetallic sheath cable should have a sprinkler system not only in the exit corridors and stairwells, but also full coverage in the dwelling area. Nonmetallic sheath cable should not be used with metal stud construction in buildings of any height. A wiring system that cannot withstand the extra pinch from a staple driven too far into a wooden stud should not be used with metal stud construction.

SCHUMACHER: Part of the submitter's substantiation is fire loss data indicating that approximately 1.5 percent of all apartment fires are caused by the wiring. This figure includes all wiring methods. What would this figure be if NM cable were allowed in all apartment buildings with no restrictions? While there is no way to answer this question, I think that we need to keep in mind Section 90-1(a) of this code.

(Log #4445)

7- 146 - (336-5): Reject

SUBMITTER: Frants Marvin Jensen, Consolidated Engr Labs

RECOMMENDATION: Delete: "~~in any multifamily dwelling or other structure exceeding 3 floors above grade.~~"

Add: "336.4 (1) of wood frame construction.

SUBSTANTIATION: There is no reason not to allow NM in any with recent reaction. As you know, you can build four floors and a penthouse with wood frame.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided any technical substantiation to support changes to uses permitted or uses not permitted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4320)

7- 147 - (336-5(a)): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.
The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM Cable use and develop any appropriate comments.
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./EL&P Group
RECOMMENDATION: Delete Section 336-5(a)(1). Renumber (2) through (9) as (1) through (8).
Section 336-5(a) will now read as follows:
336.5. Uses Not Permitted.
(a) Types NM, NMC, and NMS. Types NM, NMC, and NMS shall not be used in the following:
~~(1) In any multifamily dwelling or other structure exceeding three floors above grade.~~
~~For the purpose of this article, the first floor of a building shall be the first floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted.~~
~~(2)~~ (1) As service-entrance cable
~~(3)~~ (2) In commercial garages...Section 511.3.
~~(4-9)~~ to (3-8).
SUBSTANTIATION: This proposal goes a step beyond Proposal 7-77, which EEI submitted for the 1999 NEC. In their published actions and statements in the 1999 ROP, CMP 7 chose not to address the specific issues of Proposal 7-77, but simply reference their action on other proposals. Proposal 7-77 was similar to the Massachusetts Electrical Code where there is no three floor use restriction for Types NM, NMC, and NMS cables. Massachusetts does require that Types NM, NMC, and NMS cables not be permitted to extend vertically into another floor of the building.
This EEI 2002 NEC proposal is more in line with the electrical code in the State of Michigan, which has no height restrictions on the use of Types NM, NMC, and NMS cables. Michigan and Massachusetts have continually amended out the three floor restriction since it fist appeared in the 1975 NEC. This EEI proposal, if accepted, will remove all "number of building floors" or similar types of height restrictions on Types NM, NMC, and NMS cables. It does not affect other "uses permitted" or "uses not permitted."
EEI has closely monitored the considerable activity that has occurred on this topic following the 1998 annual meeting in Cincinnati. This includes the various appeals to the Standards Council by the NMHC, the work of the TCC-CMP 7 Task Group, and the floor action on the ICC Building Codes in St. Louis. After reviewing all that has been said and done. EEI is more convinced than ever that three floor restriction on Types NM, NMC, and NMS cables is totally unjustified, has absolutely no basis on "safety", and represent a major additional expense to the customer. It appears to EEI that this is strictly a business issue and that the NEC, the most widely adopted safety standard in the world, is being used to enhance some Corporate "bottom lines", more than it enhances public safety.
The TCC sent all CMP 7 members all materials and technical reports present to (but not always discussed) by the CMP 7 Task Group assigned to address the Type NM, NMS, and NMC controversy. We hope that the members of CMP 7 seriously consider all of the documented technical reports and test data submitted by the NMHC and others, supporting the removal of the three floor restriction. These technical reports (submitted to the CMP 7 Task Group and included in materials sent to all CMP 7 members at the direction of the TCC), coupled with the 20 plus years of virtually trouble free nonheight restricted use of Types NM, NMC, and NMS cables in the states of Michigan and Massachusetts, is documented proof that height limitations for using Types NM, NMC, and NMS cables in any building or structure cannot be justified and must be removed.
The members of EEI ask the members of CMP 7 to please act on and respond directly to the issues presented in this proposal rather than once again referring us to some other CMP 7 action on what we (EEI) may perceive to be a totally unrelated proposal. EEI hopes that CMP 7 will finally remove this long standing, unfair, unjustified rule and permit Types NM, NMC, and NMS cables to be used as are any of the other approved wiring methods.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not have any knowledge as to the substantiation used by the Commonwealth of Massachusetts and the State of Michigan in amending the three floor restriction since it first appeared in the NEC. The panel refers the submitter to the panel's action and statement on Proposal 7-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
NICKSON: The panel statement for rejection is a misrepresentation of the facts. The Commonwealth of Massachusetts and the State of Michigan never included the three floor restrictions in their codes in the first place. They had not and still have not experienced any problems with nonmetallic wiring and the NEC did not provide a justification for the restriction when it was added to the code in the first place.
The rejection of Proposal 7-137 is based on statements taken out of context from the Task Group Report on Nonmetallic Sheathed Cable which are not related to the issue of expanded use of nonmetallic sheathed cable in residential structures.
NUTT: The three-story limit on the use of NM cable cannot be substantiated based on fire-or fire-safety:
The NEC has only limited Type NM cable to buildings not exceeding three-stories since the 1974 edition, and even when the limit was adopted, there was not real evidence of problems with the product. Some jurisdictions, particularly the State of Michigan and the Commonwealth of Massachusetts, rejected the NEC three-story limit, and thereby, they do not restrict the use of nonmetallic-sheathed cable based on building height. Consequently, nonmetallic-sheathed cable is already in widespread use in buildings exceeding three stories in height, and there have been no fire safety problems reported.
Fire loss data from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) for the period 1993 to 1997 indicates that approximately 1.5 percent of all apartment fires are caused by electrical wiring. This figure includes all wiring methods, not just nonmetallic-sheathed cable. Based on this, it is fairly evident that electrical wiring of any kind is not a big factor affecting overall fire safety in R-2 occupancies regardless of the wiring method used.
The positive experience of the two states mentioned and the lack of data supporting the restricted use of NM, NMC and NMS compels the elimination of the restriction on NM, NMC, and NM cables.
This EEI 2002 NEC proposal is more in line with the electrical code in the State of Michigan, which, has no height restrictions on the use of Types NM, NMC, and NMS cables. Michigan and Massachusetts have continually amended out the three floor restriction since it first appeared in the 1975 NEC. <u>This EEI proposal, if accepted, will remove all "number of building floors" or</u> similar types of height restrictions on Types NM, NMC, and NMS cables. It does not affect other <u>"uses permitted" or "uses not permitted".</u>

(Log #1775)

7- 148 - (336-5(a)(1)): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.
The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM Cable use and develop any appropriate comments.
SUBMITTER: Harold Richmond, City of Sterling Heights, MI/Rep. Reciprocal Electrical Council Inc.
RECOMMENDATION: Deleted text:
(1) In any multifamily dwelling or other structure exceeding three floors above grade. For the purpose of this article, the first floor of a building shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and

used only for vehicle parking, storage, or similar use shall be permitted.
SUBSTANTIATION: With the construction of the material as made today there is no reason to limit the use of type NM cable to buildings no more than three floors in above grade. The State of Michigan and local jurisdictions have amended this from the Code for more than three decades with no adverse effects. Studies from some of the larger communities with multiple high rise type buildings show no increase in electrical incidents in buildings using these wiring methods as compared to buildings utilizing other (allowed) wiring methods of the Code. There should be no cause for concern in the addition of smoke or toxins being introduced during a fire, as other wiring methods allowed containing the same conductor insulation, would produce more smoke and or toxins than type NM cables. A properly installed system utilizing type NM cable has been found to be just as safe if not more so than other systems which are allowed by the Code to be installed.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel does not have any knowledge as to the substantiation used by the Commonwealth of Massachusetts and the State of Michigan in amending the three floor restriction since it first appeared in the NEC. The panel refers the submitter to the panel's action and statement on Proposal 7-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
NICKSON: The panel statement for rejection is a misrepresentation of the facts. The Commonwealth of Massachusetts and the State of Michigan never included the three floor restrictions in their codes in the first place. They had not and still have not experienced any problems with nonmetallic wiring and the NEC did not provide a justification for the restriction when it was added to the code in the first place.
The rejection of Proposal 7-137 is based on statement taken out of context from the Task Group Report on Nonmetallic Sheathed Cable which are not related to the issue of expanded use of nonmetallic sheathed cable in residential structures.
NUTT: The three-story limit on the use of NM cable cannot be substantiated based on fire-or fire-safety:
The NEC has only limited Type NM cable to buildings not exceeding three-stories since the 1974 edition, and even when the limit was adopted, there was not real evidence of problems with the product. Some jurisdictions, particularly the State of Michigan and the Commonwealth of Massachusetts, rejected the NEC three-story limit, and thereby, they do not restrict the use of nonmetallic-sheathed cable based on building height. Consequently, nonmetallic-sheathed cable is already in widespread use in buildings exceeding three stories in height, and there have been no fire safety problems reported.
Fire loss data from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) for the period 1993 to 1997 indicates that approximately 1.5 percent of all apartment fires are caused by electrical wiring. This figure includes all wiring methods, not just nonmetallic-sheathed cable. Based on this, it is fairly evident that electrical wiring of any kind is not a big factor affecting overall fire safety in R-2 occupancies regardless of the wiring method used.
The positive experience of the two states mentioned and the lack of data supporting the restricted use of NM, NMC and NMS compels the elimination of the restriction on NM, NMC, and NM cables.

(Log #3922)

7- 149 - (336-5(a)(1)): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.
The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM Cable use and develop any appropriate comments.
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
RECOMMENDATION: Delete Section 336-5(a)(1).
SUBSTANTIATION: There has been nothing submitted in the 25 years since the unsubstantiated restriction appeared in the Code that justifies continuing a restriction on this wring method. Acceptance of this proposal will restore credibility to our NFPA consensus process.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 7-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
NICKSON: The rejection of Proposal 7-137 is based on statements taken out of context from the Task Group Report on Nonmetallic Sheathed Cable which are not related to the issue of expanded use of nonmetallic sheathed cable in residential structures.
NUTT: See my Explanation of Negative Vote on Proposal 7-148.

(Log #1893)

7- 150 - (336-5(a)(1), Exception (New)): Reject
SUBMITTER: John Mangan, Medford, MA
RECOMMENDATION: Add an exception to read as follows:
Exception: Type NM, Type NMC, and Type NMS cables shall be permitted to be used in one and two-family dwelling, multi-family dwelling and other structures, provided that where such dwellings or structures exceed three floors above grade type NM and NMC cables shall not be permitted to leave the floor or dwelling unit from which the cables originated.
SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substatiation for the proposal. The NFPA Regulations Governing Committee Projects requires that proposals shall have technical substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4203)

7- 151 - (336-5(a)(1), Exception (New)): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for any comments regarding the toxicity of NM Cable in the proposed expanded applications.
The Technical Correlating Committee will direct the NM Cable Task Group to reconvene and review the proposals submitted on expanded NM Cable use and develop any appropriate comments.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add a new Exception as follows:
Exception: Type NM, Type NMC, and Type NMS cables shall be permitted to be used in multifamily dwellings and other buildings, provided that where the building exceeds three floors above grade, the cables do not leave the floor or dwelling unit from which the cables originated.
SUBSTANTIATION: The Committee is aware of the special task group recommendations to extend the use of Type NM cable to buildings and structures permitted to be of Types III, IV, or V construction by the applicable building codes. However, the continued exclusion from Type I and II construction is untenable. This construction presents the lowest risk of fire transmission, and the building codes recognize combustible plumbing and wiring elements within the walls. Other task group initiatives will severely limit or remove the possibility of Type NM cables running exposed in these buildings, and the Advisory Committee doesn't take issue with any of those new restrictions.
All these factors together lead to the following absurd result: The buildings most able to safely contain a nonmetallic wiring system will be unlikely to be allowed to use it, unless this proposal is accepted. This pro-posal contains an additional restriction to ensure that the cables aren't a factor in transmission of fire from floor to floor. As Massachusetts approaches thirty years of experience of allowing this type of use, we hope CMP 7 will see the objections for what they really are: an economic interest masquerading as a safety concern.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel does not have any knowledge as to the substantiation used by the Commonwealth of Massachusetts and the State of Michigan in amending the three floor restriction since it

first appeared in the NEC. The panel refers the submitter to the panel's action and statement on Proposal 7-137.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
NICKSON: The panel statement for rejection is a misrepresentation of the facts. The Commonwealth of Massachusetts and the State of Michigan never included the three floor restrictions in their codes in the first place. They had not and still have not experienced any problems with nonmetallic wiring and the NEC did not provide a justification for the restriction when it was added to the code in the first place.
The rejection of Proposal 7-137 is based on statements taken out of context from the Task Group Report on Nonmetallic Sheathed Cable which are not related to the issue of expanded use of nonmetallic sheathed cable in residential structures.
COMMENT ON AFFIRMATIVE:
SCHUMACHER: I agree with the panel's action on this proposal, Types I and II construction by their nature are designed to limit the flammability of buildings. The installation of a wiring method that will support a flame in an otherwise fireproof assembly is a direct contradiction.

(Log #828)

7- 152 - (336-5(a)(2)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(2) As service-entrance ~~cable~~ conductors.
SUBSTANTIATION: Edit. Service-entrance cable is a specific type cable, Type SE. Type NM cable cannot be transformed into Type SE. The intent appears related to use.
PANEL ACTION: Reject.
PANEL STATEMENT: The present wording adequately conveys that Type NM cable cannot be used as a service-entrance cable. The restriction applies to application not product identification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1451)

7- 153 - (336-5(b)(4) (New)): Accept
Note: The Technical Correlating Committee understands that the accepted text becomes Item (d) of Section 336-12(a)(10) of Proposal 7-128a.
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Please add the following new text as follows:
(4) Where exposed or subject to excessive moisture or dampness.
SUBSTANTIATION: The purpose of this change is to put wording in the positive instead of the negative. It also moves the statements into the part of the "code" where they would logically be found. The words in question have to do with where the cables should NOT be used, not where they are permitted to be used. I have submitted two other proposals to delete these same words from 336-4(a) and 336-4(c). The words that I have deleted from those two sections are as follows: "where such walls are not exposed or subject to excessive moisture or dampness".
Please see my other two proposals relating to this editorial change.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2794)

7- 154 - (336-6(a), Exception (New)): Reject
SUBMITTER: Phillip David Martin, City of Chattanooga, TN/Rep. Public Works - Insp. Div. Chattanooga, TN
RECOMMENDATION: Revise as follows:
(a) To follow surface, the cable shall closely follow the surface of the building finish or of running boards.
Add this phrase:
Exception No. 1: As provided in 300-11(a)(1) and (a)(2) where supported on independent tie wires secured at each end.
SUBSTANTIATION: To clear up any question as to the use of (NM) cable above suspended ceiling where NM has been run from fixture to fixture, provided with support in independent support wires and supported within 12 inches of each fixture and each 4 1/2 feet.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing language of 336-6 already references 300-11(a). An additonal exception to provide a second reference does not enhance clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3172)

7- 155 - (336-6(b)): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise Section 336-6(b) to read:
(b) Protection from Physical Damage. Where subject to physical damage ~~The~~ the cable shall be protected ~~from physical damage where necessary~~ by rigid conduit, IMC, electrical metallic tubing, Schedule 80 PVC rigid nonmetallic conduit, pipe, guard strips, or other equivalent means. Where passing through a floor, the cable shall be enclosed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC rigid nonmetallic conduit, listed surface metal or nonmetallic raceway, or other metal pipe extending at least 6 in. (152 mm) above the floor.
SUBSTANTIATION: Provides clarity regarding physical damage protection; "where subject to" is more objective than "where necessary." Also, surface metal raceway is not strong enough for physical protection and generally only specific conductors are permitted in these raceways.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel's intent is that "the cable shall be protected from physical damage where necessary". The term conduit encompasses both rigid metal conduit and IMC. The use of the term equivalent is not necessary as the AHJ will approve the "other means."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1063)

7- 156 - (336-6(c)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "two No. 6 or three No. 8 conductors" to "two 6 AWG or three 8 AWG conductors".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3173)

7- 157 - (336-6(c)): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise this section to read:
(c) In Unfinished Basements. Where the cable is run at angles with joists in unfinished basements, ~~it shall be permissible to secure cables not smaller than two No. 6 or three No. 8 conductors directly to the lower edges of the joists. Smaller~~ cables shall be run through bored holes in joists. ~~or on running boards.~~
SUBSTANTIATION: Frequently "unfinished" basements become "finished." Often this is done by the homeowner and without a permit. Running through bored holes at the time of construction provides greater protection from damage when finishing occurs. Even if not ever finished there is less likelihood of damage. It has long been a concern of many that exposed N/M in basements is hazardous. This provides a little more protection.
PANEL ACTION: Reject.

PANEL STATEMENT: No technical substantiation has been provided that there has been problems with securing the larger sizes of Type NM cable to the lower edges of the joists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3174)

7- 158 - (336-6(f) (New)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information. The Technical Correlating Committee understands that the Panel Action text becomes the new second paragraph of Section 336-17.
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Add a new (f) to read:
(f) Grommets in Metal Studs. Grommets shall be used in metal studs as required in 300-4(b)(1), shall remain in place during the wall finishing process, shall cover the complete opening, and shall be listed for the purpose of cable protection.
SUBSTANTIATION: The 1999 Code change to 300-4(b) was a good start toward solving a common problem. The N/M Task Group considered requiring listing of these grommets, and although consensus was not reached there was considerable support for listing. The primary problem now is grommets (or bushings) popping out with the final straightening of the wall. Section 300-4 only speaks to "prior to installation of the cable."
PANEL ACTION: Accept in Principle.
Add the proposed text as a new second paragraph to 336-9.
Grommets or bushings shall be used in metal studs as required in 300-4(b)(1), shall remain in place during the wall finishing process, shall cover the complete opening, and shall be listed for the purpose of cable protection.
PANEL STATEMENT: The addition of the word "bushing" correlates with Section 300-4. The text is more appropriately located in Section 336-9. CMP-7 refers this to the Technical Correlating Committee for correlation with any changes made CMP-3 to 300-4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4204)

7- 159 - (336-9): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
"Types NM, NMC, or NMS cable shall comply with Section 300-4 where installed through ~~or parallel to~~ joists, studs, rafters, or similar wood or metal members.
In both exposed and concealed locations, where the cable is installed parallel to framing members, such as joists, rafters, or studs, the cable shall be secured so that the nearest outside surface of the cable is not less than 1 1/4 inch (31.8 mm) from the nearest edge of the framing member where nails or screws are likely to penetrate. Where this distance cannot be maintained, the cable shall be protected from penetration by nails or screws by a steel plate, sleeve, or equivalent at least 1/16 inch (1.59 mm) thick.
Exception No. 1: For concealed work in finished buildings, or finished panels for prefabricated buildings where such supporting is impracticable, it shall be permitted to fish the cable between access points.
Exception No. 2: For mobile homes and recreational vehicles."
SUBSTANTIATION: This is a companion proposal to one made to delete Section 300-4(d). Taken together, both proposals transfer this restriction to the type of cable for which it is appropriate, namely, Type NM. There have been many studies done that well demonstrate that armored cables roll out of the way of a penetrating nail or screw. In fact, it is much more difficult to damage an armored cable assembly than it is a rigid steel raceway, whether EMT or even rigid or intermediate steel conduit, and certainly more difficult than rigid nonmetallic conduit.
CMP 7 should write appropriate protection rules within its articles, rules that will reasonably differ according to the different cable constructions. There isn't any credible reason to, in effect, say that Type NM cable and Type AC cable have similar resistances to mechanical abuse in one part of the Code, and then say in another part of the Code that their mechanical characteristics warrant dramatically different treatment for similar exposures. Or, if they're really all the same, perhaps the special CMP 7 task group would reconsider its recommended restriction against open runs of Type NM cable above suspended ceilings? Massachusetts has imposed the Section 300-4(d) restrictions on Type NM cables only (and also by extension from requirements within other articles, to Type SE and Type UF cable) for a number of code editions at this point without a single reported failure.
PANEL ACTION: Reject.
PANEL STATEMENT: The location of this requirement in Article 336 is considered necessary to ensure that Type NM cable is protected where installed parallel to framing members.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1346)

7- 160 - (336-16): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the first sentence of existing 336-16 (336-24 new) as follows:
~~336-16. Bends.~~ 336-24. Bending Radius. Bends in Type NM, NMC, and NMS cable shall be made so~~, and other handling shall be such,~~ that the cable will not be damaged~~, and the~~ The radius of the curve of the inner edge of any bend, during or after installation, shall not be less than five times the diameter of the cable.
SUBSTANTIATION: 1. " and other handlings" was deleted as it does not concern bending. In addition, the phrase "as such" was deleted because it should be followed by an example as required by NEC Style Manual Section 3.3.4. The phrase "during or after installation" was added to use wording consistent with the current requirement in Section 300-34.
2. Other suggested changes are editorial and provide clarity.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #325)

7- 161 - (336-18): Reject
SUBMITTER: Barry Knispel, Arrow Fastener Co., Inc.
RECOMMENDATION: We are asking to include the following sentence into Section 336-18 Supports (Page 70-250):
"Where staples are used for cable sizes smaller than three No. 8 conductors, they shall be of the insulated type, or listed noninsulated staples driven by staple guns shall be permitted."
Please note that the above sentence has been added into the 1996 Massachusetts Electrical Code book, as well as the 1996 Rhode Island Amendment to the NEC.
SUBSTANTIATION: Inspectors in the field seem to be confused as to allowing staples to be used for installation of nonmetallic cable, and Arrow believes this would clarify the situation.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposer has not provided technical substantiation to change the existing wording. The present text permits the use of approved and listed securing methods that are designed not to damage the cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #396)

7- 162 - (336-18): Reject
SUBMITTER: Nick Phillips, Fit Your Budget Electric
RECOMMENDATION: Revise 336-18 to read as follows:
Nonmetallic-sheath cable shall be secured by ~~staples,~~ metal staples or steel staples, cable ties, straps, or similar fittings so designed...

SUBSTANTIATION: First problem, UL approved plastic staples with 2 nail arc being used. This is not a proper means of fire protection. No way to guarantee dead short if overcurrent device fails or etc.

Second, inspectors need this rule reworded. For enforcement and guaranteed fire stop.

PANEL ACTION: Reject.

PANEL STATEMENT: The present wording adequately covers the requirements for securing cables. The submitter has not provided technical substantiation to require the use of metal or steel staples only.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2285)

7- 163 - (336-18): Reject

SUBMITTER: Terry L. Schneider, Regional Bldg Dept.

RECOMMENDATION: Revise text to read as follows:

336-18 Nonmetallic-sheated cable shall be secured by staples, cables ties, straps, or similar fittings designed and installed so as not to deform the outer sheath of the cable.

SUBSTANTIATION: A large number of fires have occurred nation wide from staples being installed too tight. Wood joists swelling and contracting from humidity changes can gradually cause arcing from eventual failure. Original installation may not appear to be damaged. This should give adequate protection for long term reliability.

PANEL ACTION: Reject.

PANEL STATEMENT: The present wording of this section adequately covers the proper installation of securing methods.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #4205)

7- 164 - (336-18): Reject

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Revise as follows:

"Nonmetallic-sheathed cable shall be secured by staples, cable ties, straps, or similar fittings so designed and installed as to not damage the cable. Where staples are used for cable sizes smaller than three No. 8 conductors, they shall be of the insulated type, or listed noninsulated staples driven by staple guns shall be permitted. Cable shall be secured in place at intervals not exceeding 4 1/2 ft (1.37 m) and within 12 in. (305 mm) from every cabinet, box, or fitting. Flat cables shall not be stapled on edge. For other than within 12 in. (305 mm) of a cable termination at a cabinet, box, or fitting, cables ~~run through holes in wood or metal joists, rafters, or studs,~~ passing through successive holes in adjacent framing members no more than 24 in. (610 mm) apart shall be considered to be secured."

SUBSTANTIATION: The insulated staple rule continues to prevent premature cable failures in Massachusetts, at negligible marginal cost. It is difficult to control the force on a hammer, and the staple insulation adds a time tested margin of safety. Remember, an over driven staple will often not cause a failure for a long time, as the insulation is gradually displaced under the constant pressure. The rule was instituted in Massachusetts only after documented failures under uninsulated staples. Now, however, that there are listed staple guns and staples for use with Type NM cable, we do permit these systems without the insulation.

Although no one is trying to staple NM cable inside of bored joists, etc., limitations need to be imposed on the permission to use stud holes as cable support. The final support adjacent to boxes, etc., should actually prevent cable movement, which will not happen in a bored hole. The rule should only apply where the cable is entrained through a series of holes in closely adjacent framing members.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposer has not provided technical substantiation to change the existing wording. The present text permits the use of approved and listed securing methods that are designed not to damage the cable.

The present wording of 336-18 covers the requirements for securing the cable within 12 inches of termination points. The 4.5 foot securing requirement is adequate and there is no substantiation to reduce the stud spacing to 24".

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #4301)

7- 165 - (336-18): Reject

SUBMITTER: Donald Handler, Arrow Fastener Co., Inc.

RECOMMENDATION: Revise text to read as follows:

"Nonmetallic-sheathed cable shall be secured by staples, listed, noninsulated staples driven by staple guns cable ties, staples, or similar fittings designed and installed as to not damage the cable."

SUBSTANTIATION: Inspectors in the field seem to be confused as to allowing listed staples to be used for installation of non-metallic cable and arrow believes this would clarify the situation.

"Where staples are used for cable sizes smaller than three No. 8 conductors they shall be of the insulated type, or listed noninsulated staples driven by staple guns shall be permitted."

Please note that the above sentence has been added into the 1996 Massachusetts Electrical Code book, as well as the 1998 Rhode Island amendment to the NEC.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposer has not provided technical substantiation to change the existing wording. The present text permits the use of approved and listed securing methods that are designed not to damage the cable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #4386)

7- 166 - (336-18): Reject

SUBMITTER: Malinda Joyce Sampson, Minnesota Electricity Board

RECOMMENDATION: Revise text to read as follows:

"When nonmetallic boxes are used with nonmetallic-sheathed cable, the cable assembly, including the sheath, shall extend into the box no less than 1/4 in. (6.35 mm) through a nonmetallic-sheathed cable knockout opening and shall be secured to the box with an approved cable clamp or strap.

Multiple cable entries shall be permitted through a single cable knockout opening.

When nonmetallic-sheathed cable is run to a single gang, nonmetallic box mounted in walls or ceilings, sized no larger than a nominal 2 1/4 x 4 in., a clamp shall not be required where the cable is fastened within 8 in. (203 mm) of the box (measured along the sheath)."

SUBSTANTIATION: This exception to the requirement for an approved cable clamp at all boxes, now located in Article 370.17, seems to be "hidden" from the other NM, NMC, and NMS requirements, and may be more appropriately located in this section.

PANEL ACTION: Reject.

PANEL STATEMENT: The Fine Print Note to 336-18 provides the necessary cross-reference to 370-17.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #3175)

7- 167 - (336-18 Exception No. 1): Reject

SUBMITTER: Tim Andrassy, Steel Tube Inst.

RECOMMENDATION: Revise the exception to read:

Exception No. 1: For concealed work in finished buildings of other than new construction, or in finished panels for prefabricated buildings where such supporting is impracticable, it shall be permissible to fish cable between access points.

SUBSTANTIATION: To clarify that new construction cannot have the finish work done and then fish N/M cable.

PANEL ACTION: Reject.

PANEL STATEMENT: The code text and proper enforcement of the requirement ensures that the permission to fish cables is applied in "finished" buildings, and not buildings under construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3176)

7- 168 - (336-18 Exception No. 2): Accept
Note: The Technical Correlating Committee understands the wording modifies 336-30, Exception No. 2 of Proposal 7-128a.
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise Exception No. 2 to read:
Exception No. 2: A wiring device ~~identified for the use, without a separate outlet box,~~ incorporating an integral cable clamp and identified for the use without a separate outlet box, shall be permitted where the cable is secured in place at intervals not exceeding 4 1/2 ft (1.37 m) and within 12 in. (305 mm) from the wiring device wall opening, and there shall be at least a 12-in. (305-mm) loop of unbroken cable or 6 in. (152 mm) of a cable end available on the interior side of the finished wall to permit replacement.
SUBSTANTIATION: Editorial.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #829)

7- 169 - (336-18 Exception No. 3): Accept
Note: The Technical Correlating Committee understands the wording replaces 336-30, Exception No. 3 of Proposal 7-128a.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Exception No. 3: Lengths not more than 4 1/2 ft (1.37 m) ~~from an outlet~~ for connection within an accessible ceiling to lighting fixture(s) or equipment shall be permitted without a support within 12 in. (305 mm) of termination.
SUBSTANTIATION: Edit. The use of the word "outlet" from which lighting fixtures or equipment is supplied infers a box or other enclosure is necessary, whereas the intent seems to allow the prescribed length from the last support.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
TRAINOR: From the Panel discussion and similar action on Proposal 7-101, it appears that the intent was to permit NM cable in a suspended ceiling to be run directly to a lighting fixture so long as it was supported within 4 1/2 ft of the fixture. This is a significant change from the present requirement which only allows 4 1/2 ft of unsupported NM cable where it is installed from an outlet to a fixture. I concur with the intent. Unfortunately, the wording change accepted will also allow 4 1/2 ft of unsupported NM cable from one lighting fixture to another. I do not believe that was the intent of the Panel or the submitter. I recommend that this proposal be amended to replace the words "from an outlet" with the words "from the last point of support". The amended text of 336-18 Exception No. 3 would then read:
"Lengths not more than 4 1/2 ft (1.37 m) from the last point of support for connection within an accessible ceiling to lighting fixture(s) or equipment." This will permit what the Panel apparently intended. It also permits NM cable from fixture to fixture but requires support of the cable between fixtures, I do not believe the additional wording regarding support within 12 ft is needed. The requirement for securing every 4 1/2 ft and within 12 in. of every box is in the same sentence in 336-18 so that the exception already applies to both requirements. I recommend that the Panel Action on this proposal be changed to Accept in Principle in Part.

(Log #2861)

7- 170 - (336-18 Exception No. 3): Reject
SUBMITTER: Bill F. Neitzel, Madison, WI
RECOMMENDATION: Delete the following text:
Section 336-18 ~~Exception No. 3: Lengths not more than 4 1/2 ft (1.37 m) from an outlet for connection within an accessible ceiling to lighting fixture(s) ore equipment.~~
SUBSTANTIATION: This exception is a clear violation of Section 336-6. Accessible ceilings offer little or no protection of NM cables, nor do they provide support within 12 in. of the connectors. These cables are just as susceptible to damage as AC cable indicated in 333-12. Installation of communications and power cables after the fact put these "NM Fixture Whips" in a compromising situation. We have spent many years trying to protect NM.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation to indicate that this type of installation has resulted in damage to the Type NM cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2862)

7- 171 - (336-18 Exception No. 3): Reject
SUBMITTER: Bill F. Neitzel, Madison, WI
RECOMMENDATION: Add the following text to 336-18 Exception No. 3:
"Exception No. 3: In dwelling units only, lengths not more than 4 1/2 ft (1.37 m) from an outlet..."
SUBSTANTIATION: My understanding is this code exception was implemented for "homeowner projects" so NM could be used as a fixture whip. So be it. NM fixture whips have no place in the commercial setting where communications, HVAC, and other personnel require constant access above suspended ceilings.
This code section also is a violation of Section 336-6 and proper wording needs to be installed in 336-6 if this code exception is allowed to remain.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation to indicate that this type of installation has resulted in damage to the Type NM cable in other than residential structures.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2909)

7- 172 - (336-18 Exception No. 3): Accept in Principle
SUBMITTER: Mark R. Hilbert, Wolfeboro, NH
RECOMMENDATION: Add the words: "or from the last point of secure attachment to a structural member or other" after the words "accessible ceiling."
The revised exception would read: Lengths not more than 4-1/2 ft (1.37 m) from an outlet for connection within an accessible ceiling or from the last point of secure attachment to a structural member or other, to lighting fixture(s) or equipment.
SUBSTANTIATION: The revised wording of this sentence would allow for six feet of flexibility for a cable that does not originate at an outlet within the accessible ceiling. For example, it would allow for a cable to be run from a switch within a wall to a light fixture within an accessible ceiling. Currently, there is no language which permits this installation method. However, it is common to see this method in the field. I am not aware of any problems due to the use of this installation method.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns have been addressed by the panel's action on Proposal 7-169. The panel notes that the permission in this exception is limited to 4.5 feet.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1753)

7- 173 - (336-21): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise to read as follows:
336-21. Devices of Insulating Material
Switch, outlet, and tap devices of insulating material shall be permitted to be used without boxes in exposed cable wiring and for rewiring in existing buildings where the cable is concealed and fished. Openings in such devices shall form a close fit around the outer covering of the cable and the device shall fully enclose the part of the cable from which any part of the covering has been removed. Devices of insulating material shall be installed so that the wiring contained in them can be rendered accessible without removing any part of the building.
SUBSTANTIATION: To make it clear that these devices are taps and/or splices and are required to remain accessible. I have heard a manufacturer claim that there taping and splicing devices do not have to be accessible after installation. There not covered under the normal accessibility requirement in 370-29 do to the fact they are not a box or conduit body.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation to add the proposed restriction on the use of these devices.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4420)

7- 174 - (336-21): Reject
SUBMITTER: Joseph McKenzie, McKenzie Safety Products, Inc.
RECOMMENDATION: Revise text to read as follows:
"Devices of insulating material for NMFP cable. Switch, outlet and tap devices of insulating material shall be permitted to be used without boxes in exposed cable wiring and for rewiring in existing buildings where the cable is concealed and fished. Openings in such devices shall form a close fit around the outer covering of the cable and the devices shall fully enclose the part of the cable from which any part of the covering has been removed. Where connections to conductors are by binding-screw terminals, there shall be available as many terminals as conductors. There must be an interrupter installed in line with the heat responsive cable assembly and any signaling component."
SUBSTANTIATION: Enhance the safety and lives of many people by early detection of heat buildup and a possible fire. This will compliment and enhance present fire detection technology.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Currently, there is no description of Type NMFP cable in the NEC, therefore acceptance of this proposal for devices to be used with this cable is not appropriate. See panel action and statement on Proposal 7-186.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1347)

7- 175 - (336-26): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 336-26 (336-80 New) as follows:
~~336-26.~~ 336-80 Ampacity. The ampacity of Types NM, NMC, and NMS cable shall be determined in accordance ~~be that of 60°C (140°F) conductors and shall comply~~ with ~~Section~~ 310-15.
The ampacity shall be in accordance with the 60°C (140°F) conductor temperature rating. The 90°C (194°F) rating shall be permitted to be used for ampacity derating purposes provided the final derated ampacity does not exceed that for a 60°C (140°F) rated conductor.
SUBSTANTIATION: Reworded for clarity and to incorporate text consistent with that used in other cable articles.
The word "Section" was deleted in accordance with NEC Style Manual Section 4.1.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1754)

7- 176 - (336-26): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise to read as follows:
336-26. Ampacity. The ampacity of ~~Types NM, NMC, and NMS~~ cable shall be that of 60ºC (140ºF) conductors and shall comply with Section 310-15.
SUBSTANTIATION: To make it clear that the 60°C degree ampacity applys to SE cable used for interior wiring pertaining to 338-4 (a).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree with the submitter that referral to types of NM cable limits the application of 336-26 to only Type NM cables. The appropriate references in Articles 338 and 339 to this section are applicable to those cable types.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1857)

7- 177 - (336-26): Accept
Note: The Technical Correlating Committee understands the wording replaces 336-80 of Proposal 7-128a.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise as follows:
336-26. Ampacity. The ampacity of Types NM, NMC, and NMS cable shall be determined in accordance ~~that of 60°C (140°F) conductors and shall comply~~ with ~~Section~~ 310-15.
The ampacity shall be in accordance with the 60°C (140°F) conductor temperature rating. The 90°C (194°F) rating shall be permitted to be used for ampacity derating purposes provided the final derated ampacity does not exceed that for a 60°C (140°F) rated conductor.
The ampacity of Type NM NMC, and NMS cable installed in cable tray shall be determined in accordance with 318-11.
SUBSTANTIATION: Reworded for clarity and to incorporate text consistent with that used in other cable articles.
Section 4.1.2 of the 1999 National Electrical Code Stle Manual stipulates that "...references shall include only the number of the rule being referenced; the word section, subsection, and paragraph shall not be used."
318-3(a) permits Type NM, NMC, and NMS cables to be installed in cable tray; the additional text clarifies what ampacities apply to cable tray.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2288)

7- 178 - (336-26): Reject
SUBMITTER: Greg Fretwell, Blue Light Inspection Services
RECOMMENDATION: Remove the entire text of 336-26.
SUBSTANTIATION: Type NM and Type UF are the only wiring methods that have this restriction and I see no relevant difference between them and a method like SE or conductors in raceways. 310-16 conductor and termination ratings should prevail as it does everywhere else.
PANEL ACTION: Reject.
PANEL STATEMENT: The changes were made for these types of cables based on information submitted for the 1984 NEC regarding appropriate ampacity requirements for these cables. The submitter has not provided technical substantiation to remove this restriction for these cable types.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3038)

7- 179 - (336-26): Reject

SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit

RECOMMENDATION: Revise 336-26 to read:

The ampacity of Types NM, NMC, and NMS cable shall be that of 60°C (140°F) conductors and shall comply with Section 310-15. The 90°C rating shall not be permitted to be used for ampacity derating purposes. ~~The 90°C (194°F) rating shall be permitted to be used for ampacity derating purposes provided the final derated ampacity does not exceed that for a 60°C (140°F) rated conductor.~~

SUBSTANTIATION: This section should not have been revised in the previous Code. The historical reason for the 90°C rating requirement was because 60°C rated N/M Cable was overheating in thermal (weatherizing) insulation. Bringing it back down to 60°C is a step backward. When Proposal 7-31 was accepted in the 1984 NEC, it was based on data documenting temperature rise. To permit derating from 90°C does not address those situations which required a final ampacity of less than 60°C before Proposal 7-31 was accepted. There is a good chance the use of N/M will be expanded this Code cycle. In addition, use of electrical equipment continues to grow and this safety factor should go back in the Code.

PANEL ACTION: Reject.

PANEL STATEMENT: It is intended that the final ampacity for Type NM cable shall be that of 60 degree C conductors and it is permitted to use the 90 degree C ampacity for application of adjustment or correction factors. See panel action on Proposal 7-177.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

STRANIERO: The substantiation submitted with the proposal is correct. When cables are installed in thermal insulation and operated at 60 C ampacity, the heat dissipation is impeded by the thermal insulation causing the actual conductor temperature to rise to 90 C. Allowing the 90 C conductor rating to be used for derating, even when limiting the final value to that of 60 C conductors, will permit bundled cables or cables in high ambient that are installed in thermal insulation to be exposed to temperatures above that for which they are rated.

(Log #4206)

7- 180 - (336-26): Reject

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Revise as follows:

"Type NM, NMC, and NMS cable shall have conductors rated at 90°C (194°F). Where in-stalled in thermal insulation, the ampacity of conductors shall be that of 60°C (140°F) conductors."

SUBSTANTIATION: The 1999 NEC contains a technical error. The NEC does not condition the increased ampacity allowances on the cables being run in open air, as it does with Type AC cable in Section 333-20. This wording incorporates that concept. Studies done by UL and NEMA conclusively demonstrate the severe effect that thermal insulation has on conductor ampacities. See, for example, Proposals 7-131 and 4-97 in the 1987 NEC cycle for the original substantiation.

In its prior rejections of this proposal, CMP 7 seems not to have read it well enough to understand that it really is just what the panel historically seems to want, namely, another restriction on NM cable. This one actually has technical merit.

It does not, however, turn the clock back to 1993, as another proposal presently circulating would do, and make Type NM-B cable start its derating in the 60° column even if run in open air. This leads to some truly remarkable results, well suited to satire. Suppose, for example, you run two 12-2 NM cables for kitchen small appliance branch circuits through the same set of bored holes in attic rafters (no thermal insulation around the cables). Assume the attic design temperature is 110°F, quite conservative in many areas of the country.

What you find is that you have to wire the kitchen circuits with No. 8, because even No. 10 fails to work if you start in the 60°C column [30A x 0.8 x 0.71 = 17A; per Sec. 240-3(b)(1) next higher sized device not allowable.] If, however, you start in the 90°C column, now No. 12 works (30A x 0.8 x 0.87 = 21A.) This result wasn't being enforced when it was in the Code, even in the southwest according to an article at the time in IAEI News. I'd like to meet the inspector who'd insist on 8-2 NM cable in this case, or even 10-2 cable through separate holes (25A x 0.71 = 18A, No. 10 required) in the same attic.

This wording is technically appropriate and it has been in the Massachusetts Code for four cycles of the Code at this point, without any reported problems.

PANEL ACTION: Reject.

PANEL STATEMENT: It is intended that the final ampacity for Type NM cable shall be that of 60 degree C conductors in all installations, and it is permitted to use the 90 degree C ampacity for application of adjustment or correction factors. There has been no technical substantiation provided to indicate that there has been a problem with applying the derating factors to the 90 degree C ampacity where installed in thermal installation. See panel action on Proposal 7-177.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

STRANIERO: See my Explanation of Negative Vote on Proposal 7-179.

(Log #1486)

7- 181 - (336-27 (New)): Reject

SUBMITTER: Norman Arendt, City of Chicago,

RECOMMENDATION: Add new section to read as follows:

336-27. Arc-Fault Current Circuit-Interrupter Protection. Arc-fault circuit-interrupter protection shall be installed for concealed Types NM, NMC, and NMS cable.

SUBSTANTIATION: The U.S. Consumer Product Safety Commission "1995 Residential Fire Loss Estimates" identifies the following: 1) 425,500 residential structure fires; 2) 3,695 civilian deaths; 3) 19,125 civilian injuries; 4) $4.4 billion in property loss; 5) material first ignited in 33,800 fires was Electrical Cable Insulation.

Arc-fault circuit-interrupters will detect arcing faults which have been know to cause such fires as referenced in the CPSC Report of Manufacturers test results as well as their advertising shows the positive impact of arc-fault devices on NM cable wiring methods.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The data supplied by the submitter is not accurate in identifying the problems as exclusive to Type NM cable installations. The submitter has not provided substantiation to indicate that this type of protection should be applied only to installations of Type NM cable. Section 210-12 requires this method of protection for specific branch circuits regardless of the wiring method.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1349)

7- 182 - (336-30, 336-108, 336-112, 336-116 (New)): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise 336-30 (336-100 New) as follows:

~~336-30.~~ 336-100. ~~General.~~ Construction. ~~Nonmetallic-sheathed cable shall comply with (a) and (b) below.~~

~~(a) Construction.~~ The outer cable sheath of nonmetallic-sheathed cable shall be a nonmetallic material.

~~(1) Type NM. The overall covering shall be flame retardant and moisture resistant.~~

~~(2) Type NMC. The overall covering shall be flame retardant, moisture resistant, fungus resistant, and corrosion resistant.~~

~~(3) Type NMS. Type NMS cable is a factory assembly of insulated power, communications, and signaling conductors enclosed within a common sheath of moisture resistant, flame retardant, nonmetallic material. The sheath shall be applied so as to separate the power conductors from the communications and signaling conductors. The signal conductors shall be permitted to be shielded. An optional outer jacket shall be permitted.~~

~~(FPN): For composite optical cable, see Sections 770-4 and 770-52.~~

~~(b) Conductors. The insulated power conductors shall be one of the types listed in Table 310-13 that is suitable for branch-circuit wiring or one that is identified for use in these cables.~~
~~The power conductors shall be sizes No. 14 through No. 2 with copper conductors or sizes No. 12 through No. 2 with aluminum or copper-clad aluminum conductors.~~
~~The signaling conductors shall comply with Section 780-5.~~
~~In addition to the insulated conductors, the cable shall be permitted to have an insulated or bare conductor for equipment grounding purposes only. Where provided, the grounding conductor shall be sized in accordance with Article 250.~~
~~Conductors shall be rated at 90°C (194°F).~~
~~(FPN): Types NM, NMC, and NMS cable identified by the markings NM-B, NMC-B, and NMS-B meet this requirement.~~

Revise 336-30(b) (336-104 New) as follows:

~~336-30(b)~~ 336-104. Conductors. The power conductors shall be sizes No. 14 through No. 2 with copper conductors or sizes No. 12 through No. 2 with aluminum or copper-clad aluminum conductors. The signaling conductors shall comply with ~~Section~~ 780-5.

Add a new Section 336-108 as follows:

336-108. Equipment Grounding. In addition to the insulated conductors, the cable shall be permitted to have an insulated or bare conductor for equipment grounding purposes only.

Insulated equipment grounding conductors shall be rated at 90°C (194°F).

Add a new Section 336-112 as follows:

336-112. Insulation. The insulated power conductors shall be one of the types listed in Table 310-13 that is suitable for branch-circuit wiring or one that is identified for use in these cables.

Conductors shall be rated at 90°C (194°F).

(FPN): Types NM, NMC, and NMS cable identified by the markings NM-B, NMC-B, and NMS-B meet this requirement.

Add a new Section 336-116 as follows:

336-116. Sheath. The outer sheath of nonmetallic-sheathed cable shall comply with:

(1) Type NM. The overall covering shall be flame retardant and moisture resistant.

(2) Type NMC. The overall covering shall be flame retardant, moisture resistant, fungus resistant, and corrosion resistant.

(3) Type NMS. The overall covering shall be flame retardant and moisture resistant. The sheath shall be applied so as to separate the power conductors from the communications and signaling conductors. The signal conductors shall be permitted to be shielded. An optional outer jacket shall be permitted.

(FPN): For composite optical cable, see ~~Sections~~ 770-4 and 770-52.

SUBSTANTIATION: Present text of Section 336-30 has been divided into five sections (336-100, 336-104, 336-108, 336-112, and 336-116) to provide consistency among the wire and cable articles. A portion of 336-30(a) has been relocated to 336-116. The balance of 336-30(a) is shown as 336-100. One portion of 336-30(b) is shown as 336-104, second portion of 336-30(b) is shown as 336-108, and the remaining portion of 336-30(b) is shown as 336-112. Changes shown are consistent with this division.

In Section 336-30(b) deleted the sentence: "Where provided, the grounding conductor shall be sized in accordance with Article 250." Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3. Also, Section 4.4.1 prohibits referencing an entire Article.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #3244)

7- 183 - (336-30): Reject

SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council

RECOMMENDATION: Revise text to read as follows:

336-30. General. Nonmetallic-sheathed cable shall be listed and shall comply with (a) and (b).

No change to remainder of text.

SUBSTANTIATION: This proposal was developed by the Task Group on Nonmetallic-Sheathed Cable based on their review of appropriate uses for Nonmetallic-Sheathed Cable. The task group noted that their evaluation of Nonmetallic-Sheathed Cable was based on the assumption that the cable would be constructed in accordance with criteria contained in UL Standard for Safety 719. The review of current installation requirements and the development of new requirements were also based on this assumption. The task group noted that all major manufacturers of Nonmetallic-Sheathed Cable presently obtain listing for their cables on voluntary basis so that a requirement for Nonmetallic-Sheathed Cable to be listed is necessary to establish uniform cable construction standards and assure that the installation requirements relate directly to the capability of the cables.

NHMC is submitting this proposal to forward the work of the Task Group on Nonmetallic-Sheathed to Panel 7.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: There are a number of methods for conformity assessment and it is not the panel's intent to promote one to the exclusion of the others. Other methods of conformity assessment include:

Company reputation (brand name recognition); Supplier's declaration; Third-party certification; Certification through voluntary inter-laboratory agreements that are not limited to national borders; and private sector agreements on conformity assessment activities (subcontracting and laboratory memorandums of understandings, including company laboratories) that are not limited by national border.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 2

NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

PROPST: While I generally support the panel's substantiation that a number of means exist for assessing the suitability of a product, I feel that NM cable needs to be addressed separately. The product is widely used by people with a broad range of experience and knowledge from the skilled electrician to the weekend handyman. The product is readily available in almost any hardware store, home center, or discount store. With this exposure, I believe that the consequences associated with the use of products not meeting minimum industry product standards creates safety concern. It was reported in the panel meeting that all of the major cable manufacturer's NM cables are currently listed. If that is the case, then this additional requirement for this specific type of cable would not have a significant impact or burden on the manufacturer or consumer, and would provide some level of assurance that potentially inferior material was not being used by consumers who may not be well educated in the significance of listed products.

TRAINOR: The International Association of Electrical Inspectors endorses the work of the Task Group on Nonmetallic-Sheathed Cable. As noted in the substantiation, this proposal was prepared by that task group for sound and compelling reasons. Objective, third party testing and listing of products is a basic requirement of practically every inspection jurisdiction. This is of extreme benefit to manufacturers. If every inspection jurisdiction adopted its own review process for approving products, the differences between them would make it impossible for manufacturers to produce a product that was uniformly accepted. In addition, listing provides some protection against the liability inherent in manufacturing products. The Panel Statement lists a number of different methods for conformity assessment. These include:

Company reputation (brand name recognition)
Suppliers declaration
Private sector agreements
Third Party Certification
Certification through voluntary inter-laboratory agreements
Private sector agreements

These types of options may exist but, in fact, they are not being used for this product. Inspection jurisdictions seldom accept any option other than listing. When they do, it is usually to assist in the review of a new or one-of-a-kind product. For all wiring methods, listing is the standard requirement for acceptance. Listing certifies to the inspector that the product has been tested to an appropriate standard and will perform safely in its intended use. Manufacturers obviously know this. Every manufacturer of Nonmetallic-Sheathe Cable has

obtained a listing for their product. They know that the alternate "methods for conformity assessment" are not acceptable for their product. At present however, there is nothing to prevent anyone from producing a cable to no standard at all and calling it Nonmetallic-Sheathed Cable. It would undoubtedly cost less than a listed cable. Since listing is not a code requirement, the inspector would have the sole responsibility of deciding whether or not it was acceptable. This is not a situation the inspector wants to be and it's unlikely that reputable manufacturers want an inspector making that call.

It is noted that nearly all of the raceway wiring methods are required to be listed while nearly none of the cable methods have this requirement. This is a serious inconsistency in requirements for products that serve basically the same function. It weakens the credibility of the NEC, leaves manufacturers open to unfair competition and makes the inspector's job more difficult. The International Association of Electrical Inspectors recommends reconsideration of this issue and acceptance of a listing requirement for Nonmetallic-Sheathed Cable.

(Log #4073)

7- 184 - (336-30): Reject
SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council
RECOMMENDATION: Revise text to read as follows:

336-30. General. Nonmetallic-sheathed cable shall be listed and shall comply with (a) and (b).

No change to the remainder of text.

SUBSTANTIATION: This proposal was developed by the Task Group on Nonmetallic-Sheathed Cable based on their review of appropriate users for Nonmetallic-Sheathed Cable. The task group noted that their evaluation of Nonmetallic-Sheathed Cable was based on the assumption that the cable would be constructed in accordance with the criteria contained in UL Standard for Safety 719. The review of current installation requirements and the development of new requirements were also based on this assumption. The task group noted that all major manufacturers of Nonmetallic-Sheathed Cable presently obtain listing for their cables on voluntary basis so that a requirement for Nonmetallic-Sheathed Cable to be listed is necessary to establish uniform cable construction standards and assure that the installation requirements relate directly to the capability of the cables.

NHMC is submitting this proposal to forward the word of the Task Group on Nonmetallic-Sheathing to Panel 7.

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: There are a number of methods for conformity assessment and it is not the panel's intent to promote one to the exclusion of the others. Other methods of conformity assessment include:

Company reputation (brand name recognition); Supplier's declaration; Third-party certification; Certification through voluntary inter-laboratory agreements that are not limited to national borders; and private sector agreements on conformity assessment activities (subcontracting and laboratory memorandums of understandings, including company laboratories) that are not limited by national border.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
TRAINOR: See my Explanation of Negative Vote on Proposal 7-183. The International Association of Electrical Inspectors recommends that this proposal be accepted.

(Log #4333)

7- 185 - (336-30(3)): Reject
SUBMITTER: Joseph McKenzie, McKenzie Safety Products, Inc.
RECOMMENDATION: None.
SUBSTANTIATION: Theoretically this cable is available but in reality this cable is not produced for use. See my proposal on Section 336-30(3). To be substituted for 336-3(3) or as replace to same.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any recommendation in his proposal. The proposal does not comply with the requirements of the NFPA Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4334)

7- 186 - (336-30(3)): Reject
SUBMITTER: Joseph McKenzie, McKenzie Safety Products, Inc.
RECOMMENDATION: Proposed rewritten text to read as follows:

"Type NMFP cable is a factory assembly of insulated power, communication, and signaling conductors enclosed within a common sheath of moisture resistant, flame retardant, nonmetallic material. The sheath shall be applied so as to incorporate the power conductors and the heat responsive cable assembly within the same cavity."
SUBSTANTIATION: The Safety and Lives of Thousands of People. Our cable assembly will instantaneously signal a heat buildup, a potential fire and shutdown power to bring immediate action before a full blown fire erupts.

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided a fact-finding report to indicate that the proposed new type of cable provides equivalent safety to that of the existing Type NM cable. Additionally the submitter has not demonstrated that the existing cable requires the proposed modification in construction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3177)

7- 187 - (336-30(a)): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise 336-30.a to read:

Nonmetallic-sheathed cable shall comply with (a) and (b).

(a) Construction. The outer cable sheath of Types NM, NMC, and NMS shall be a nonmetallic material and ~~(1) Type NM. The~~ the overall covering shall be flame retardant and moisture resistant.

(1) ~~(2)~~ Type NMC. The overall covering of Type NMC shall also be fungus resistant and corrosion resistant.

(2) ~~(3)~~ Type NMS. ~~Type NMS cable is a factory assembly of insulated power, communications, and signaling conductors enclosed within a common sheath of moisture resistant, flame retardant, nonmetallic material.~~ The sheath of Type NMS shall be applied so as to separate the power conductors from the communications and signaling conductors. The signaling conductors shall be permitted to be shielded. An optional outer jacket shall be permitted.

FPN: For composite optical cable, see Sections 770-4 and 770-52.
SUBSTANTIATION: 336-30.a – These changes make it clear all three types are nonmetallic and are flame retardant and moisture resistant. It consolidates and shortens text.

336-30.a.3 – Part of the deleted first sentence was moved to become a definition for NMS in a related proposal. The changes to the second sentence are editorial only.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed language changes the technical requirements for type NMS cable construction. The proposed text does not improve the clarity of this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2220)

7- 188 - (336-30(a)(1), (2), and (3)): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" (or "flame retardant") to "flame tested" in three places [in 336-30(a)(1), (2), and (3)].
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because

the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

PANEL ACTION: Reject.

PANEL STATEMENT: The term "flame-retardant" is used throughout the Code as a means of expressing to the user that the material resists ignition or the spread of flames, albeit the test methods are often not defined. The term "flame tested" is similarly undefined, but can be understood to mean a test which does not necessarily measure the ability of a material to resist ignition or flame propagation. Some articles of the NEC offer information regarding the tests deemed appropriate for the required level of resistance to ignition or flame propagation. Others rely on the product standard to provide such information. The panel suggests that specific proposals be made wherever the generic reference to "flame retardant" is not sufficient.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

COMMENT ON AFFIRMATIVE:

STEWART: The panel statement is correct. Changing the words "flame tested" is an undefined term that would lead to improper testing for the intended application.

TEMBLADOR: See comment on Ravi Gantra's Proposal 6-3.

(Log #1064)

7- 189 - (336-30(b)): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: In the second paragraph change:

"No. 14" to "14 AWG"

"No. 2" to "2 AWG" in two places

"No. 12" to "12 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2570)

7- 190 - (336-30(b)): Reject

SUBMITTER: Travis Lindsey, Bldg Dept., Clark County, NV

RECOMMENDATION: Revise as follows:

... the power conductors shall be sizes No. ~~14~~ 12 through No. 2 with copper conductors or sizes No. ~~12~~ 10 through No. 2 with aluminum or copper clad aluminum conductors,...

SUBSTANTIATION: A large number of residential fires have been attributed to the fixed wiring systems of buildings. CPSC residential fire loss estimates for 1995 alone indicated 14,640 fires from the fixed wiring of residential structures.

Drawing from experience as a code professional the problem is obvious.

In our jurisdiction we have enacted rules limiting branch circuits to No. 12. We did this because there were problems with heating of conductors, overloaded circuits and tripping related to these conditions. Since enacting these regulations the number of problems have been reduced significantly.

In addition to the factors above, conductors are usually not applied incorrectly. Ambient temperature correction factors are not considered. Attics in most parts of the country are hot enough for prolonged periods during the summer months that application of the correction factors would reduce the current carrying capacity of the No. 14 wire to a very small number. Increased heating occurs when circuits are heavily loaded, and the combined effect of neglecting these factors can be disastrous.

In cases such as single outlet appliance circuits serving refrigerators and similar loads, the circuits have been known to fatigue and deteriorate (oxidize and burn) at connection points, overcurrent devices and receptacles due to the high starting loads and the small wire size.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not documented that the use of No. 14 AWG copper and No. 12 AWG aluminum has been the cause of the problems cited in his substantiation. The Code does not prohibit the use of the proposed conductor sizes. The use of cables with conductors No. 14 AWG copper and No.12 AWG aluminum in accordance with the applicable rules of the Code will result in safe installations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NEGATIVE: 1

NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

STRANIERO: This proposal will enhance safety. Clark County Nevada and other municipalities have high ambient temperatures and derating of conductors is rarely applied. Fire occurrence should be reduced by this proposal.

(Log #3178)

7- 191 - (336-30(b)): Reject

SUBMITTER: Tim Andrassy, Steel Tube Inst.

RECOMMENDATION: Revise 336-30(b) to read:

(b) Conductors and Cable Jacket. Conductors and cable jackets shall comply with the following:

(1) The insulated power conductors shall be one of the types listed in Table 310-13 that is suitable for branch-circuit wiring or one that is identified for use in these cables.

(2) The power conductors shall be sizes No. 14 through No. 2 with copper conductors or sizes No. 12 through No. 2 with aluminum or copper-clad aluminum conductors.

(3) The signaling conductors shall comply with Section 780-5.

(4) In other than detached one and two family dwellings or in one floor structures, the cables shall also be listed as follows:

1. As suitable for use in a vertical run in a shaft or from floor to floor and as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

FPN: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of the Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts, ANSI/UL 1666-1997.

2. For permitted uses other than as riser cable, the cables shall be listed as resistant to the spread of fire.

FPN: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in the Reference Standard for Electrical Wires, Cables and Flexible Cords, ANSI/UL 1581-1991.

In addition to the insulated conductors, the cable shall be permitted to have an insulated or bare conductor for equipment grounding purposes only. Where provided, the grounding conductor shall be sized in accordance with Section 250-122, comply with ~~Article 250~~ Section 250-122 and comply with Section 250-2(d).

Conductors shall be rated at 90°C (194°F).

~~FPN: Types NM, Nonmetallic Sheathed Cable, and NMS cable identified by the markings NM B, Nonmetallic Sheathed Cable B meet this requirement.~~

SUBSTANTIATION: N/M Cable currently meets the least stringent test for flame retardation. If it is going to be installed from floor to floor and between units of buildings, it should at least be as flame retardant as communications wire and cables. This text is copied from Article 800. The FPN is proposed to be deleted and a separate proposal has been submitted to move this to the "Marking" section as a requirement.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided substantiation to document that the use of Type NM cable has resulted in the propagation of flame between floors under the current permitted uses.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1854)

7- 192 - (336-31): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 336-31. Marking. in its entirety.
SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3 and 4 apply generally.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3179)

7- 193 - (336-31): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise 336-31 to read:
336-31. Marking.The cable shall be marked in accordance with Sections 110-21 and 310-11. The cable shall also be identified as Type NM-B, NMC-B, or NMS-B to indicate an insulation rating of 90°C (194°F) as required in Section 336-30(d)(2).
SUBSTANTIATION: This information is currently contained in a FPN in Section 336-30(b). It is more appropriate in a marking section and thus assures a means of identifying the 90°C insulation. This is very important when N/M cable is surrounded by thermal insulation. (The FPN was proposed for deletion in a companion proposal.)
PANEL ACTION: Reject.
PANEL STATEMENT: Marking is covered in 310-11. The reference to 110-21 is not necessary as per 90-3 it is applicable. The Fine Print Note adequately conveys the marking designation for 90 degree C conductors. See panel's rewrite of Article 336 in Proposal 7-128a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3035)

7- 194 - (336-32 (New)): Reject
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Add a new section titled, "Listed" to read:
Types N/M, NMS, and Nonmetallic-Sheathed Cable shall be listed.
SUBSTANTIATION: Evaluation of the suitability of products assumes they meet certain requirements. Listing is the best way to accomplish this. Other wiring methods in Chapter 8 have listing requirements and cables should also be listed.
We keep hearing "most everyone lists anyway." If so, then there is no reason not to make it a requirement so cable from other countries will also be listed.
PANEL ACTION: Reject.
PANEL STATEMENT: There are a number of methods for conformity assessment and it is not the panel's intent to promote one to the exclusion of the others. Other methods of conformity assessment include:
Company reputation (brand name recognition); Supplier's declaration; Third-party certification; Certification through voluntary inter-laboratory agreements that are not limited to national borders; and private sector agreements on conformity assessment activities (subcontracting and laboratory memorandums of understandings, including company laboratories) that are not limited by national border.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
GUIDA: This proposal should be accepted. As indicated by the submitter, most, if not all nonmetallic-sheathed cable used is listed. The definition of "Listed" in the NEC states that the listing organization is required to be acceptable to the authority having jurisdiction, and that equipment meets identified standards or has been tested and found suitable for a specified purpose. Many other cables and most raceways in the NEC are required to be listed.
The panel statement indicates that company reputation or a supplier's declaration are acceptable alternatives to listing. It should be noted that Code-Making Panel 1 has rejected similar proposals due to the potential for inconsistent interpretations by authorities having jurisdiction. Listing is based on compliance with recognized product safety standards.
As additional information, the Standard for Nonmetallic-Sheathed Cables, UL 719, requires a thorough construction and performance evaluation for all nonmetallic-sheathed cables. Among others, testing includes flammability, dielectric voltage-withstand, unwinding at low temperatures, pulling through joists, conductor pullout, crushing and abrasion. Nonlisted cables may not have been evaluated for compliance with these requirements, and may not function correctly with listed termination fittings.
TRAINOR: See comments on Proposal 7-183. The International Association of Electrical Inspectors recommends that the action on this proposal be changed to Accept in Principle and the proposed text be placed in a new 336-6 which is the section number in the new parallel numbering format which is reserved for listing requirements. The new section would read as follows:
"336-6. Listing Requirements. Nonmetallic-Sheathed Cable shall be listed."

(Log #3036)

7- 195 - (336-32 (New)): Reject
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Add a new section titled, "Listed" to read:
Types N/M, NMS, and Nonmetallic-Sheathed Cable shall be listed.
SUBSTANTIATION: Evaluation of the suitability of products assumes they meet certain requirements. Listing is the best way to accomplish this. Other wiring methods in Chapter 8 have listing requirements and cables should also be listed.
We keep hearing "most everyone lists anyway." If so, then there is no reason not to make it a requirement so cable from other countries will also be listed.
PANEL ACTION: Reject.
PANEL STATEMENT: There are a number of methods for conformity assessment and it is not the panel's intent to promote one to the exclusion of the others. Other methods of conformity assessment include:
Company reputation (brand name recognition); Supplier's declaration; Third-party certification; Certification through voluntary inter-laboratory agreements that are not limited to national borders; and private sector agreements on conformity assessment activities (subcontracting and laboratory memorandums of understandings, including company laboratories) that are not limited by national border.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
GUIDA: This proposal should be accepted. As indicated by the submitter, most, if not all nonmetallic-sheathed cable used is listed. The definition of "Listed" in the NEC states that the listing organization is required to be acceptable to the authority having jurisdiction, and that equipment meets identified standards or has been tested and found suitable for a specified purpose. Many other cables and most raceways in the NEC are required to be listed.
The panel statement indicates the company reputation or a supplier's declaration are acceptable alternatives to listing. It should be noted that Code-Making Panel 1 has rejected similar proposals due to the potential for inconsistent interpretations by authorities having jurisdiction. Listing is based on compliance with recognized product safety standards.

As additional information, the Standard for Nonmetallic-Sheathed Cables, UL 719, requires a thorough construction and performance evaluation for all nonmetallic-sheathed cables. Among others testing includes flammability, dielectric voltage-withstand, unwinding at low temperatures, pulling through joists, conductor pullout, crushing, and abrasion. Nonlisted cables may not have been evaluated for compliance with those requirements, and may not unction correctly with listed termination fittings.

TRAINOR: See my Explanation of Negative Vote on Proposal 7-194.

ARTICLE 338 — SERVICE-ENTRANCE CABLE

(Log #CP713)

7- 195a - (338): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: CMP 7

RECOMMENDATION: Rewrite Article 338 to comply with NEC Style Manual.

ARTICLE 338 -- Service-Entrance Cable:

Types SE and USE

I General

338-1. Scope. This article covers the use, installation, and construction specifications of service- entrance cable.

338-2. Definition.

Service-Entrance Cable. A single conductor or multiconductor assembly provided with or without an overall covering, primarily used for services, and of the following types:

(a) Type SE. Service-entrance cable having a flame-retardant, moisture-resistant covering.

(b) Type USE. Service-entrance cable, identified for underground use, having a moisture- resistant covering, but not required to have a flame-retardant covering.

Cabled, single-conductor, Type USE constructions recognized for underground use may have a bare copper conductor cabled with the assembly. Type USE single, parallel, or cabled conductor assemblies recognized for underground use may have a bare copper concentric conductor applied. These constructions do not require an outer overall covering.

FPN: See 230-41, Exception, item (b) for directly buried, uninsulated service-entrance conductors.

(c) One Uninsulated Conductor. If Type SE or USE cable consists of two or more conductors, one shall be permitted to be uninsulated.

II Installation

338-10. Uses Permitted.

(a) Service-Entrance Conductors. Service-entrance cable used as service-entrance conductors shall be installed as required by Article 230.

Type USE used for service laterals shall be permitted to emerge above ground outside at terminations in meter bases or other enclosures where protected in accordance with 300-5(d).

(b) Branch Circuits or Feeders.

(1) Grounded Conductor Insulated. Type SE service-entrance cables shall be permitted in interior wiring systems where all of the circuit conductors of the cable are of the rubber-covered or thermoplastic type.

(2) Grounded Conductor Not Insulated. Type SE service-entrance cables without individual insulation on the grounded circuit conductor shall not be used as a branch circuit or as a feeder within a building, except a cable that has a final nonmetallic outer covering and is supplied by alternating current at not over 150 volts to ground shall be permitted as a feeder to supply only other buildings on the same premises.

Type SE service-entrance cable shall be permitted for use where the fully insulated conductors are used for circuit wiring and the uninsulated conductor is used for equipment grounding purposes.

(3) Temperature Limitations. Type SE service-entrance cable used to supply appliances shall not be subject to conductor temperatures in excess of the temperature specified for the type of insulation involved.

(4) Installation Methods for Branch Circuits and Feeders.

(a) Interior Installations. In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Part II of Article 336 and shall comply with the applicable provisions of Article 300.

FPN: See 310-10 for temperature limitation of conductors.

(b) Exterior Installations. In addition to the provisions of this article, service-entrance cable used for feeders or branch circuits, where installed as exterior wiring, shall be installed as required by Article 225. The cable shall be supported in accordance with 336-18, unless used as messenger-supported wiring as allowed by Article 321.

Type USE cable shall be installed outside in accordance with the provisions of Article 339. Where Type USE cable emerges above ground at terminations, it shall be protected in accordance with 300-5(d).

Multiconductor service-entrance cable shall be permitted to be installed as messenger-supported wiring in accordance with Articles 225 and 321.

338-24. Bending Radius. Bends in Type USE and SE cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend, during or after installation, shall not be less than five times the diameter of the cable.

III. Construction.

338-120. Marking. Service-entrance cable shall be marked as required in 310-11. Cable with the neutral conductor smaller than the ungrounded conductors shall be so marked.

SUBSTANTIATION: This revision to Article 338 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-196, 7-197, 7-198, and 7-210.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1385)

7- 196 - (338): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Add " I. General" before Section 338-1.

Add " II. Installation" before Section 338-10 (New).

Add " III. Construction Specifications" before Section 338-120 (New).

Revise existing 338-2, 338-3 and 338-4 as follows:

~~338-2.~~ 338-10. Uses Permitted. ~~as Service-Entrance Conductors.~~

(a) Service-Entrance Conductors. Service-entrance cable used as service-entrance conductors shall be installed as required by Article 230.

Type USE used for service laterals shall be permitted to emerge above ground outside at terminations in meter bases or other enclosures where protected in accordance with Section 300-5(d).

~~338-3.~~ (b) ~~Uses Permitted as~~ Branch Circuits or Feeders.

~~(a)~~ (1) Grounded Conductor Insulated. Type SE service-entrance cables shall be permitted in interior wiring systems where all of the circuit conductors of the cable are of the rubber-covered or thermoplastic type.

~~(b)~~ (2) Grounded Conductor Not Insulated. Type SE service-entrance cables without individual insulation on the grounded circuit conductor shall not be used as a branch circuit or as a feeder within a building, except a cable that has a final nonmetallic outer covering and is supplied by alternating current at not over 150 volts to ground shall be permitted as a feeder to supply only other buildings on the same premises.

Type SE service-entrance cable shall be permitted for use where the fully insulated conductors are used for circuit wiring and the uninsulated conductor is used for equipment grounding purposes.

~~(c)~~ (3) Temperature Limitations. Type SE service-entrance cable used to supply appliances shall not be subject to conductor temperatures in excess of the temperature specified for the type of insulation involved.

~~338-4.~~ (4) Installation Methods for Branch Circuits and Feeders.

(a) Interior Installation. In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Parts A and B of Article 336 and shall comply with the applicable provisions of Article 300.

(FPN): See Section 310-10 for temperature limitation of conductors.

(b) Exterior Installation. In addition to the provisions of this article, service-entrance cable used for feeders or branch circuits, where installed as exterior wiring, shall be installed as required by Article

225. The cable shall be supported in accordance with Section 336-18, unless used as messenger-supported wiring as allowed by Article 321.

Type USE cable shall be installed outside in accordance with the provisions of Article 339. Where Type USE cable emerges above ground at terminations, it shall be protected in accordance with Section 300-5(d).

Multiconductor service-entrance cable shall be permitted to be installed as messenger-supported wiring in accordance with Article 225 and 321.

Revise "338-5. Marking." to "338-120. Marking."

Revise "338-6. Bends." To "338-24. Bending Radius."

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.

A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel Code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-195a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1352)

7- 197 - (338-1): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Add 338-1 (New) as follows:

338-1. Scope. This article covers the use, installation, and construction specifications of service-entrance cable.

Renumber existing Sections accordingly.

SUBSTANTIATION: NEC Style Manual Section 2.2.1 requires that each Article contain a Scope.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-195a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2064)

7- 198 - (338-1): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add a Scope section to Article 338 to read as follows:

338-1. Scope. The provisions of this article covers the use and installation requirements of service-entrance cable.

Renumber remaining sections.

SUBSTANTIATION: Each Article should have a scope section.

The NEC style manual on style also shows a scope article.

To keep the Articles consistent all Articles should be similar.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-195a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2221)

7- 199 - (338-1(a) and (b)): Reject

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."

SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

PANEL ACTION: Reject.

PANEL STATEMENT: The term "flame-retardant" is used throughout the Code as a means of expressing to the user that the material resists ignition or the spread of flames, albeit the test methods are often not defined. The term "flame tested" is similarly undefined, but can be understood to mean a test which does not necessarily measure the ability of a material to resist ignition or flame propagation. Some articles of the NEC offer information regarding the tests deemed appropriate for the required level of resistance to ignition or flame propagation. Others rely on the product standard to provide such information. The panel suggests that specific proposals be made wherever the generic reference to "flame retardant" is not sufficient.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

COMMENT ON AFFIRMATIVE:

STEWART: The panel statement is correct. Changing the words "flame tested" is an undefined term that would lead to improper testing for the intended application.

TEMBLADOR: See comment on Ravi Gantra's Proposal 6-3.

(Log #365)

7- 200 - (338-1(b)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise second paragraph:

Cabled ~~single conductor~~ Type USE constructions recognized for underground use may have a bare copper conductor cabled with the assembly. Type USE ~~single~~ parallel or cabled conductor assemblies recognized for underground use may have a bare copper concentric conductor applied. These constructions do not require an outer covering overall.

SUBSTANTIATION: Editorial. If a single (insulated) conductor is "cabled" with a bare conductor it seems it is no longer a single-conductor cable.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed change does not enhance the clarity of this section. The present terminology is commonly understood.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #3902)

7- 201 - (338-2): Reject

SUBMITTER: Alfred A. Fiorello, Fiorello Electric Inc.

RECOMMENDATION: Add new text to read as follows:

"Service entrance cable shall be sealed with a suitable, listed sealant, at service entrance caps to prevent the entry of water into the cable."

SUBSTANTIATION: Where service entrance cable is tied into service drop wires, a big problem exists when it rains. As the service drop is shaken by the wind, a capillary action causes the water on the uninsulated service cable to travel up into the cable. Once a little

water gets into the cable, it acts like a siphon and as it goes into the cable it sucks more water into the cable. Over time, the water rusts out the meter equipment and the electric panel. NEMA recommends any circuit breaker which gets wet should be replaced. Thousands of these problems of malfunctioning main and branch circuit breaker wiring could be prevented. How safe is a circuit breaker which doesn't trip? The panels rust out and must replaced.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 230-54 and proper workmanship adequately cover the requirements for preventing the entrance of water or moisture into service equipment. The submitter has not provided any documented instances where this issue has resulted in a problem.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #830)

7- 202 - (338-3(a), (b) and Exception (New)): Accept
Note: The Technical Correlating Committee directs the Panel to correlate the action on this Proposal with the action on Proposals 7-203 and 7-209.
The Technical Correlating Committee understands that the recommended text replaces the text in 338-10(b)(1) and (2) in Proposal 7-195a.
This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(a) Grounded Conductor Insulated. Type SE service-entrance cable shall be permitted in ~~interior~~ wiring systems where all of the circuit conductors of the cable are of the rubber-covered or thermoplastic type.
(b) Grounded Conductor Not Insulated. Type SE service-entrance cable without individual insulation on the grounded circuit conductor shall not be used as a branch or feeder ~~within a building,~~ except a cable that has a final nonmetallic covering and is supplied by alternating-current at not over 150 volts to ground shall be permitted as a feeder or branch circuit ~~to~~ supply conductors only for other buildings or structures on the same premises.
Exception: A bare grounded conductor shall be permitted in accordance with Section 250-140.
SUBSTANTIATION: Article 225 apparently does not prohibit Type SE cable for use outside on buildings. Since it is permitted outside as service conductors, why should feeder or branch circuit use be limited to interior wiring? Since present requirements for insulated conductors applies for interior wiring, it is not clear whether cable with an uninsulated grounded conductor can be used on the exterior of buildings where not used as a feeder for other buildings. Uninsulated grounded conductors can present the same potential hazard whether inside or outside of buildings. If an uninsulated grounded conductor is suitable as a feeder to other buildings, why not as a branch circuit supply? The number and size of conductors could be exactly the same for a feeder or branch circuit. An uninsulated grounded conductor should also be suitable as supply conductors to structures other than buildings.
The exception is proposed for correlation with Section 250-140.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel directs staff to insert the existing second paragraph of Section 338-3(b) after the new exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3885)

7- 203 - (338-3(b)): Accept in Principle
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Change the first paragraph of this section as follows:
(b) Grounded Conductor Not Insulated. Type SE service-entrance cables without individual insulation on the grounded circuit conductor shall not be used as a branch circuit or as a feeder within a building. A ~~except a~~ cable that has a final nonmetallic outer covering and is supplied by alternating current at not over 150 volts to ground shall be permitted as a feeder to supply only other buildings or structures on the same premises where the grounded conductor is grounded at the additional building or structure as provided in Section 250-32(b)(2).
SUBSTANTIATION: These changes will bring this section into compliance with Section 250-32(b)(2) which permits the grounded system conductor to be grounded at additional buildings or structures under specific conditions. Type SE cable with an uninsulated conductor should be permitted as a feeder to other buildings or structures only where the grounded conductor is grounded as provided in Section 250-32(b)(2).
PANEL ACTION: Accept in Principle.
Revise the proposed wording to read:
338-3. Uses Permitted as Branch Circuits or Feeders.
(a) Grounded Conductor Insulated. Type SE service-entrance cables shall be permitted in wiring systems where all of the circuit conductors of the cable are of the rubber-covered or thermoplastic type.
(b) Grounded Conductor Not Insulated. Type SE service-entrance cables shall be permitted for use where the insulated conductors are used for circuit wiring and the uninsulated conductor is used only for equipment grounding purposes.
Exception: Uninsulated conductors shall be permitted as the a grounded conductor in accordance with 250-140.
PANEL STATEMENT: The panel's action addresses the submitter's concern and improves the clarity of this section. The revision to 338-3(a) and the addition of the new exception to 338-3(b) is a result of the panel's action on Proposal 7-202.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #831)

7- 204 - (338-3(d) (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
"Ampacity. The ampacity of Type SE cable shall be that of 75°C (167°F) conductors in accordance with Section 310-15."
SUBSTANTIATION: The ampacity of Type SE cable is not specified in this article nor specifically indicated in Table 310-16. The UL "white book" indicates the conductors are Type RHW, XHHW, or THWN, 75°C rated. The proposal would be a user friendly addition.
PANEL ACTION: Reject.
PANEL STATEMENT: The conductors of Type SE cable can be either 75 or 90 degree C insulation and those ampacities can be used for ampacity correction and adjustment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #832)

7- 205 - (338-4(a)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 6-84. The Technical Correlating Committee understands that the action text replaces 338-10(b)(4)(a) of Proposal 7-195a.
This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(a) Interior Installations. In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Part A and B of Article 336, excluding Section 336-26, and shall comply with the applicable provisions of Article 300.
SUBSTANTIATION: Edit. Section 336-26 is in Part B. Since Type SE cable contains insulated conductors rated for 75°C, ampacity should be based on that rating. If the panel feels a 60°C ampacity should be adhered to, a provision should be made to permit the 75°C rating for derating purposes, similar to the second paragraph of Section 336-26.
PANEL ACTION: Accept in Principle.
Revise the proposed text:
"Interior Installations. In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Parts A and B of Article 336, excluding Section 336-26."

PANEL STATEMENT: The panel has accepted the proposal in principle, deleting the reference to Article 300 in accordance with the NFPA NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
STRANIERO: Type SE cables are constructed from the same insulation and jacket materials as other wiring used for interior branch circuit wiring. Where embedded in thermal insulation, type SE is subjected to the same temperature degradation and the same rules of physics as the other types of wire. There is no reason Type SE should be subjected to less stringent requirements.

(Log #2222)

7- 206 - (338-4(a)): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Revise to read:
In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements <u>other than 336-26</u> of Parts A and B of Article 336 and shall comply with the applicable provisions of Article 300.
SUBSTANTIATION: During the 1999 NEC cycle, proposal 7-119 and comment 7-182, changed the text of 336-30 (renumbered as 336-26). This change, although appropriate for Article 336, is not appropriate for Article 338. Ampacity requirements for products in Article 338 are already addressed in Chapter 3. Requirements in 336-30 (new 336-26) are specific to the products in Article 336.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 7-205.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
STRANIERO: See my Explanation of Negative Vote on Proposal 7-205.

(Log #3907)

7- 207 - (338-4(a)): Accept in Principle
SUBMITTER: Ronald E. Gnotke, Rep. Minnesota Board of Electricity
RECOMMENDATION: Revise text to read as follows:
338-4(a) Interior Installations. In addition to the provisions of this article, Type SE service-entrance cable used for interior within shall comply with the installation requirements of Parts A and B of Article 336, <u>except Section 336.26,</u> and shall comply with the applicable provisions of Article 300.
SUBSTANTIATION: The application of a 60°C rating on SE when used for electric ranges appears to have become more restricted than necessary when Section 336.26 was added to the 1996 NEC. A #8/4 SE aluminum cable for example supplying a range in the 1999 NEC is restricted to a maximum of 30 ampere overcurrent device. In previous code revisions, this cable was adequately protected at 40 amperes at the 75°C rating. This cable is rarely used to supply lighting fixtures which require supply conductors of 90°C. If an installer uses a raceway for this circuit and pulls in #8 aluminum RHW, XHHW, or THWN, a 40 ampere overcurrent device would be code compliant for 75°C conductors. Assuming that an electric range normally has a power consumption time of 3 hours or less, and is less than 80 percent loaded on the branch circuit, there would appear to be no hazard created by protecting this cable at 40 amperes.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 7-205.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
STRANIERO: See my Explanation of Negative Vote on Proposal 7-205.

(Log #4207)

7- 208 - (338-4(a)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
(a) Interior Installations. In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Parts A and B of Article 336. <u>Section 336-26 shall only apply where Type SE cable runs in thermal insulation. The installation</u> ~~and~~ shall comply with the applicable provisions of Article 300.
SUBSTANTIATION: Due to the relocation of the 60°C rule from Part C to Part B in the last cycle, Type SE cable installed within buildings has, inadvertently, come under its restrictions. This wiring method has never had those limitations applied to it, there wasn't any substantiation to do it at this time, and in general it shouldn't now.
However, what immediately follows this provision is a FPN about Sec. 310-10. This NEMA proposal (Proposal 7-131 in the A86TCR) had elaborate substantiation that CMP 7 should review. It described actual testing involving this wiring method, specifically No. 2 SEU Aluminum XHHW. When this cable was embedded in cellulose insulation, it rapidly exceeded its temperature rating at currents well below its table ampacity. For example, at just 65A this 100A 90°C cable already was running at 96°C. Another test showed the overall jacket completely charred when the cable ran at its rated current, but under a 7-in. insulation blanket. To give the conduit folks equal time, another test involving No. 6 THHN in a metal conduit produced similar overheating in the area of insulation contact on the pipe.
This proposal provides a small safety factor, not enough but better than nothing, to address this issue. When installers and designers come up against a rule that says they can't use the cable in anywhere near the way the were probably planning if the cable runs in insulation, they'll most likely make sure it doesn't run in insulation. That's the best result. As long as it stays out of insulation, it can function and be installed just as it always has.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation to limit the ampacities of Type SE cable as specified in Section 336-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 1
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
STRANIERO: See my Explanation of Negative Vote on Proposal 7-205.

(Log #3759)

7- 209 - (338-4(b)): Accept
Note: The Technical Correlating Committee understands that the accepted text replaces the second paragraph of 338-10(b)(4)(b) of Proposal 7-195a.
SUBMITTER: Timothy M. Croushore, Allegheny Power Service Corp.
RECOMMENDATION: Reword the second paragraph of (b) to read as follows:
"Type USE cable shall be installed outside in accordance with the provisions of Article 339. Type USE shall be permitted to be terminated in enclosures at an indoor location where Type USE cable emerges above ground. The length of the cable extending indoors to the first termination box shall not exceed 6 ft. Where Type USE cable emerges above ground at termination's, it shall be protected in accordance with Section 300-5(d)."
SUBSTANTIATION: This change allows short lengths of Type USE cable to be terminated indoors. Currently, some inspectors interpret this section and not allow Type USE cable installed indoors at the first termination point. In their opinion, this type cable must be terminated outdoors in order to be used. However, many electrical inspectors will permit this type of cable to be used as manufactured home feeder cable, which is terminated within the manufactured home. There have not been any reports of problems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1353)

7- 210 - (338-6): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise existing 338-6 (338-24 new) as follows:

~~338-6. Bends.~~ 338-24. Bending Radius. Bends in Type USE and SEcable shall be made~~, and other handlings shall be such,~~ so that the ~~protective coverings of the~~ cable will not be damaged~~. , and the~~ The radius of the curve of the inner edge of any bend, during or after installation, shall not be less than five times the diameter of the cable.

SUBSTANTIATION: 1. " and other handlings" was deleted as it does not concern bending. In addition, the phrase "as such" was deleted because it should be followed by an example as required by NEC Style Manual Section 3.3.4. The phrase "during or after installation" was added to use wording consistent with the current requirement in Section 300-34.

2. "protective coverings" was deleted as the requirement for not causing damage applies to the whole cable not just the "protective coverings".

3. Other suggested changes are editorial and provide clarity.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-195a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

ARTICLE 339 — UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE: TYPE UF

(Log #CP714)

7- 210a - (339): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: CMP 7

RECOMMENDATION: Rewrite Article 339 to comply with NEC Style Manual.

ARTICLE 339 -- Underground Feeder and Branch-Circuit Cable: Type UF

I General

339-1. Scope. This article covers the use, installation, and construction specifications for Underground Feeder and Branch-Circuit Cable, Type UF.

339-2. Definition.

Underground Feeder and Branch-Circuit Cable, Type UF. A listed factory assembly of one or more insulated conductors with an integral or an overall covering of nonmetallic material suitable for direct burial in the earth.

339-10. Uses Permitted. Type UF cable shall be permitted:

(1) For use underground, including direct burial in the earth. For underground requirements, see 300-5.

(2) As feeder or branch-circuit cable where provided with overcurrent protection of the rated ampacity as required in 339-4.

(3) As single-conductor cables. Where so installed, all cables of the feeder circuit or branch circuit, including the neutral and equipment grounding conductor, if any, shall be run together in the same trench or raceway.

(4) For interior wiring in wet, dry, or corrosive locations under the recognized wiring methods of this Code,

(5) Installed as nonmetallic-sheathed cable. Where so installed, the installation and conductor requirements shall comply with the provisions of Article 336 and shall be of the multiconductor type.

(6) For solar photovoltaic systems in accordance with 690-31.

(7) As single-conductor cables as the nonheating leads for heating cables as provided in 424-43.

(8) Supported by cable trays. Type UF cable supported by cable trays shall be of the multiconductor type.

FPN: See 310-10 for temperature limitation of conductors.

339-12. Uses Not Permitted. Type UF cable shall not be used:

(1) As service-entrance cable

(2) In commercial garages

(3) In theaters and similar locations.

(4) In motion picture studios

(5) In storage battery rooms

(6) In hoistways, or on elevators or escalators.

(7) In hazardous (classified) locations

(8) Embedded in poured cement, concrete, or aggregate, except where embedded in plaster as nonheating leads where permitted in 424-43

(9) Where exposed to direct rays of the sun, unless identified as sunlight resistant

(10) Where subject to physical damage

339-24. Bending Radius. Bends in Type UF cable shall be made so that the cable shall not be damaged. The radius of the curve of the inner edge of any bend shall not be less than five times the diameter of the cable.

339-80. Ampacity The ampacity of Type UF cable shall be that of 60º C (140º F) conductors in accordance with 310-15..

III Construction Specifications

339-104. Conductors. The conductors shall be sizes 14 AWG copper or 12 AWG aluminum or copper-clad aluminum through 4/0 AWG.

339-108. Equipment Grounding. In addition to the insulated conductors, the cable shall be permitted to have an insulated or bare conductor for equipment grounding purposes only.

339-112. Insulation. The conductors of Type UF shall be one of the moisture-resistant types listed in Table 310-13 that is suitable for branch-circuit wiring or one that is identified for such use.

339-116. Sheath. The overall covering shall be flame retardant; moisture, fungus, and corrosion resistant, and suitable for direct burial in the earth.

SUBSTANTIATION: This revision to Article 339 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-211, 7-212, 7-213, 7-214, 7-217, 7-218, 7-219, 7-221, 7-225, 7-227 and 7-231.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1386)

7- 211 - (339): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise text to read as follows:

Article 339 –Underground Feeder and Branch-Circuit Cable: Type UF

I. General

~~339-1 Description and Marking. (a) Description.~~

339-2. Definition. Underground feeder and branch-circuit cable (Type UF). ~~shall be a~~ A listed ~~Type UF~~ cable in sizes No. 14 copper or No. 12 aluminum or copper-clad aluminum through No. 4/0. The conductors of Type UF shall be one of the moisture-resistant types listed in Table 310-13 that is suitable for branch-circuit wiring or one that is identified for such use. In addition to the insulated conductors, the cable shall be permitted to have an insulated or bare conductor for equipment grounding purposes only. The overall covering shall be flame retardant; moisture, fungus, and corrosion resistant; and suitable for direct burial in the earth.

~~339-2.~~ 339-3. Other Articles. In addition to the provisions of this article, installations of underground feeder and branch-circuit cable (Type UF) shall comply with other applicable provisions of this Code, especially Article 300 and Section 310-13.

II. Installation

~~339-3. Use~~

~~339-3(a)~~ 339-10. Uses Permitted.

1. Type UF cable shall be permitted for use underground, including direct burial in the earth, as feeder or branch-circuit cable where provided with overcurrent protection of the rated ampacity as required in Section 339-4.

2. Where single-conductor cables are installed, all cables of the feeder circuit or branch circuit, including the neutral and equipment grounding conductor, if any, shall be run together in the same trench or raceway.

3. For underground requirements, see Section 300-5.

4. Type UF cable shall be permitted for interior wiring in wet, dry, or corrosive locations under the recognized wiring methods of this Code, and, where installed as nonmetallic-sheathed cable, the installation and conductor requirements shall comply with the provisions of Article 336 and shall be of the multiconductor type.
5. For solar photovoltaic systems in accordance with Section 690-31.
6. Single-conductor cables shall be permitted as the nonheating leads for heating cables as provided in Section 424-43.

Type UF cable supported by cable trays shall be of the multiconductor type.

FPN: See Section 310-10 for temperature limitation of conductors.

~~339-3(b)~~ 339-12. Uses Not Permitted. Type UF cable shall not be used in the following:
1. As service-entrance cables
2. In commercial garages
3. In theaters
4. In motion picture studios
5. In storage battery rooms
6. In hoistways
7. In any hazardous (classified) location
8. Embedded in poured cement, concrete, or aggregate, except where embedded in plaster as nonheating leads as provided in Article 424
9. Where exposed to direct rays of the sun, unless identified as sunlight resistant
10. Where subject to physical damage

~~339-5.~~ 339-80. Ampacity. The ampacity of Type UF cable shall be that of 60°C (140°F) conductors in accordance with Section 310-15.

~~339-4.~~ 339-90. Overcurrent Protection. Overcurrent protection shall be provided in accordance with the provisions of Section 240-3.

III. Construction Specifications

~~339-1.(b)~~

339-120. Marking. The cable shall be marked in accordance with Section 310-11.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.

A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel Code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1354)

7- 212 - (339-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a new Section as follows:

339-1. Scope. This article covers the use, installation, and construction specifications for Underground Feeder and Branch-Circuit Cable, Type UF.

Renumber existing 339-1 to 339-2
339-2 to 339-3
339-3 to 339-4
339-4 to 339-5
339-5 to 339-6

SUBSTANTIATION: NEC Style Manual requires that each article contain a statement of scope and that the scope statement be the first section of the Article. See NEC Style Manual 2.2.1, 2.2.2.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1356)

7- 213 - (339-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a new definition of Type UF cable. Relocate existing description specifications to new III. Construction Specifications. Revise existing 339-1 (339-2 New) to read as follows:

339-2 Definition. Underground feeder and branch-circuit cable (Type UF). A listed factory assembly of one or more insulated conductors with an integral or an overall covering of nonmetallic material suitable for direct burial in the earth.

Relocate portions of existing text in Section 339-1 to New Part III sections as follows:

III. Construction Specifications

339-104. Conductors. The conductors shall be sizes No. 14 copper or No. 12 aluminum or copper-clad aluminum through ~~No.~~ 4/0 AWG.

339-108. Equipment Grounding. In addition to the insulated conductors, the cable shall be permitted to have an insulated or bare conductor for equipment grounding purposes only.

339-112. Insulation. The conductors of Type UF shall be one of the moisture-resistant types listed in Table 310-13 that is suitable for branch-circuit wiring or one that is identified for such use.

339-116. Sheath. The overall covering shall be flame retardant; moisture, fungus, and corrosion resistant; and suitable for direct burial in the earth.

SUBSTANTIATION: Section 339-1 contains information concerning "Construction Specifications." The section was relocated to III. Construction Specs. Specific construction information was placed under the appropriate revised numbering system section. A new definition was added for consistency with other cable & wiring articles.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2096)

7- 214 - (339-1): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a Scope section to Article 339 to read as follows:

339-1. Scope. The provisions of this article covers the use and installation requirements of underground feeder and branch-circuit cable.

Renumber remaining sections.

SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2223)

7- 215 - (339-1): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The

NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

PANEL ACTION: Reject.

PANEL STATEMENT: The term "flame-retardant" is used throughout the Code as a means of expressing to the user that the material resists ignition or the spread of flames, albeit the test methods are often not defined. The term "flame tested" is similarly undefined, but can be understood to mean a test which does not necessarily measure the ability of a material to resist ignition or flame propagation. Some articles of the NEC offer information regarding the tests deemed appropriate for the required level of resistance to ignition or flame propagation. Others rely on the product standard to provide such information. The panel suggests that specific proposals be made wherever the generic reference to "flame retardant" is not sufficient.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

COMMENT ON AFFIRMATIVE:

STEWART: The panel statement is correct. Changing the words "flame tested" is an undefined term that would lead to improper testing for the intended application.

TEMBLADOR: See comment on Ravi Gantra's Proposal 6-3.

(Log #1065)

7- 216 - (339-1(a)): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change:

"No. 14" to "14 AWG"

"No. 12" to "12 AWG"

"No. 4/0" to "4/0 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1855)

7- 217 - (339-1(b)): Accept in Principle

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Delete 339-1(b). Marking. in its entirety.

SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3 and 4 apply generally.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1355)

7- 218 - (339-2): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Delete Section 339-2 (339-3 New)

~~339-2. 339-3. Other Articles. In addition to the provisions of this article, installations of underground feeder and branch circuit cable (Type UF) shall comply with other applicable provisions of this Code, especially Article 300 and Section 310-13.~~

SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1424)

7- 219 - (339-2): Accept in Principle

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Delete 339-2 in its entirety.

SUBSTANTIATION: 1999 National Electrical Code Style Manual:

Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."

Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #833)

7- 220 - (339-3): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise:

(a) Uses Permitted. (1) Type UF cable shall be permitted for use underground, including direct burial in the earth, as feeder or branch circuit ~~cable~~ conductors. ~~where provided with overcurrent protection of the rated ampacity as required in Section 339-4.~~

(2) ~~Where single conductor cables are installed, all cables of the feeder or branch circuit, including the neutral and equipment grounding conductor, if any, shall be run together in the same trench or raceway.~~ All conductors of the same circuit and, where used, the equipment grounding conductor shall be contained in the same raceway or multiconductor cable.

Exception No. 1: Conductors in parallel as specified in Section 310-4 shall be permitted in separate raceways or cables provided each phase, polarity, grounded conductor, and equipment grounding conductor is contained in each raceway or multiconductor cable.

Exception No. 2: Switch loops shall be permitted to consist of only those conductors connected to the switching device(s) and, where used, the equipment grounding conductor.

(3) For underground requirements, see Section 300-5.

(4) Type UF cable shall be permitted for ~~interior~~ wiring in wet, dry, or corrosive locations under the recognized wiring methods of this Code, and, where ~~installed as nonmetallic sheathed cable, the installation and conductor requirements shall comply with~~ of the multiconductor type shall be permitted to be installed under the provisions of Article 336, except it shall be permitted in wet locations . ~~and shall be of the multiconductor type.~~

(5) No change

(6) No change

(7) Type UF cable shall be permitted to be supported by cable trays ~~shall be~~ where of the multiconductor type or installed in a raceway.

FPN: No change

(b) Uses Not Permitted. Type UF cable shall not be used in e following:

(1) As service-entrance conductors. ~~cables~~.

(2) In commercial garages having hazardous (classified) locations.

(3) No change

(4) No change

(5) No change

(6) No change

(7) No change

(8) No change
(9) No change
(10) No change
Exception No 1 for (7): Multiconductor Type UF cable shall be permitted in accordance with Sections 501-4(b) Exception, and 502-4(b) Exception.
Exception No. 2 for (1) through (8): Single-conductor Type UF cable shall be permitted in approved raceways.
Exception No. 3 for (3) and (4): Multiconductor Type UF cable shall be permitted where nonmetallic-sheathed cable is permitted by Section 520-5(c).

SUBSTANTIATION: Edit. In (a)(1) the reference to OCP is superfluous as it is covered in the following section. In (a)(2) the proposal includes multiconductor cables and "all conductors of the same circuit" includes neutrals.

Proposed Exceptions No. 1 and 2 for (a) appear to be necessary as the text doesn't provide for those installations.

Proposed (a)(4) deletes "interior" as recognized wiring methods appears to permit Type UF where suitable for exterior installation (wet locations, sunlight resistant, in raceways). "Exposed to direct rays of the sun" suggests exterior installation and (b)(10) provides for necessary protection. Section 336-6 permits exposed installation where in accordance with that article.

Type UF cable may be installed in conformance with Article 336 but does not transform into another type cable and Article 336 doesn't provide for wet locations.

In (b)(2) commercial garages should be qualified as having hazardous (classified) locations as Section 511-2 indicates some garages are not classified.

The proposed exceptions for (b) conform to recognized wiring methods permitted elsewhere in the Code and provide clarification.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed wording adds language that is presently covered in the Code and it is not necessary to provide the additional cross-references. There is proposed new text that does not have technical substantiation. See panel's editorial action on Proposal 7-210a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1358)

7- 221 - (339-3): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise existing 339-3 (339-10 New) to convert text to a list.

~~339-3.~~ 339-10. Use.
~~(a)~~ Uses Permitted.
~~1.~~ Type UF cable shall be permitted:
(a) For ~~for~~ use underground, including direct burial in the earth.~~,~~ For underground requirements, see Section 300-5.
(2) As ~~as~~ feeder or branch-circuit cable where provided with overcurrent protection of the rated ampacity as required in Section 339-4.
(3) ~~2.~~ As ~~Where~~ single-conductor cables. Where so ~~are~~ installed, all cables of the feeder circuit or branch circuit, including the neutral and equipment grounding conductor, if any, shall be run together in the same trench or raceway.
~~3. For underground requirements, see Section 300-5.~~
~~4. Type UF cable shall be permitted~~
(4) For ~~for~~ interior wiring in wet, dry, or corrosive locations under the recognized wiring methods of this Code,
(5) ~~and, where installed~~ Installed as nonmetallic-sheathed cable~~,~~. Where so installed, the installation and conductor requirements shall comply with the provisions of Article 336 and shall be of the multiconductor type.
(6) ~~5. For~~ For solar photovoltaic systems in accordance with Section 690-31.
(7) ~~6. Single~~ As single-conductor cables ~~shall be permitted~~ as the nonheating leads for heating cables as provided in Section 424-43.
(8) Supported ~~supported~~ by cable trays. Type UF cable supported by cable trays shall be of the multiconductor type.
FPN: See Section 310-10 for temperature limitation of conductors.

SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that where possible lists or tables be used to present requirements, rather than long text descriptions.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #835)

7- 222 - (339-3(a)(1)): Accept in Part

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 7-210a. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise:

(1) Type UF cables shall be permitted for use underground, including direct burial in the earth as feeders ~~or~~ branch circuits, ~~cable~~ or tap conductors, for power, lighting, control, and signal circuits. ~~Where provided with overcurrent protection of the rated ampacity as required in Section 339-4.~~

SUBSTANTIATION: Edit. The limitation of use to feeders or branch circuits may be interpreted as not permitting use as tap conductors or control and signal circuits. Sections 330-3 and 334-3 indicate power and lighting (which could be tap conductors) and control and signal circuits. Limitation of use in this section infers such other use is literally not permitted. Overcurrent protection is a different category.

PANEL ACTION: Accept in Part.

Revise first sentence to read:

"Type UF cables shall be permitted for use underground, including direct burial in the earth as feeders or branch circuits where..."

PANEL STATEMENT: The accepted change conforms with the NFPA NEC Manual of Style.

The panel rejects the remainder of the proposed text as Section 339-3(a) is not intended to be an all inclusive list of uses permitted, but a list of common applications for the wiring method. Uses not permitted are specifically covered in Section 339-3(b) and the wiring methods proposed by the submitter are not excluded.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2170)

7- 223 - (339-3(a)(3) and FPN (New)): Reject

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

~~(3) For underground requirements, see Section 300-5.~~
FPN: See 300-5 for underground requirements.

SUBSTANTIATION: This deleted sentence is an explanatory reference to another NEC rule; therefore, it should be a fine print note. The NEC Style Manual 4.1 states, "Explanatory references shall be in fine print notes." The Style Manual 4.1.2 also states, "... references shall include only the number of the rule being referenced; the word section,... shall not be used.

PANEL ACTION: Reject.

PANEL STATEMENT: The inclusion of this text as a Fine Print Note could cause confusion that application of Section 300-5 is not mandatory. The panel's editorial action on Proposal 7-210a has deleted unnecessary redundant references.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2168)

7- 224 - (339-3(a)(5)): Accept in Principle

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

(5) Type UF cable shall be permitted for solarvoltaic systems in accordance with Section 690-31.

SUBSTANTIATION: This is not a complete sentence like the rest of the subsections of 339-3(a). Revise the subsection to make it a complete sentence. This change will also provide parallel construction in accordance with the NEC Style Manual 3.3.5 Lists which states, "Parallel Construction means stating similar requirements in similar ways", for example using all complete sentences in related subsections.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concern has been addressed by the Panel's action on Proposal 7-210a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1359)

7- 225 - (339-3(b)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Relocate the text contained in 339-3(b) to new 339-12 and revise to read as follows:
339-12. Uses Not Permitted. Type UF cable shall not be used ~~in the following~~:
(1) As service-entrance cable~~s~~
(2) In commercial garages
(3) In theaters and similar locations,
(4) In motion picture studios
(5) In storage battery rooms
(6) In hoistways, or on elevators or escalators
(7) In ~~any~~ hazardous (classified) locations,
(8) Embedded in poured cement, concrete, or aggregate, except where embedded in plaster as nonheating leads where permitted in 424-43 ~~as provided in Article 424~~
(9) Where exposed to direct rays of the sun, unless identified as sunlight resistant
(10) Where subject to physical damage
SUBSTANTIATION: "As provided" was replaced with "where permitted" to aid in word clarity in accordance with NEC Style Manual Section 3.3.4.
NEC Style Manual Section 4.1.1 prohibits referencing an entire Article unless additional conditions are specified. Referencing parts within Articles is permitted.
(6) was revised to provide consistent text in all the wire and cable articles.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #3813)

7- 226 - (339-3(b)(2) (New)): Accept in Principle
Note: The Technical Correlating Committee understands the new text is Item 11 of 339-12 in Proposal 7-210a.
SUBMITTER: Douglas Hansen, Codecheck
RECOMMENDATION: Add new item 2 to read "As overhead feeders." Renumber the remaining portion of the section.
SUBSTANTIATION: This proposal would correct a common hazardous practice. Overhead conductors without support are subjected to bending stresses and stretching. UF cable is not permitted as service entrance cable, yet nothing presently prohibits the common practice of stringing it overhead between buildings. The code presently addresses only the installation requirements in buildings or underground. Support every 4 1/2 ft is already required indoors, but not outdoors.
PANEL ACTION: Accept in Principle.
Amend the proposed text to read:
"As overhead cable except where installed as messenger supported wiring in accordance with Article 321."
PANEL STATEMENT: The use of this type of cable is permitted as an overhead cable where installed accordance with Section 321-3(a). The panel agrees with the submitter's concern that multiconductor Type UF cable is not intended to be installed without support or messenger.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1360)

7- 227 - (339-4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete Section 339-4.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #834)

7- 228 - (339-5): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Ampacity. Conductors shall be rated at 90°C (194°F). The ampacity of Type UF cable shall be that of 60°C (140°F) conductors in accordance with Section 310-15. The 90°C (194°F) rating shall be permitted to be used for ampacity derating purposes provided the final derated ampacity does not exceed that for a 60°C (140°F) rated conductor.
SUBSTANTIATION: Section 339-3(a)(4) requires compliance with provisions of Article 336 where installed in accordance with that article. There doesn't seem to be a valid safety reason to restrict Type UF more than Type NM. Present Code deters use as nonmetallic sheathed cable due to conductor temperature restrictions.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 339-3(a)(4) refers to the requirements of Article 336 where multiconductor Type UF cable is installed as nonmetallic-sheathed cable. Therefore the requirement of Section 336-30(b) for 90 degree C conductors is applicable. There is no substantiation provided to require that all UF cable have 90 degree C conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1856)

7- 229 - (339-5): Reject
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise as follows:
339-5. Ampacity. The ampacity of Type UF cable shall be determined ~~that of 60°C (140°F) conductors~~ in accordance with ~~Section~~ 310-15.
The ampacity shall be in accordance with the 60°C (140°F) conductor temperature rating. The 90°C (194°F) rating shall be permitted to be used for ampacity derating purposes provided the final derated ampacity does not exceed that for a 60°C (140°F) rated conductor.
The ampacity of Type UF cable installed in cable tray shall be determined in accordance with 318-11.
SUBSTANTIATION: Reworded for clarity and to incorporate text consistent with that used in other cable articles.
Section 4.1.2 of the 1999 National Electrical Code Style Manual stipulates that "...references shall include only the number of the rule being referenced; the word section, subsection, and paragraph shall not be used."
318-3(a) permits Type UF cables to be installed in cable tray; the additional text clarifies what ampacities apply to cable tray.
PANEL ACTION: Reject.
PANEL STATEMENT: Acceptance of this change would mandate that all UF cable have 90 degree C conductor insulation. This is not necessary where the cable is used in underground applications. Section 339-3(a)(4) covers indoor uses of Type UF cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2287)

7- 230 - (339-5): Reject
SUBMITTER: Greg Fretwell, Blue Light Inspection Services
RECOMMENDATION: Remove the entire text of 339-5.
SUBSTANTIATION: Type NM and Type UF are the only wiring methods that have this restriction and I see no relevant difference between them and a method like SE or conductors in raceways. 310-16 conductor and termination ratings should prevail as it does everywhere else.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement is necessary as it relates to product performance and construction requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1357)

7- 231 - (339-24): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a new section to cover requirements for bending as follows:
339-24. Bending Radius. Bends in Type UF cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than five times the diameter of the cable.
SUBSTANTIATION: To promote usability a section on bending is being added to provide consistency and continuity with other similar wire and cable articles, such as Articles 336 and 338. A recommended minimum bending radius of 5 times is based on 336-16.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-210a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

ARTICLE 340 — POWER AND CONTROL TRAY CABLE: TYPE TC

(Log #CP715)

7- 231a - (340): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 340 to comply with NEC Style Manual.
ARTICLE 340 -- Power and Control Tray Cable: Type TC
I General
340-1. Scope. This article covers the use, installation, and construction specifications for Power and Control Tray Cable, Type TC.
340-2. Definition
Power and Control Tray Cable, Type TC. A factory assembly of two or more insulated conductors, with or without associated bare or covered grounding conductors, under a nonmetallic sheath, for installation in cable trays, in raceways, or where supported by a messenger wire.
II Installation
340-10. Uses Permitted. Type TC tray cable shall be permitted to be used in the following:
(1) For power, lighting, control, and signal circuits.
(2) In cable trays, or in raceways, or where supported in outdoor locations by a messenger wire.
(3) In cable trays in hazardous (classified) locations as permitted in Articles 318, 501, 502, 504, and 505 in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation.
(4) For Class 1 circuits as permitted in Article 725.
(5) For nonpower-limited fire alarm circuits if conductors comply with the requirements of 760-27.
(6) In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type TC tray cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring in lengths not to exceed a total of 15 m (50 ft) between a cable tray and the utilization equipment or device.
The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft).
Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable.
(7) Where installed in wet locations, Type TC cable shall also be resistant to moisture and corrosive agents.
FPN: See 310-10 for temperature limitation of conductors.
340-12. Uses Not Permitted. Type TC tray cable shall not be used in the following:
(1) Installed where it will be exposed to physical damage
(2) Installed as open cable on brackets or cleats
(3) Used where exposed to direct rays of the sun, unless identified as sunlight resistant
(4) Direct buried, unless identified for such use
340-24. Bending radius. Bends in Type TC cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than five times the diameter of the cable.
340-80. Ampacity. The ampacity of Type TC tray cable shall be determined in accordance with 318-11 for 14 AWG and larger conductors and in accordance with 402-5 for 18 - 16 AWG conductors.
III Construction Specifications
340-100. Construction. A metallic sheath shall not be permitted either under or over the nonmetallic sheath.
340-104. Conductors. The insulated conductors of Type TC tray cable shall be in sizes 18 AWG through 1000 kcmil copper and sizes 12 AWG through 1000 kcmil aluminum or copper-clad aluminum. Insulated conductors of sizes 14 AWG and larger copper and sizes 12 AWG and larger aluminum or copper-clad aluminum shall be one of the types listed in Tables 310-13 or 310-62 that is suitable for branch circuit and feeder circuits or one that is identified for such use.
(a) Fire Alarm Systems. Where used for fire alarm systems, conductors shall also be in accordance with 760-27.
(b) Thermocouple Circuits. Conductors in Type TC cables used for thermocouple circuits in accordance with Article 725 shall also be permitted to be any of the materials used for thermocouple extension wire.
. (c) Class 1 Circuit Conductors. Insulated conductors of sizes 18 AWG and 16 AWG copper shall also be in accordance with 725-27.
340-116. Sheath. The outer sheath shall be a flame-retardant, nonmetallic material.
340-120. Marking. There shall be no voltage marking on a Type TC cable employing thermocouple extension wire.
SUBSTANTIATION: This revision to Article 340 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-233, 7-234, 7-237, 7-238, 7-246, 7-247, 7-249, 7-250, 7-251, 7-253, and 7-254.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1066)

7- 232 - (340): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 340 as follows:
340-3 - change:
"No. 18" to "18 AWG"
"No. 14" to "14 AWG"
"No. 12" to "12 AWG" in two places.
340-3(d) - revise as follows: "Insulated conductors of ~~sizes No.~~ 18 and ~~No.~~ 16 AWG copper shall also be in accordance with Section 725-27.
340-7 - change "No. 14" to "14 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1387)

7- 233 - (340): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Add "I. General" between the Article heading and the first Section.

Renumber and revise Section 340-1 as follows:

~~340-1.~~ 340-2. Definition. ~~Type TC power and control tray cable~~ Power and control tray cable (Type TC). ~~is a~~ A factory assembly of two or more insulated conductors, with or without associated bare or covered grounding conductors under a nonmetallic sheath, for installation in cable trays, in raceways, or where supported by a messenger wire.

Renumber "340-2. Other Articles" as "340-3. Other Articles."

Add "II. Installation" following the above Section.

Renumber and revise "340-4. Use Permitted." to read "340-10. Uses Permitted." and add Section 340-3(a) before the FPN as (7) to read:

(7) ~~340-3(a) Wet Locations.~~ Where installed in wet locations, Type TC cable shall also be resistant to moisture and corrosive agents.

Renumber "340-5. Uses Not Permitted." as "340-12. Uses Not Permitted."

Renumber and revise "340-8. Bends." to read "340-24. Bending Radius."

Renumber "340-7. Ampacity." as "340-80. Ampacity."

Add "III. Construction Specifications" immediately following the above Section.

Revise Section 340-3 to read as follows:

~~340-3.~~ 340-100. Construction. A metallic sheath shall not be permitted either under or over the nonmetallic sheath.

340-104. Conductors. The insulated conductors of Type TC tray cable shall be in sizes No. 18 through 1000 kcmil copper and sizes No. 12 through 1000 kcmil aluminum or copper-clad aluminum. Insulated conductors of sizes No. 14 and larger copper and sizes No. 12 and larger aluminum or copper-clad aluminum shall be one of the types listed in Tables 310-13 or 310-62 that is suitable for branch circuit and feeder circuits or one that is identified for such use. ~~The outer sheath shall be a flame-retardant, nonmetallic material.~~ [Note – text relocated to 340-116 below.] ~~A metallic sheath shall not be permitted either under or over the nonmetallic sheath.~~ [Note – text relocated to 340-100 above.]

~~(a) Wet Locations. Where installed in wet locations, Type TC cable shall also be resistant to moisture and corrosive agents.~~ [Note – relocated to 340-10 above.]

(a) ~~(b)~~ Fire Alarm Systems. Where used for fire alarm systems, conductors shall also be in accordance with Section 760-27.

(b) ~~(c)~~ Thermocouple Circuits. Conductors in Type TC cables used for thermocouple circuits in accordance with Article 725 shall also be permitted to be any of the materials used for thermocouple extension wire.

~~There shall be no voltage marking on a Type TC cable employing thermocouple extension wire.~~ [Note – text relocated to 340-120 below.]

(c) ~~(d)~~ Class 1 Circuit Conductors. Insulated conductors of sizes No. 18 and No. 16 copper shall also be in accordance with ~~Section~~ 725-27.

Relocate the text from the second sentence of 340-3 to new Section 340-116 to read as follows:

340-116. Sheath. The outer sheath shall be a flame-retardant, nonmetallic material.

Renumber "340-6. Marking." as "340-120. Marking" and relocate the text from the second paragraph of 340-3(c) so the Section reads as follows:

~~340-6.~~ 340-120. Marking. The cable shall be marked in accordance with ~~Section~~ 310-11.

~~340-3.(c)~~ There shall be no voltage marking on a Type TC cable employing thermocouple extension wire.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.

A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel Code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1361)

7- 234 - (340-1): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Add a new Section to read:

340-1. Scope. This article covers the use, installation, and construction specifications for Power and Control Tray Cable: Type TC.

Renumber 340-1 thrrough 340-8 as 340-2 through 340-9.

SUBSTANTIATION: NEC Style Manual Section 2.2.1 requires that each article contain a statement of scope and that the scope statement be the first section of the Article.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1708)

7- 235 - (340-1): Reject

SUBMITTER: Paul Petit, American Insulated Wire Corp.

RECOMMENDATION: Revise text as follows:

340-1. Definition. Type TC Power and Control Tray Cable is a single conductor or a factory assembly of two or more insulated conductors, ...

SUBSTANTIATION: The problem is the confusion with regard to the 1/C cables out in the field marked either "CT USE" or "for use in cable trays." They're not being allowed for uses specifying "TYPE TC." These are clearly 1/C tray cables and should be marked "TC" to eliminate confusion. Section 12-2204 of the Canadian Electrical Code clearly shows that the Canadian CEC recognizes 1/C Type TC Tray Cables.

Note: Supporting material available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Type TC cable was intentionally defined as a factory assembly of two or more insulated conductors under a nonmetallic sheath. The nonmetallic sheath provides additional mechanical protection to the insulated conductors. Single conductors do not have the additional nonmetallic sheath.

318-3(a) does not permit single conductors in cable tray as a general wiring method. 318(3)(b)(1) does permit single conductors, 1/0 AWG and larger, to be installed in cable tray under certain conditions as specified in 318-3(b), Industrial Establishments.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1858)

7- 236 - (340-1): Accept

Note: The Technical Correlating Committee understands that the text modifies 340-2 of Proposal 7-231a.

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change "under a nonmetallic sheath" to "under a nonmetallic jacket."

SUBSTANTIATION: To prevent possible confusion with the use of the term "sheath" for a continuous metallic sheath in Type MC cable. This correlates with a proposal for a similar change in 340-3.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2065)

7- 237 - (340-1): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add a Scope section to Article 340 to read as follows:

340-1. Scope. The provisions of this article covers the use, installation, and construction specifications requirements of power and control tray cable.

Renumber remaining sections.

SUBSTANTIATION: Each Article should have a scope section.

The NEC style manual on style also shows a scope article.

To keep the Articles consistent all Articles should be similar.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1425)

7- 238 - (340-2): Accept in Principle

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Delete 340-2 in its entirety.

SUBSTANTIATION: 1999 National Electrical Code Style Manual:

Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."

Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1859)

7- 239 - (340-3): Accept in Principle

Note: The Technical Correlating Committee understands that the text modifies 340-116 of Proposal 7-231a.

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise the last two sentences in 340-3 and add an additional sentence to read as follows:

"The outer ~~sheath~~ jacket shall be a flame-retardant, nonmetallic material. A metallic sheath or armor shall not be permitted either under or over the nonmetallic ~~sheath~~ jacket. A shielding tape or foil shall be permitted under the nonmetallic jacket."

SUBSTANTIATION: To prevent possible confusion with the use of the term "sheath" for a continuous metallic sheath in Type MC cable. This correlates with a proposal for a similar change in 340-1.

To clarify that neither a metallic sheath or an interlocking tape armor is permitted.

To clarify that a metal tape or metallic foil shield is permitted under the nonmetallic jacket.

PANEL ACTION: Accept in Principle.

The panel accepts the change of "sheath" to "jacket." The other changes are accepted in principle.

PANEL STATEMENT: The panel concurs with the submitter's substantiation on changing the terminology and accepts in principle the remainder of the proposed text. See panel action on Proposal 7-241.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #2224)

7- 240 - (340-3): Reject

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."

SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

PANEL ACTION: Reject.

PANEL STATEMENT: The term "flame-retardant" is used throughout the Code as a means of expressing to the user that the material resists ignition or the spread of flames, albeit the test methods are often not defined. The term "flame tested" is similarly undefined, but can be understood to mean a test which does not necessarily measure the ability of a material to resist ignition or flame propagation. Some articles of the NEC offer information regarding the tests deemed appropriate for the required level of resistance to ignition or flame propagation. Others rely on the product standard to provide such information. The panel suggests that specific proposals be made wherever the generic reference to "flame retardant" is not sufficient.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

COMMENT ON AFFIRMATIVE:

STEWART: The panel statement is correct. Changing the words "flame tested" is an undefined term that would lead to improper testing for the intended application.

TEMBLADOR: See comment on Ravi Gantra's Proposal 6-3.

(Log #2267)

7- 241 - (340-3 and 727-6): Accept in Principle

Note: The Technical Correlating Committee understands that the text modifies 340-100 of Proposal 7-231a. In addition, the Panel is directed to reconsider the Proposal and correlate with Proposal 7-239. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Kenneth E. Bow, The Dow Chemical Co.

RECOMMENDATION: Insert: A metallic shield or metalized foil shield with drain wire(s) shall be permitted to be applied either over the cable core, over groups of conductors or both into 340-3 and 727-6. Note: this insertion has been extracted from Article 725-71(e) of the 1999 NEC.

SUBSTANTIATION: This proposal will clarify the use of shielding in tray cable (Type TC), instrument tray cable (Type ITC), and power limited tray cable (Type PLTC). Shielding is often important to satisfactory operations of such cables. There is confusion on the part of users relative to the permitted use of shields for these three types of tray cable. Therefore, the wording of 725-71(e) should be added to Articles 340-3 and 727-6 to eliminate the confusion. Shielding of tray cables is covered in UL 13, Section 10, UL 1277, Section 10.4, but not in UL 2250. Therefore, a section such as in UL 13 or UL 1277 also needs to be added to UL 2250.

PANEL ACTION: Accept in Principle.

Amend the existing last sentence of Section 340-3 to read:

"A metallic sheath or armor as defined in 334-22 shall not be permitted either under or over the nonmetallic jacket. Metallic shield(s) shall be permitted over groups of conductors, under the outer jacket, or both."

PANEL STATEMENT: The panel's action clarifies that a metallic armor is not permitted and that metal shields are permitted. The term "sheath" has been changed to "jacket" in order to avoid confusion with the term "sheath" as used in Article 334. See panel action on Proposal 7-239.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #338)

7- 242 - (340-3, Exception (New)): Reject

SUBMITTER: Frank H. Rocchio, The Okonite Co., Inc.

RECOMMENDATION: The last line of section 340-3 "A metallic sheath shall not be permitted either under or over the nonmetallic sheath." treats Type TC cable differently than other armored cable types in that a cable core marked Type TC cannot be armored while the same unmarked core can be armored and marked Type MC. This proposal is to provide a clarification of this sentence.

Add:

Exception: Type TC cable can be converted to Type MC cable with the addition of a metallic sheath and an overall jacket marked in accordance with Article 334.

SUBSTANTIATION: The wording "A metallic sheath shall not be permitted either under or over the nonmetallic sheath," was added to Section 340-3 during the 1978-81 era. The purpose was to avoid seeing the marking Type TC as the first cable type indication after the unjacketed armor was removed. Type TC without marking has been used in Type MC cable for many years. Recently, environmental concerns have prevented the removal of the print legend containing Type TC from previously completed cable in order to convert it to Type MC. The same environmental concerns forced the markings of Type TC to be indent printed so as to prevent the removal of the Type TC markings without complete replacement of the jacket. This proposal is to permit type TC cable to be made into Type MC cable with an overall jacket containing the legend of a Type MC cable for the following reasons.

Type TC Section 340-3 is inconsistent with other cable Types listed in the code with regard to a metallic sheath as indicated in the following sections of the NEC.

Section 340-5, Exception, permits Type TC cable marked "OPEN WIRING" to be used in the traditional role of Type MC cable for lengths not to exceed 50 feet.

Section 340-3, Type TC cable, prohibits the addition of a metallic sheath either over or under the nonmetallic sheath. The construction of a Type TC cable can be identical to the construction of a Type MC core under the metallic sheath before armoring except that the Type TC cable being armored cannot be marked Type TC. The allowed ampacity of Type TC cable (reference Section 340-7) and Type MC cable (reference Section 334-13 and Exception No. 1 and 2) are identical. Section 340-4 (6) permits a Type TC cable that complies with the crash and impact test of a Type MC cable to be used as a Type MC cable by permitting the Type TC cable to be marked OPEN WIRING and used in lengths not to exceed a total of 50 ft (15.24 m) between a cable tray and the utilization equipment or device.

Type PLTC with the addition of a metallic sheath remains Type PLTC. (Reference Section 725-71, Exception No. 1). Section 725-61(d), Exception No. 3 provides the same limitations for Type PLTC cable as Section 340-4(6) does for Type TC cable. Section 723-71(e) permits nonmetallic sheathed cable to be listed as Type PLTC. Section 723-71(e) Exception No. 1 permits a smooth metallic sheath, welded and corrugated metallic sheath or interlocked tape armor to be applied over the nonmetallic jacket of a Type PLTC cable while still being listed as Type PLTC.

Type ITC with the addition of a metallic sheath remains Type ITC (Reference Section 727-1, 727-3, Exception No. 2: and 727-4, Exception). Section 727-4, Exception No. 2 provides the same limitations for Type ITC cable as Section 340-4(6) does for type TC cable. Section 727-6 permits nonmetallic-sheathed cable to be listed as Type ITC. This article also permits a smooth metallic sheath, welded and corrugated metallic sheath or interlocked tape armor to be applied over the nonmetallic jacket of a Type ITC cable while still being listed as Type ITC. Article 334, Type MC recognizes conductors rated 2001 to 35,000 volts in Section 310-60. Type MV with the addition of a metallic sheath becomes Type MV and Type MC (Reference Sections 318-12 and 318-13).

PANEL ACTION: Reject.

PANEL STATEMENT: All Type TC cables may not be appropriate for use as MC cables. There are inherent construction differences such as equipment grounding conductor provisions and type of conductor insulation that preclude a dual designation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 2

NOT RETURNED: 1 Ensign

EXPLANATION OF NEGATIVE:

PROPST: In order for a cable to be "marked" in accordance with Article 334," the product would have to comply with the construction requirements of 334, including the issues identified in the panel statement. I recommend that the panel accept this proposal as written.

STEWART: The panel statement is insufficient to reject. The fact that some TC may not be appropriate to use to manufacture an MC cable would only mean that these cables could not be used. The completed cable would be a Type MC cable and would be required to comply with all Type MC cable requirements.

The completed cable with armor would be a Type MC cable. The cable with armor removed would be a Type TC cable.

This type installation is quite common where a portion of a cable circuit is Type MC and a portion is Type TC (particularly at cable ends inside control rooms).

This exception would increase the reliability of the installation as the conversion from MC to TC could be made without the need for a splice or double terminations into a junction box.

This proposal, if accepted, would increase the system reliability and reduce possible errors in installation.

(Log #1532)

7- 243 - (340-3(d)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for action. This action will be considered by the Panel as a Public Comment.

SUBMITTER: William J. Tipton, I.B.E.W. Local 575

RECOMMENDATION: Delete 240-3 in its entirety.

SUBSTANTIATION: Text moved back to Table 310-16 and 310-17.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's proposal is outside the scope of CMP 7.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1860)

7- 244 - (340-4(6)): Accept in Principle

Note: The Technical Correlating Committee understands that the accepted text replaces the text in the last paragraph of 340-10(6) of Proposal 7-231a.

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Add an additional sentence to the last paragraph of 340-4(6) so the paragraph reads:

Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable. One or more insulated conductors shall be permitted to be permanently identified as an equipment grounding conductor at the time of installation in accordance with 250-119(b).

SUBSTANTIATION: Type TC Tray Cable is not normally manufactured with an equipment grounding conductor since the cable tray usually provides the equipment grounding. This revision will permit industrial facilities that meet the definition in 340-4(6), which is more limited that the definition in 250-119(b), to use standard tray cable and identify one of the insulated conductors in the cable as an equipment grounding conductor at the time of installation as already authorized by 250-119(b). This revision will eliminate the need to manufacture a special TC cable construction for use as open wiring.

PANEL ACTION: Accept in Principle.
Revise the proposed text to read:
Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable. In cables containing conductors size 6 AWG or smaller, the equipment grounding conductor shall be provided within the cable or, at the time of installation, one or more insulated conductors shall be permanently identified as an equipment grounding conductor in accordance with 250-119(b).
PANEL STATEMENT: This recognizes an already permitted practice in accordance with 250-119(b). This change allows the construction of this type cable without a separate identified equipment grounding conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4344)

7- 245 - (340-4(6)): Reject
SUBMITTER: Robert B. Alexander, Fluor Daniel
RECOMMENDATION: Delete from the the first sentence the clause:
"in lengths not to exceed a total of 50 ft (15.42 m) between a cable tray ant the utilization equipment or device."
SUBSTANTIATION: In reviewing the previous ROP/ROC for this section, it is obvious that the 50 ft limit is a commercial rather than technical or safety issue. There is NO offer in either ROP or ROC to substantiate the limit.
Section 336-4(3) permits NM,NMC and NMS, identified for the use, to be used in cable trays.
Section 336-4(2) permits their general use except as specifically prohibited by section 336-5.
Section 336-5 does not prohibit open wiring as a METHOD. The prohibitions are for conditions of location.
It is extremely difficult to understand why a vastly superior product(TC), in fact, one that meets the crush and impact tests of an even more superior product(MC), has greater restrictions placed on it than NM, NMC, or NMS - EXCEPT that it is a commercial restriction.
PANEL ACTION: Reject.
PANEL STATEMENT: By definition Type TC cable is intended to be supported by a cable tray, in raceways or where supported by a messenger wire. The panel has concerns relative to the use of the cable in unlimited lengths as open wiring including increased exposure to physical damage. Section 340-5(2) does not permit the installation of Type TC cable as open cable on brackets or cleats.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 2
NOT RETURNED: 1 Ensign
EXPLANATION OF NEGATIVE:
PROPST: During the discussion of this proposal, there appeared to be concern among the panel that approval of this proposal would result in unlimited open wiring using Tray Cable. I do not believe that this was the intent of the proposal.
To help clarify this issue, I believe that the panel should keep in perspective that this proposal does not apply to ordinary Tray Cable as defined in Article 340-1 and of a construction described in 340-3. This proposal applies only to a hybrid class of Tray Cable. It applies only to a Tray Cable, which in addition to meeting all the requirements described in Section 340, also meets the crush and impact requirements of Type MC cable. This is not to imply that it is equal to MC cable, but rather, that from a mechanical protection standpoint it will meet all the physical protection requirements which type MC cable is required to meet. This is one important factor that the panel should consider in reviewing this proposal. This cable is not ordinary Tray Cable. It is a hybrid Tray Cable that has the enhanced mechanical properties resulting in a higher level of mechanical protection.
The second issue that the panel must consider is that this proposal applies only for the very specific application of this hybrid tray cable only "In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage." There are two significant factors for the panel to consider in this statement. First, the restricted use in industrial establishments. This is a very specific application for this hybrid cable. Second, there is the additional restriction that it will only be used "where not subject to physical damage". During the panel discussions and in the panel statement, the issue of physical damage was cited as a concern. I believe that this concern is somewhat related to the rather broad and vague term of "open wiring". While the concept of open wiring could be envisioned to the extreme of looping, laying, mounting on brackets or cleats, and otherwise stringing cable in an uncontrolled manner across industrial facilities, I do not believe that this was the intent of the original proposal creating this exception, nor of this proposal to remove the 50 foot limit. This is an issue that the panel may want to address through additional language that would clarify the intent. I believe that there are two approaches which the panel could consider to clarify this intent. The first would be to provide additional language similar to the ITC language found in 727-4, exception stating "where the cable is supported and protected against physical damage using mechanical protection, such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 6 ft." I believe that this is the level of support that the creators of this section intended. Another issue that the panel expressed was the concern that this exception would permit the user to install the entire length of cable without the need for any cable tray. Again, I do not think that this was the intent or desire of those proposing this exception nor those seeking to drop the 50 foot restriction. The reason for seeking relief on the 50 foot restriction is that in large manufacturing locations with major cable trays running in elevated racks, it is not unusual to have tray located nearly 50 feet above grade. This does not provide a reasonable method to use this method to drop from the tray to the utilization equipment. I believe that this concern will not result in abuses because the economics of installing strut, angle, or channel versus tray. The installed cost per foot of cable will automatically result in the maximized use of tray while minimizing the use of strut, angle, and channel. The existing wording of the exception does require that this exception only applies from tray to the utilization equipment. While not being totally prescriptive to the user, it does require that the cable be installed in tray before making a transition using this exception.
In considering the suggestions and wording mentioned above, I would suggest that the panel reconsider this proposal with the following additional wording for clarification of the intent:
340-4(6) In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is ~~not subject to physical damage~~ supported and protected against physical damage using mechanical protection, such as struts, angles, or channel, Type TC tray cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring ~~in lengths not to exceed a total of 50 ft (15.24 m)~~ between a cable tray and the utilization equipment or device.
The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).
Equipment grounding for the utilization equipment shall be provided by an equipment grounding conductor within the cable.
FPN: See Section 310-10 for temperature limitation of conductors.
STEWART: The elimination of the 50 ft limit is not a safety issue. In fact, it could improve reliability and safety by avoiding problems involved with changing wiring methods when dropping out of the cable tray.
This does not allow for unlimited lengths as open wiring as the cable must be supported and secured at 6 ft intervals.
There is no increased exposure to physical damage as Section 340-4(6) states: "where the cable is not subject to physical damage."
If the cable is not subject to physical damage, how can there be "increased exposure to physical damage"?
This type installation is not as open cable on brackets or cleats as prohibited in Section 340-5(2).

(Log #474)

7- 246 - (340-4(b)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "50 ft (15.24 m)" to "15 m (50 ft)"
Change "6 ft (1.83 m)" to "1.8 m (6 ft)"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1362)

7- 247 - (340-5): Accept in Principle
Note: The Technical Correlating Committee understands that this Proposal modifies 340-12 of Proposal 7-231a.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 340-5 (340-12 New) to read as follows:
340-5. Uses Not Permitted. Type TC ~~tray~~ cable shall not be used ~~in the following~~:
(1) ~~Installed where~~ Where ~~it will be~~ exposed to physical damage
(2) ~~Installed aa~~ As open cable on brackets or cleats
(3) ~~Used where~~ Where exposed to direct rays of the sun, unless identified as sunlight resistant
(4) Direct buried, unless identified for such use
SUBSTANTIATION: To incorporate text consistent with the other wire and cable Articles and to provide clarity in accordance with NEC Style Manual Section 3.3.4.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4341)

7- 248 - (340-5(2)): Accept
Note: The Technical Correlating Committee understands that this Proposal modifies 340-12(2) of Proposal 7-231a.
SUBMITTER: Robert B. Alexander, Fluor Daniel
RECOMMENDATION: Add at the end of the clause:
"except as permitted in 340-4(6)".
SUBSTANTIATION: This resolves a slight conflict between the two sections.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1363)

7- 249 - (340-6): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 340-6. Marking in its entirety.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1, requires that references not be provided if the material is already covered by Section 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1861)

7- 250 - (340-6): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 340-6. Marking. in its entirety.
SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3 and 4 apply generally.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1364)

7- 251 - (340-7): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 340-7 (340-80 New) to read as follows:
340-7. Ampacity. The ampacity of Type TC tray cable shall be determined in accordance with 318-11 for 14 AWG and larger conductors and in accordance with 402-5 for 18-16 AWG conductors. ~~The ampacities of the conductors of Type TC tray cable shall be determined from Section 402-5 for conductors smaller than No. 14 and from Section 318-11.~~
SUBSTANTIATION: For clarity and to incorporate text consistent with that used in other cable articles.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-231a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1931)

7- 252 - (340-7): Accept in Principle
Note: The Technical Correlating Committee understands that this Proposal modifies 340-80 of Proposal 7-231a.
SUBMITTER: Warren Kohm, Briner Electric
RECOMMENDATION: Revise to read as follows:
340-7. Ampacity. The ampacities of the conductors of Type TC tray cable shall be determined from Section 402-5 for conductors smaller than No. 14 ~~and~~, from Section 318-11 where installed in cable tray, and from Section 310-15 where installed in a raceway or supported by a messenger wire.
SUBSTANTIATION: Section 340-7 currently gives only two choices for determining the ampacity of Type TC tray cable: (1) Section 402-5 for conductors smaller than No. 14 and (2) Section 318-11. Section 318-11 only applies to cables installed in cable tray. Where Type TC tray cable is installed in a raceway or supported by a messenger wire as permitted by Section 340-4, Section 340-7 is silent on how to determine the ampacity. Section 310-15 should be referenced so that the correct ampacity can be determined.
PANEL ACTION: Accept in Principle.
Revise Section 340-7 to read:
340-7. Ampacity. The ampacity of Type TC tray cable shall be determined in accordance with 318-11 for 14 AWG and larger conductors, in accordance with 402-5 for 18-16 AWG conductors where installed in cable tray, and in accordance with Section 310-15 where installed in a raceway or as messenger supported wiring.
PANEL STATEMENT: The panel has accepted the proposer's concept and modified the text to comply with the NFPA NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #CP702)

7- 252a - (340-8): Accept
Note: The Technical Correlating Committee understands that this Proposal modifies 340-24 of Proposal 7-231a. The Technical Correlating Committee assumes a soft conversion is to be used for the metric conversions.
SUBMITTER: CMP 7
RECOMMENDATION: Revise existing Section 340-8 to read:
340-8. Bending Radius. Bends in Type TC cable shall be made so as not to damage the cable. For Type TC cable without metal shielding, the minimum bending radius shall be:

(1) Cables with an outside diameter of 1.000 inches or less- 4 times the overall diameter
(2) cables with diameter of 1.001 to 2.000 inch-5 times the overall diameter
(3) Cables with diameters of 2.001 inch and larger-6 times the overall diameter
Type TC cables with metallic shielding shall have a minimum bending radius of not less than 12 times the cable overall diameter.
SUBSTANTIATION: These are the minimum accepted industry requirements for bending Type TC cable.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1365)

7- 253 - (340-8): Reject
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise existing 340-8 (340-24 New) as follows:
~~340-8. Bends.~~ 340-24. Bending Radius. Bends in Type TC cable shall be made so ~~as not to damage the cable.~~ that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than five times the diameter of the cable.
SUBSTANTIATION: A value for the minimum bending radius is being added to provide consistency and continuity with other wire and cable articles. A recommended minimum bending radius of 5 times is based on a ICEA value for power cable. ICEA S-61-402 / NEMA WC5 recommends a value of 4. The value recommended for this proposal was increased to 5 so as to be conservative and is the same as the value that is used by UL in the performance of the cold bend test requirements for non shielded Type TC cable (UL 1277).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel has accepted minimum bending radius requirements for Type TC cable through their action on Proposal 7-252a. The values accepted by the panel reflect current industry standards for the minimum bending radius of Type TC cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

ARTICLE 342 — NONMETALLIC EXTENSIONS

(Log #475)

7- 254 - (342): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 342-7(a)(1) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
342-7(a)(2) - change "8 in. (203 mm)" to "200 mm (8 in.)" and change "12 in. (305 mm)" to "300 mm (12 in.)"
342-7(b) - revise the first three paragraphs as follows:
"(b) Aerial Cable.
(1) Aerial cable shall be supported by its messenger cable and securely attached at each end with clamps and turnbuckles. Intermediate supports shall be provided at not more than 6 m (20 ft) ~~20 ft (6.1 m)~~ intervals. Cable tension shall be adjusted to eliminate excessive sag. The cable shall have a clearance of not less than 50 mm (2 in.) ~~2 in. (50.8 mm)~~ from steel structural members or other conductive material.
(2) Aerial cable shall have a clearance of not less than 3 m (10 ft) ~~10 ft (3.05 m)~~ above floor areas accessible to pedestrian traffic, and not less than 4.3 m (14 ft) ~~14 ft (4.27 m)~~ above floor areas accessible to vehicular traffic.
(3) Cable suspended over work benches, not accessible to pedestrian traffic, shall have a clearance of not less than 2.5 m (8 ft) ~~8 ft (2.44 m)~~ above the floor."
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #CP716)

7- 254a - (342): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee the Panel Action.
SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 342 to comply with NEC Style Manual.
. ARTICLE 342 -- Nonmetallic Extensions
I General
342-1. Scope. This article covers the use, installation, and construction specifications for Nonmetallic Extensions.
342-2. Definition. Nonmetallic Extension. An assembly of two insulated conductors within a nonmetallic jacket or an extruded thermoplastic covering. The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings.
II Installation
342-10. Uses Permitted. Nonmetallic extensions shall be permitted only where all of the following conditions are met.
(a) From an Existing Outlet. The extension is from an existing outlet on a 15- or 20-ampere branch circuit.
(b) Exposed and in a Dry Location. The extension is run exposed and in a dry location.
(c) Nonmetallic Surface Extensions. For nonmetallic surface extensions, the building is occupied for residential or office purposes and does not exceed the height limitations specified in 336-5(a)(1).
. FPN: See 310-10 for temperature limitation of conductors.
342-12. Uses Not Permitted. Nonmetallic extensions shall not be used:
(1) In unfinished basements, attics, or roof spaces.
(2) Where the voltage between conductors exceeds 150 volts for nonmetallic surface extension and 300 volts for aerial cable.
(3) Where subject to corrosive vapors.
(4) Where run through a floor or partition, or outside the room in which it originates.
342-15. Exposed. One or more extensions shall be permitted to be run in any direction from an existing outlet, but not on the floor or within 50 mm (2 in.) from the floor.
342-26. Bends. A bend that reduces the normal spacing between the conductors shall be covered with a cap to protect the assembly from physical damage.
342-30. Securing and Supporting. Nonmetallic surface extensions shall be secured in place by approved means at intervals not exceeding 200 mm (8 in.), with an allowance for 300 mm (12 in.) to the first fastening where the connection to the supplying outlet is by means of an attachment plug. There shall be at least one fastening between each two adjacent outlets supplied. An extension shall be attached to only woodwork or plaster finish, and shall not be in contact with any metal work or other conductive material other than with metal plates on receptacles.
342-40. Boxes and Fittings. Each run shall terminate in a fitting that covers the end of the assembly. All fittings and devices shall be of a type identified for the use.
342-56. Splices and Taps. Extensions shall consist of a continuous unbroken length of the assembly, without splices, and without exposed conductors between fittings. Taps shall be permitted where approved fittings completely covering the tap connections are used. Aerial cable and its tap connectors shall be provided with an approved means for polarization. Receptacle-type tap connectors shall be of the locking type.
SUBSTANTIATION: This revision to Article 342 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with

the usability effort. Specific proposals addressed by this revision include 7-255, 7-256, 7-257, 7-258, 7-259, 7-260, 7-261, 7-262, 7-263 and 7-265.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1388)

7- 255 - (342): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise text to read as follows:
Article 342 — Nonmetallic Extensions
I. General
~~342-1~~ 342-2. Definition.
Nonmetallic extensions are an assembly of two insulated conductors within a nonmetallic jacket or an extruded thermoplastic covering. The classification includes both surface extensions, intended for mounting directly on the surface of walls or ceilings, and aerial cable containing a supporting messenger cable as an integral part of the cable assembly.
~~342-2~~ 342-3. Other Articles.
In addition to the provisions of this article, nonmetallic extensions shall be installed in accordance with the applicable provisions of this Code.
II. Installation
~~342-3~~ 342-10. Uses Permitted
Nonmetallic extensions shall be permitted only where all of the following conditions are met.
(a) From an Existing Outlet. The extension is from an existing outlet on a 15- or 20-ampere branch circuit. ~~in conformity with the requirements of Article 210.~~
(b) Exposed and in a Dry Location. The extension is run exposed and in a dry location.
(c) Nonmetallic Surface Extensions. For nonmetallic surface extensions, the building is occupied for residential or office purposes and does not exceed the height limitations specified in ~~Section~~ 336-5(a)(1).
(c1) [Alternate to (c)]. For aerial cable, the building is occupied for industrial purposes, and the nature of the occupancy requires a highly flexible means for connecting equipment.
~~(b) Aerial Cable.~~ Where used as aerial cable nonmetallic extensions shall conform to the following:
1. Aerial cable shall be supported by its messenger cable and securely attached at each end with clamps and turnbuckles. Intermediate supports shall be provided at not more than 20-ft (6.1-m) intervals. Cable tension shall be adjusted to eliminate excessive sag. The cable shall have a clearance of not less than 2 in. (50.8 mm) from steel structural members or other conductive material.
2. Aerial cable shall have a clearance of not less than 10 ft (3.05 m) above floor areas accessible to pedestrian traffic, and not less than 14 ft (4.27 m) above floor areas accessible to vehicular traffic.
3. Cable suspended over work benches, not accessible to pedestrian traffic, shall have a clearance of not less than 8 ft (2.44 m) above the floor.
4. Aerial cables shall be permitted as a means to support lighting fixtures where the total load on the supporting messenger cable does not exceed that for which the assembly is intended.
5. The supporting messenger cable where installed in conformity with the applicable provisions of Article 250 and if properly identified as an equipment grounding conductor, shall be permitted to ground equipment. The messenger cable shall not be used as a branch-circuit conductor.
FPN: See Section 310-10 for temperature limitation of conductors.
~~342-4~~ 342-12. Uses Not Permitted. Nonmetallic extensions shall not be used as follows:
(a) Aerial Cable. As aerial cable to substitute for one of the general wiring methods specified by this Code.
(b) Unfinished Areas. In unfinished basements, attics, or roof spaces.
(c) Voltage Between Conductors. Where the voltage between conductors exceeds 150 volts for nonmetallic surface extension and 300 volts for aerial cable.
(d) Corrosive Vapors. Where subject to corrosive vapors.
(e) Through a Floor or Partition. Where run through a floor or partition, or outside the room in which it originates.
~~342-7.~~ 342-15. Exposed. ~~Nonmetallic extensions shall be installed as specified in (a) and (b).~~
~~(a) Nonmetallic Surface Extensions.~~
~~1.~~ One or more extensions shall be permitted to be run in any direction from an existing outlet, but not on the floor or within 2 in. (50.8 mm) from the floor.
342-26. Bends.
~~3.~~ A bend that reduces the normal spacing between the conductors shall be covered with a cap to protect the assembly from physical damage.
342-30 Securing and Supporting.
~~2.~~ Nonmetallic surface extensions shall be secured in place by approved means at intervals not exceeding 8 in. (203 mm), with an allowance for 12 in. (305 mm) to the first fastening where the connection to the supplying outlet is by means of an attachment plug. There shall be at least one fastening between each two adjacent outlets supplied. An extension shall be attached to only woodwork or plaster finish, and shall not be in contact with any metal work or other conductive material other than with metal plates on receptacles.
~~342-6.~~ 342-40. Boxes and Fittings. Each run shall terminate in a fitting that covers the end of the assembly. All fittings and devices shall be of a type identified for the use.
~~342-5.~~ 342-56. Splices and Taps. Extensions shall consist of a continuous unbroken length of the assembly, without splices, and without exposed conductors between fittings. Taps shall be permitted where approved fittings completely covering the tap connections are used. Aerial cable and its tap connectors shall be provided with an approved means for polarization. Receptacle-type tap connectors shall be of the locking type.
III. Construction
~~342-8.~~ 342-120. Marking. Nonmetallic extensions shall be marked in accordance with Section 110-21.
SUBSTANTIATION: The proposed article re-write was developed as part of a larger effort by the NEC Usability Committee to re-format existing raceway, cable and wiring articles. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as state in the NEC Style Manual 2.4.1. It is hoped that the parallel code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.
To the extent that this was possible in this article, this has been done. It is not the intent or purpose of this re-write to change the actual intent of the existing article requirements. The only new material in this proposal is the proposed new article scope which has been added to conform with the NEC Style Manual 2.2.1
A companion proposal has also been submitted which re-structures the article to a greater degree by splitting existing Code requirements into new sections to better adhere to the new article format. In some cases this is done with an alternate article re-write while in other cases, individual proposals have been submitted. These proposals are also intended to further enhance the structure and format of the article but in some cases existing code text requirements had to be revised or altered to meet the re-formatting needs. For this reason the proposals are separate which will allow the Code Making Panels to individually consider each proposal.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1389)

7- 256 - (342): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Article 342 as follows: (renumber existing sections accordingly)
Article 342 — Nonmetallic Extensions
342-1. Definition.

Nonmetallic extensions are an assembly of two insulated conductors within a nonmetallic jacket or an extruded thermoplastic covering. The classification includes ~~both~~ surface extensions, intended for mounting directly on the surface of walls or ceilings~~, and aerial cable containing a supporting messenger cable as an integral part of the cable assembly~~.

342-2. Other Articles. In addition to the provisions of this article, nonmetallic extensions shall be installed in accordance with the applicable provisions of this Code.

342-3. Uses Permitted. Nonmetallic extensions shall be permitted only where all of the following conditions are met.

(a) From an Existing Outlet. The extension is from an existing outlet on a 15- or 20-ampere branch circuit in conformity with the requirements of Article 210.

(b) Exposed and in a Dry Location. The extension is run exposed and in a dry location.

(c) Nonmetallic Surface Extensions. For nonmetallic surface extensions, the building is occupied for residential or office purposes and does not exceed the height limitations specified in Section 336-5(a)(1).

~~(c1) [Alternate to (c)]. For aerial cable, the building is occupied for industrial purposes, and the nature of the occupancy requires a highly flexible means for connecting equipment.~~

FPN: See Section 310-10 for temperature limitation of conductors.

342-4. Uses Not Permitted. Nonmetallic extensions shall not be used as follows:

~~(a) Aerial Cable. As aerial cable to substitute for one of the general wiring methods specified by this Code.~~

~~(b)~~ (a) Unfinished Areas. In unfinished basements, attics, or roof spaces.

~~(c)~~ (b) Voltage Between Conductors. Where the voltage between conductors exceeds 150 volts ~~for nonmetallic surface extension and 300 volts for aerial cable.~~

~~(d)~~ (c) Corrosive Vapors. Where subject to corrosive vapors.

~~(e)~~ (d) Through a Floor or Partition. Where run through a floor or partition, or outside the room in which it originates.

342-5. Splices and Taps. Extensions shall consist of a continuous unbroken length of the assembly, without splices, and without exposed conductors between fittings. Taps shall be permitted where approved fittings completely covering the tap connections are used. Aerial cable and its tap connectors shall be provided with an approved means for polarization. Receptacle-type tap connectors shall be of the locking type.

342-6. Fittings. Each run shall terminate in a fitting that covers the end of the assembly. All fittings and devices shall be of a type identified for the use.

342-7. Installation. Nonmetallic extensions shall be installed as specified ~~in (a) and (b)~~.

(a) Nonmetallic Surface Extensions.

1. One or more extensions shall be permitted to be run in any direction from an existing outlet, but not on the floor or within 2 in. (50.8 mm) from the floor.

2. Nonmetallic surface extensions shall be secured in place by approved means at intervals not exceeding 8 in. (203 mm), with an allowance for 12 in. (305 mm) to the first fastening where the connection to the supplying outlet is by means of an attachment plug. There shall be at least one fastening between each two adjacent outlets supplied. An extension shall be attached to only woodwork or plaster finish, and shall not be in contact with any metal work or other conductive material other than with metal plates on receptacles.

3. A bend that reduces the normal spacing between the conductors shall be covered with a cap to protect the assembly from physical damage.

~~(b) Aerial Cable.~~

~~1. Aerial cable shall be supported by its messenger cable and securely attached at each end with clamps and turnbuckles. Intermediate supports shall be provided at not more than 20 ft (6.1 m) intervals. Cable tension shall be adjusted to eliminate excessive sag. The cable shall have a clearance of not less than 2 in. (50.8 mm) from steel structural members or other conductive material.~~

~~2. Aerial cable shall have a clearance of not less than 10 ft (3.05 m) above floor areas accessible to pedestrian traffic, and not less than 14 ft (4.27 m) above floor areas accessible to vehicular traffic.~~

~~3. Cable suspended over work benches, not accessible to pedestrian traffic, shall have a clearance of not less than 8 ft (2.44 m) above the floor.~~

~~4. Aerial cables shall be permitted as a means to support lighting fixtures where the total load on the supporting messenger cable does not exceed that for which the assembly is intended.~~

~~5. The supporting messenger cable, where installed in conformity with the applicable provisions of Article 250 and if properly identified as an equipment grounding conductor, shall be permitted to ground equipment. The messenger cable shall not be used as a branch circuit conductor.~~

342-8. Marking. Nonmetallic extensions shall be marked in accordance with ~~Section~~ 110-21.

SUBSTANTIATION: This particular wiring method is no longer being manufactured or used. Article 320 and Article 321 covers similar requirements. Deleting the portions related to use as aerial cable within this article will improve usability and increase consistency with the other cable and wiring articles.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 1 Ensign

(Log #1390)

7- 257 - (342): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise text to read as follows:

Article 342 — Nonmetallic Extensions

I. General

~~342-1.~~ 342-2. Definition.

Nonmetallic extensions are an assembly of two insulated conductors within a nonmetallic jacket or an extruded thermoplastic covering. The classification includes both surface extensions, intended for mounting directly on the surface of walls or ceilings, and aerial cable containing a supporting messenger cable as an integral part of the cable assembly.

~~342-2.~~ 342-3. Other Articles. In addition to the provisions of this article, nonmetallic extensions shall be installed in accordance with the applicable provisions of this Code.

II. Installation

~~342-3.~~ 342-10. Uses Permitted. Nonmetallic extensions shall be permitted only where all of the following conditions are met.

(a) From an Existing Outlet. The extension is from an existing outlet on a 15- or 20-ampere branch circuit in conformity with the requirements of Article 210.

(b) Exposed and in a Dry Location. The extension is run exposed and in a dry location.

(c) Nonmetallic Surface Extensions. For nonmetallic surface extensions, the building is occupied for residential or office purposes and does not exceed the height limitations specified in Section 336-5(a)(1).

(c1) [Alternate to (c)]. For aerial cable, the building is occupied for industrial purposes, and the nature of the occupancy requires a highly flexible means for connecting equipment.

FPN: See Section 310-10 for temperature limitation of conductors.

~~342-4.~~ 342-12. Uses Not Permitted. Nonmetallic extensions shall not be used as follows:

(a) Aerial Cable. As aerial cable to substitute for one of the general wiring methods specified by this Code.

(b) Unfinished Areas. In unfinished basements, attics, or roof spaces.

(c) Voltage Between Conductors. Where the voltage between conductors exceeds 150 volts for nonmetallic surface extension and 300 volts for aerial cable.

(d) Corrosive Vapors. Where subject to corrosive vapors.

(e) Through a Floor or Partition. Where run through a floor or partition, or outside the room in which it originates.

~~342-7.~~ 342-13. Installation. Nonmetallic extensions shall be installed as specified in (a) and (b).

(a) Nonmetallic Surface Extensions.

1. One or more extensions shall be permitted to be run in any direction from an existing outlet, but not on the floor or within 2 in. (50.8 mm) from the floor.

2. Nonmetallic surface extensions shall be secured in place by approved means at intervals not exceeding 8 in. (203 mm), with an allowance for 12 in. (305 mm) to the first fastening where the connection to the supplying outlet is by means of an attachment plug. There shall be at least one fastening between each two adjacent outlets supplied. An extension shall be attached to only woodwork or plaster finish, and shall not be in contact with any metal work or other conductive material other than with metal plates on receptacles.

3. A bend that reduces the normal spacing between the conductors shall be covered with a cap to protect the assembly from physical damage.

(b) Aerial Cable.

1. Aerial cable shall be supported by its messenger cable and securely attached at each end with clamps and turnbuckles. Intermediate supports shall be provided at not more than 20-ft (6.1-m) intervals. Cable tension shall be adjusted to eliminate excessive sag. The cable shall have a clearance of not less than 2 in. (50.8 mm) from steel structural members or other conductive material.

2. Aerial cable shall have a clearance of not less than 10 ft (3.05 m) above floor areas accessible to pedestrian traffic, and not less than 14 ft (4.27 m) above floor areas accessible to vehicular traffic.

3. Cable suspended over work benches, not accessible to pedestrian traffic, shall have a clearance of not less than 8 ft (2.44 m) above the floor.

4. Aerial cables shall be permitted as a means to support lighting fixtures where the total load on the supporting messenger cable does not exceed that for which the assembly is intended.

5. The supporting messenger cable, where installed in conformity with the applicable provisions of Article 250 and if properly identified as an equipment grounding conductor, shall be permitted to ground equipment. The messenger cable shall not be used as a branch-circuit conductor.

~~342-6.~~ 342-40. Boxes and Fittings.

Each run shall terminate in a fitting that covers the end of the assembly. All fittings and devices shall be of a type identified for the use.

~~342-5.~~ 342-56. Splices and Taps.

Extensions shall consist of a continuous unbroken length of the assembly, without splices, and without exposed conductors between fittings. Taps shall be permitted where approved fittings completely covering the tap connections are used. Aerial cable and its tap connectors shall be provided with an approved means for polarization. Receptacle-type tap connectors shall be of the locking type.

III. Construction

~~342-8.~~ 342-120. Marking.

Nonmetallic extensions shall be marked in accordance with Section 110-21.

SUBSTANTIATION: The proposed article re-write was developed as part of a larger effort by the NEC Usability Committee to re-format existing raceway, cable and wiring articles. The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as state in the NEC Style Manual 2.4.1. It is hoped that the parallel code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

To the extent that this was possible in this article, this has been done. It is not the intent or purpose of this re-write to change the actual intent of the existing article requirements. The only new material in this proposal is the proposed new article scope which has been added to conform with the NEC Style Manual 2.2.1

A companion proposal has also been submitted which re-structures the article to a greater degree by splitting existing Code requirements into new sections to better adhere to the new article format. In some cases this is done with an alternate article re-write while in other cases, individual proposals have been submitted. These proposals are also intended to further enhance the structure and format of the article but in some cases existing code text requirements had to be revised or altered to meet the re-formatting needs. For this reason the proposals are separate which will allow the Code Making Panels to individually consider each proposal.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1367)

7- 258 - (342-1 (New)): Accept in Principle

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add new 321-1 to read as follows:
321-1. Scope. This article covers the use, installation, and construction specifications for Nonmetallic Extensions.
Renumber existing Sections accordingly.
SUBSTANTIATION: NEC Style Manual requires that each article contain a statement of scope and that the scope statement be the first section of the article. See 2.2.1 and 2.2.2.2.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2066)

7- 259 - (342-1 (New)): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a Scope section to Article 342 to read as follows:
342-1. Scope. The provisions of this article covers the use and installation requirements of nonmetallic extensions.
Renumber the remaining sections.
SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1366)

7- 260 - (342-1-Nonmetallic Extensions (New)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION:
Revise 342-1 (342-2. New) Definition as follows:
~~342-1~~ 342-2. Definition.
Nonmetallic Extensions. ~~are~~ An assembly of two insulated conductors within a nonmetallic jacket or an extruded thermoplastic covering. The classification includes both surface extensions, intended for mounting directly on the surface of walls or ceilings, and aerial cable containing a supporting messenger cable as an integral part of the cable assembly.
SUBSTANTIATION: The Definition has been editorially revised to match the sentence structure of the other cable and wiring articles which contain a "definition" of the covered cable or wiring article. It is not intended that this change be other than editorial to provide a similar format where the definition follows a standard sentence structure where ever possible.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1368)

7- 261 - (342-2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete 342-2.
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3. Also, Section 4.4.1 prohibits referencing an entire Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1426)

7- 262 - (342-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 342-2 in its entirety.
SUBSTANTIATION: Section 4.1 of the 1999 National Electrical Code Style Manual stipulates "Do not use a reference if the requirement is already covered by 90.3."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1369)

7- 263 - (342-4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 342-4 (342-12 New) to read as follows:
342-4. Uses Not Permitted. Nonmetallic extensions shall not be used ~~as follows~~:
~~(a) Aerial Cable.~~ (1) As aerial cable to substitute for one of the general wiring methods specified in ~~by~~ this Code ~~.~~
~~(b) Unfinished Areas.~~ (2) In unfinished basements, attics, or roof spaces .
~~(c) Voltage Between Conductors.~~ (3) Where the voltage between conductors exceeds 150 volts for nonmetallic surface extension and 300 volts for aerial cable ~~.~~
~~(d) Corrosive Vapors.~~ (4) Where subject to corrosive vapors .
~~(e) Through a Floor or Partition.~~ (5) Where run through a floor or partition, or outside the room in which it originates ~~.~~
SUBSTANTIATION: To incorporate text consistent with the other wire and cable Articles and to provide clarity in accordance with NEC Style Manual Section 3.3.4.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #836)

7- 264 - (342-4(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(a) As aerial cable to substitute for one of the general wiring methods specified by this Code, except as permitted in Section 342-3(c1).
SUBSTANTIATION: Section 342-3(c1) permits use as aerial cable and Section 342-7(b) details these installations.
PANEL ACTION: Reject.
PANEL STATEMENT: Aerial cable has been deleted from Article 342, therefore the proposed text is not needed. See panel action on 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1862)

7- 265 - (342-8): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 342-8. Marking. in its entirety.
SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3 and 4 apply generally.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-254a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

ARTICLE 343 — NONMETALLIC UNDERGROUND CONDUIT WITH CONNECTORS: TYPE NUCC

(Log #1222)

8- 74 - (343): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Article 343 to read as follows:
Article 343 -- Nonmetallic Underground Conduit with Conductors: Type NUCC
A. General
343-1. Scope. This article covers the use, installation, and construction specifications for Nonmetallic Underground Conduit with Conductors (NUCC).
343-2. ~~343-1.~~ Definition. Nonmetallic Underground Conduit with Conductors (NUCC). A ~~is a~~ factory assembly of conductors or cables inside a nonmetallic, smooth wall conduit with a circular cross section.
~~The nonmetallic conduit shall be composed of a material that is resistant to moisture and corrosive agents. It shall also be capable of being supplied on reels without damage or distortion and shall be of sufficient strength to withstand abuse, such as impact or crushing, in handling and during installation without damage to conduit or conductors.~~
343-3. ~~343-2.~~ Other Articles. Installations for NUCC ~~nonmetallic underground conduit with conductors~~ shall comply with the provisions of ~~the~~ applicable sections of Article 300. ~~Where equipment grounding is required by Article 250, an assembly containing a separate equipment grounding conductor shall be used~~.
343-6. Listing Requirements. NUCC and associated fittings shall be listed.
B. Installation
~~343-3.~~ 343-10. Uses Permitted. The use of NUCC ~~listed nonmetallic underground conduit with conductors~~ and fittings shall be permitted in the following.
(1) For direct burial underground installation. For minimum cover requirements, see Tables 300-5 and 300-50 under Rigid Nonmetallic Conduit.
(2) Encased or embedded in concrete.
(3) In cinder fill.
(4) In underground locations subject to severe corrosive influences as covered in Section 300-6 and where subject to chemicals for which the assembly is specifically approved.
~~343-4.~~ 343-12. Uses Not Permitted. NUCC ~~Nonmetallic underground conduit with conductors~~ shall not be used in the following:
(1) In exposed locations
(2) Inside buildings

Exception: The conductor or the cable portion of the assembly, where suitable, shall be permitted to extend within the building for termination purposes in accordance with Section 300-3.
(3) In hazardous (classified) locations except as permitted by Sections 503-3(a), 504-20, 514-8, and 515-5, and in Class I, Division 2 locations as permitted in Section 501-4(b), Exception
~~343-5.~~ 343-20. Size.
(a) Minimum.
NUCC ~~Nonmetallic underground conduit with conductors~~ smaller than 1/2-in. ~~electrical~~ trade size shall not be used.
(b) Maximum.
NUCC ~~Nonmetallic underground conduit with conductors~~ larger than 4-in. ~~electrical~~ trade size shall not be used.
FPN: Metric trade numerical designations for NUCC ~~nonmetallic underground conduit with conductors~~ are 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, and 4 = 103.
343-22. Number of Conductors. The number of conductors or cables shall not exceed that permitted by the percentage fill in Table 1, Chapter 9.
~~343-10.~~ 343-24. Bends — How Made.
Bends ~~of Nonmetallic underground conduit with conductors~~ shall be manually made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. The radius of the curve of the centerline of such bends shall not be less than shown in Table ~~343-10~~ 343-24.
Table ~~343-10.~~ 343-24. Minimum Bending Radius ~~of Conduit Bends~~ for Nonmetallic Underground Conduit with Condutors (NUCC).
[*****1999 NEC Table 343-10 here*****]
~~343-11.~~ 343-26. Bends — Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between termination points.
~~343-6.~~ 343-28. Trimming. For termination, the conduit shall be trimmed away from the conductors or cables using an approved method that will not damage the conductor or cable insulation or jacket. All conduit ends shall be trimmed inside and out to remove rough edges.
~~343-9.~~ 343-46. Bushings. Where the NUCC ~~Nonmetallic underground conduit with conductors~~ enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the conductor or cable from abrasion unless the design of the box, fitting, or enclosure provides equivalent protection.
FPN: See Section 300-4(f) for the protection of conductors size No. 4 or larger.
~~343-7.~~ 343-48. Joints. All joints between conduit, fittings, and boxes shall be made by an approved method.
~~343-8.~~ 343-50. Conductor Terminations. All terminations between the conductors or cables and equipment shall be made by an approved method for that type of conductor or cable.
~~343-12.~~ 343-56. Splices and Taps. Splices and taps shall be made in junction boxes or other enclosures. See Article 370 for rules on the installation and use of boxes and conduit bodies.
343-60. Grounding. Where equipment grounding is required by Article 250, an assembly containing a separate equipment grounding conductor shall be used.
C. Construction Specifications.
343-100. Construction.
(a) General. NUCC ~~Nonmetallic underground conduit with conductors~~ is an assembly that is provided in continuous lengths shipped in a coil, reel, or carton.
(b) Nonmetallic Underground Conduit. The nonmetallic underground conduit shall be composed of a material that is resistant to moisture and corrosive agents. It shall also be capable of being supplied on reels without damage or distortion and shall be of sufficient strength to withstand abuse, such as impact or crushing, in handling and during installation without damage to conduit or conductors.
~~343-14.~~ (c) Conductors and Cables. Conductors and cables used in NUCC ~~Nonmetallic underground conduit with conductors~~ shall be listed, shall be suitable for use in wet locations, and shall be as follows.
~~(a)~~ (1) 600 Volts or Less.
Alternating-current and direct-current circuits shall be permitted. All conductors shall have an insulation rating equal to at least the maximum nominal circuit voltage of any conductor or cable within the conduit.
~~(b)~~ (2) Over 600 Volts.
Conductors or cables rated over 600 volts shall not occupy the same conduit with conductors or cables of circuits rated 600 volts or less.
~~343-15.~~ (d) Conductor Fill.
The maximum number of conductors or cables in NUCC ~~Nonmetallic underground conduit with conductors~~ shall not exceed that permitted by the percentage fill in Table 1, Chapter 9.
~~343-16.~~ 343-120. Marking. NUCC ~~Nonmetallic underground conduit with conductors~~ shall be clearly and durably marked at least every 10 ft (3.05 m) as required by Section 110-21. The type of conduit material shall also be included in the marking.
Identification of conductors or cables used in the assembly shall be provided on a tag attached to each end of the assembly or to the side of a reel. Enclosed conductors or cables shall be marked in accordance with Section 310-11.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements.
Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.
The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.
A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.
For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.
Explanation of proposed renumbering and editorial changes;

- Title Added Type and the Acronym "NUCC"
- 343-1 New Scope added to conform with the style manual.
- 343-2

(1) Definition renumbered from Section 343-1 to 343-2.
(2) Added acronym after title.
(3) Material composition and strength characteristics moved to Section 343-100(b).
343-3
(1) Other Articles renumbered from Section 343-2 to 343-3.
(2) Substitute acronym "NUCC" for the product proper name
(3) Moved grounding requirements to 343-60.
343-6
(1) New section specifically for listing requirements.
(2) Listing requirements moved here from 343-3 (99 NEC)
343-10
(1) Uses Permitted renumbered from Section 343-3 to 343-10.
(2) Delete product name and replace with acronym "NUCC".
343-12
(1) Uses Not Permitted renumbered from Section 343-4 to 343-12.
(2) Delete product name and replace with acronym "NUCC".
(3) Correct section references.
343-20
(1) Size renumbered from Section 343-5 to 343-20.
(2) Delete product description or product name and replace with acronym "NUCC" (three places).
(3) The word "electrical" was deleted as it added nothing to the clarity of this section (two places).
343-22
(1) Number of Conductors renumbered from 343-6 to 343-22.

(2) Reword section adding reference to cables for clarity.
(3) Removed the reference to tubing for clarity (two places).
343-24
(1) Bends-How Made renumbered from 343-9 to 343-24.
(2) Delete product name for clarity.
(3) Corrected section reference.
343-26 Bends-Number in One Run renumbered from 343-10 to 343-26.
343-28
(1) Trimming renumbered from 343-7 to 343-28.
(2) Delete " of tubing" for clarity.
343-30
(1) Securing and Supporting renumbered from 343-11 to 343-30.
(2) Title changed from "Supports" to "Securing and Supporting" since section addresses both subjects.
(3) Deleted product name and replaced with acronym "NUCC" (two places)
(4) Separated the Section into two parts for clarity.
(5) Added text for clarity without changing the original requirement.
343-40
(1) Boxes and Fittings renumbered from 343-12 to 343-40.
(2) Listing requirement for fittings moved to 343-6.
343-46 Bushings renumbered from 343-14 to 343-46
343-48 Joints renumbered from 343-8 to 343-48.
343-56
(1) Splices and Taps renumbered from 343-13 to 343-56.
(2) Referenced 300-15 and deleted list of products for clarity.
343-60 New Section for the grounding requirements. Text moved from 343-2 (99 NEC).
343-100
(1) Construction renumbered and renamed from 343-15 General to 343-100 Construction.
(2) Deleted product name and replaced with acronym "NUCC"
(3) Material characteristics moved from 343-1 (99 NEC).
(4) Moved marking requirements to 343-120.
New section for marking requirements moved from 343-15 (99 NEC).

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	**Common Numbering System for the Circular Raceway Articles**
	Article 3XX, <title>: <acronym>
	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.
3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.
3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete proposed Section 343-3.
Revise proposed Section 343-22 to read:
"The ~~maximum~~ number of conductors or cables ~~in nonmetallic underground conduit with conductors~~ shall not exceed that permitted by the percentage fill in Table 1, Chapter 9".
Delete the second sentence from proposed 343-56.
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 343-3 and the second sentence of 343-56 are deleted as Section 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
Proposed Section 343-22 is revised because section 4-3.3 of the Regulations Governing Committee Projects requires that a proposal include the words to be deleted.
The panel recognizes that the submitter inadvertently omitted the correct renumbering sequence in its substantiation. The panel has corrected the renumbering as follows:
Explanation of proposed renumbering and editorial changes;
· Title Added Type and the Acronym "NUCC"
· 343-1 New Scope added to conform with the style manual.
· 343-2
(1) Definition renumbered from Section 343-1 to 343-2.
(2) Added acronym after title.
(3) Material composition and strength characteristics moved to Section 343-100(b).
· 343-3
(1) Other Articles renumbered from Section 343-2 to 343-3.
(2) Substitute acronym "NUCC" for the product proper name
(3) Moved grounding requirements to 343-60.
· 343-6
(1) New section specifically for listing requirements.
(2) Listing requirements moved here from 343-3 (99 NEC)
· 343-10
(1) Uses Permitted renumbered from Section 343-3 to 343-10.
(2) Delete product name and replace with acronym "NUCC".
· 343-12
(1) Uses Not Permitted renumbered from Section 343-4 to 343-12.
(2) Delete product name and replace with acronym "NUCC".
(3) Correct section references.
· 343-20
(1) Size renumbered from Section 343-5 to 343-20.
(2) Delete product description or product name and replace with acronym "NUCC" (three places).
(3) The word "electrical" was deleted as it added nothing to the clarity of this section (two places).
· 343-22
(1) Number of Conductors renumbered from 343-15 to 343-22.
· 343-24
(1) Bends-How Made renumbered from 343-10 to 343-24.
(2) Delete product name for clarity.
(3) Corrected section reference.

Table 343 –10. Radius of Conduit Bends

Metric Designator	Trade Size	Minimum Bending Radius	
		mm	in.
16	1/2	250	10
21	3/4	300	12
27	1	350	14
35	1 1/4	450	18
41	1 1/2	500	20
53	2	650	26
63	2 1/2	900	36
78	3	1200	48
103	4	1500	60

· 343-26 Bends-Number in One Run renumbered from 343-11 to 343-26.
· 343-28
(1) Trimming renumbered from 343-6 to 343-28.
(2) Added the word "conduit" for clarity.
· 343-46
(1) Bushings renumbered from 343-9 to 343-46
(2) Delete product name and replace with acronym "NUCC".
· 343-48 Joints renumbered from 343-7 to 343-48.
· 343-5 Conductor Terminations renumbered from 343-8 to 343-50.
· 343-56
(1) Splices and Taps renumbered from 343-12 to 343-56.
· 343-60 New Section for the grounding requirements. Text moved from 343-2 (99 NEC).
· 343-100 Construction.
343-100(a) General.
(1) Construction renumbered and renamed from 343-3 General to 343-100 Construction.
(2) Deleted product name and replaced with acronym "NUCC"
343-100(b) Nonmetallic Underground Conduit.
(1) Material characteristics moved from 343-1 (99 NEC).
343-100(c) Conductors and Cables.
(1) Conductor and Cable requirements moved from 343-14.
343-100(d) Conductor Fill.
(1) Conductor fill requirements moved from 343-15.
· 343-120 New section for marking requirements moved from 343-16 (99 NEC).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1279)

8- 75 - (343): Accept

Note: The Technical Correlating Committee notes that the FPN in the proposal is modified by the action on Proposal 8-80.#EF3

SUBMITTER: #BF4Technical Correlating Committee National Electrical Code #EF4

RECOMMENDATION: Revise as follows:

343 - 5 (a) Minimum. Nonmetallic underground conduit with conductors smaller than metric designator 16 (1/2) ~~1/2 in. electrical trade size~~ shall not be used.

343-5 (b) Maximum. Nonmetallic underground conduit with conductors larger than metric designator 103 (4)~~4 in. electrical trade size~~ shall not be used.

FPN: Metric trade numerical designations for nonmetallic underground conduit with conductors are 16 = 1/2 ~~1/2 = 16~~, 21 = 3/4 ~~3/4 = 21~~, 27 = 1 ~~1 = 27~~, 35 = 1 1/4 ~~1 1/4 = 35~~, 41 = 1 1/2 ~~1 1/2 = 41~~, 53 = 2 ~~2 = 53~~, 63 = 2 1/2 ~~2 1/2 = 63~~, 78 = 3 ~~3 = 78~~, 91 = 3 1/2 ~~3 1/2 = 91~~, and 103 = 4 ~~4 = 103~~.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.
In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.
In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #2067)

8- 76 - (343-1): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add a Scope section to Article 343 to read as follows:

343-1. Scope. The provisions of this article covers the use, installation, and construction specifications requirements of nonmetallic underground conduit with conductors.

Renumber remaining sections.

SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-74.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2966)

8- 77 - (343-1): Accept

Note: The Technical Correlating Committee directs the panel to clarify the action on this Proposal. The Technical Correlating Committee assumes that the Panel Action on Proposal 8-74 appropriately handles the issue through the introduction of 343-6. This action will be considered by the Panel as a Public Comment.

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions

RECOMMENDATION:
Revise text to read as follows:
"The nonmetallic conduit shall be listed and composed of a material that is resistant to moisture and corrosive agents. It shall also be capable of being supplied on reels without damage or distortion and shall be of sufficient strength to withstand abuse, such as impact or crushing, in handling and during installation without damage to conduit or conductors."

SUBSTANTIATION: This proposal requires the conduit, as a component, to be listed. Currently the conductors are required to be listed per Section 343-14. This will prohibit the use of communication raceways and require the use of electrical conduit.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1427)

8- 78 - (343-2): Accept in Principle

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise as follows:

343-2. Other Articles. ~~Installations for nonmetallic underground conduit with conductors shall comply with the provisions of the applicable sections of Article 300.~~ Where equipment grounding is required by Article 250, an assembly containing a separate equipment grounding conductor shall be used.

SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-74.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2180)

8- 79 - (343-3(1), FPN (New)): Reject

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

(1) For direct burial underground installation. ~~For minimum cover requirements, see Table 300-5 and 300-50 under rigid nonmetallic conduit.~~

FPN: See Tables 300-5 and 300-50 under rigid nonmetallic conduit, for minimum cover requirements.
SUBSTANTIATION: This deleted sentence is an explanatory reference to another NEC rule; therefore, it should be a fine print note. The NEC Style Manual 4.1 states, "Explanatory references shall be in fine print notes." Also 4.1.2 states, "References shall indicate the subject of the rules being referenced; the subject shall follow the number."
PANEL ACTION: Reject.
PANEL STATEMENT: This information is necessary as mandatory text since Tables 300-5 and 300-50 do not specifically refer to Nonmetallic Underground Conduit with Conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3037)

8- 80 - (343-5): Accept in Principle
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise text as follows:
(a) Minimum. NUCC ~~Nonmetallic underground conduit with conductors~~ smaller than 1/2 (16) ~~-in. electrical trade size~~ shall not be used.
(b) Maximum. NUCC ~~Nonmetallic underground conduit with conductors~~ larger than 4 (103) ~~-in. electrical trade size~~ shall not be used.
FPN: The Trade Sizes and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-1(c).
~~FPN: Metric trade numerical designations for nonmetallic underground conduit with conductors are 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/2 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, and 4 = 103.~~
SUBSTANTIATION: To correlate with proposal submitted by NEMA to CMP 3 to add a table showing current trade sizes and metric designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code which is no longer needed. Metric designators for trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code.
PANEL ACTION: Accept in Principle.
The Panel accepts in principle the addition of the new FPN to read as follows:
FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions.
The panel accepts the deletion of the old FPN. The Panel accepts in principle the replacement of the product name with the acronym "NUCC" and the deletion of "in. electrical trade size" by action on Proposals 8-74 and 8-75.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See Panel Action on Proposals 8-74 and 8-75.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1067)

8- 81 - (343-9, FPN): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 4" to "4 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1156)

8- 82 - (343-11): Reject
SUBMITTER: Charles N. Landey, Wisconsin Dept. of Transportation
RECOMMENDATION: Delete 343-11.
SUBSTANTIATION: Purpose of material cited in Section 343 is low-cost protection of cable which would otherwise be direct buried. There are other methods for usable raceways with less than 360 degrees of bend. This material is often installed with greater than 360 degrees of bends and twists.
PANEL ACTION: Reject.
PANEL STATEMENT: Raceways are to be installed so conductors will not be subjected to installation stresses by being pulled through more than 360 degrees of total bends. This installation requirement is applicable to NUCC because conductors are permitted to be removed and installed just like any other raceway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #837)

8- 83 - (343-14): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(a) 600 Volts or Less. Conductors of different systems rated 600 volts, nominal, or less, ~~Alternating~~ alternating current or direct-current circuits shall be permitted in the same conduit. All conductors shall have an insulation rating ~~equal to at least~~ not less than the maximum nominal circuit voltage of any conductor or cable within the conduit.
(b) Over 600 Volts. Conductors or cables of circuits rated over volts shall not occupy the same conduit with conductors or cables of circuits rated 600 volts or less.
SUBSTANTIATION: It is presumed the intent of (a) is to permit different systems in the same conduit per Section 300-3(c)(1), not limited to just ac or dc circuits.
The intent of (b) is not clear. UL listing indicates the voltage rating of all conductors rated over 600 volts is the same. The first part relates to insulation rating, the last part relates to circuit rating. Present wording prohibits conductors with insulation rating over 600 volts being used for circuits rated less than 600 volts. If this is the intent, the wording should indicate that.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is introducing material that is under the purview of CMP 3. See Panel action on Proposal 8-83a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #CP802)

8- 83a - (343-14(a) and (b)): Accept
Note: The Technical Correlating Committee understands that this action replaces the accepted text in 343-100(c) in Proposal 8-74.
SUBMITTER: CMP 8
RECOMMENDATION: Delete Sections 343-14(a) & (b).
Revise the existing first paragraph to read:
"343-14. Conductors and Cables. Conductors and cables used in NUCC shall be listed and shall comply with 310-8(c). Conductors of different systems shall be installed in accordance with 300-3(c)."
SUBSTANTIATION: The deleted sections are not necessary as the requirements for conductor insulation and mixing different voltage systems are stated in Section 300-3(c). The words concerning wet locations have been removed and replaced by the reference to Section 310-8(c).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #125)

8- 84 - (344): Accept

NOTE: The following proposal consists of Comment 8-168 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-5a was:

Delete Article 331–Electrical Nonmetallic Tubing

Delete Article 343–Nonmetallic Underground Conduit With Conductors

Delete Article 345–Intermediate Metal Conduit

Delete Article 346–Rigid Metal Conduit

Delete Article 347–Rigid Nonmetallic Conduit

Delete Article 348–Electrical Metallic Tubing

Delete Article 349–Flexible Metallic Tubing

Delete Article 350–Flexible Metal Conduit

Delete Article 351–Liquidtight Flexible Metal Conduit and Liquidtight Flexible Nonmetallic Conduit

Add new Article 315

Raceways of Circular Cross Section-Conduit, Tubing and Prewired Assemblies

A. General

315-1. Scope. This article covers the use, installation, and construction specifications for those raceways defined in Section 315-2.

315-2. Definitions.

FPN: See Section 315-100 for the construction specifications of these raceways.

Electrical Metallic Tubing (EMT): A ferrous or nonferrous metal raceway of circular cross section with or without integral couplings.

Electrical Nonmetallic Tubing (ENT): A pliable corrugated nonmetallic raceway of circular cross section that can be bent by hand with a reasonable force, but without other assistance.

Flexible Metal Conduit (FMC): A flexible ferrous or nonferrous metal raceway of circular cross section.

Flexible Metallic Tubing (FMT): A metal raceway of circular cross section that is flexible, and liquidtight without a nonmetallic jacket.

Intermediate Metal Conduit (IMC). A steel raceway of circular cross section, with integral or associated couplings.

Liquidtight Flexible Metal Conduit (LFMC): A raceway of circular cross section having an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.

Liquidtight Flexible Nonmetallic Conduit (LFNC): A flexible nonmetallic raceway of circular cross section.

Nonmetallic Underground Conduit (NUC): A factory assembly of conductors or cables inside a nonmetallic, smooth-walled raceway with a circular cross section.

Rigid Metal Conduit (RMC). A ferrous or nonferrous metal raceway of circular cross section, with integral or associated couplings.

Rigid Nonmetallic Conduit (RNC): A nonmetallic raceway of circular cross section with or without integral couplings.

Schedule 80: A PVC heavy walled raceway with a wall thickness conforming to schedule 80- Iron Pipe Size (IPS) dimensions.

Schedule 40: A PVC raceway with a wall thickness conforming to schedule 40-IPS dimensions.

Type A: A PVC thin walled raceway with wall thickness conforming to schedule A-IPS dimensions.

Type EB: A PVC thin walled raceway with wall thickness designed to achieve a duct stiffness of 20 lbs/in./in.

HDPE: A high density polyethelyne raceway with a wall thickness conforming to schedule 40-IPS dimensions.

RTRC: A rigid thermosetting resin raceway with a wall thickness conforming to industry specifications.

315-3. Other Articles. All raceway installations in this article shall comply with other applicable provisions of this *Code*.

315-7. Listing Requirements. All raceways covered in this article, and their associated fittings shall be listed.

B. Installation

315-12. Uses Permitted and Not Permitted. Uses permitted and not permitted for raceways covered in this article shall be as shown in Tables 315-12(a),(b) and (c).

315-14. Temperature Limitations.

(a) LFMC and LFNC shall not be permitted where any combination of ambient and conductor insulation temperatures will produce an operating temperature in excess of that for which the material is listed.

(b) ENT and RNC:

(1) ENT and RNC shall not be permitted where subject to ambient temperatures exceeding those for which the material is listed.

FPN: The maximum ambient temperature of PVC conduit and tubing is 50 degrees C (122 degrees F).

(2) ENT and RNC shall not be permitted for conductors whose insulation temperature limitation would exceed those for which the conduit or tubing is listed.

315-15. Corrosive Locations and Raceway Degradation

(a) Metal Raceways. Metal raceways subject to airborne or splash chemical exposure shall utilize materials approved for the installation. Coated metal raceways subject to airborne and splash chemical exposure and ultraviolet degradation shall utilize materials approved for the installation

(b) Nonmetallic Raceways.

(1) Nonmetallic raceways subject to ultraviolet degradation shall utilize materials approved for the installations and shall be listed as sunlight resistant.

(2) Non-metallic raceways subject to chemical solvent airborne or splash exposure shall be suitable for the installation.

FPN: See Section 300-6 for protection against corrosion.

315-17. Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.

Aluminum fittings and enclosures shall be permitted to be used with EMT, IMC and steel RMC. Steel fittings and enclosures shall be permitted to be used with aluminum RMC.

Table 315-12(a). Uses Permitted and Not Permitted for EMT, IMC, and RMC.

P = Permitted N = Not Permitted

	EMT		IMC	RMC				
Application	Galv	Alum	Galv or Coated	Galv	Alum	Other Non-ferrous	Coated	Enameled
Outdoors	P	P	P	P	P	P	P	N
Indoors, Exposed	P	P	P	P	P	P	P	P3
Indoors, Concealed	P	P	P	P	P	P	P	P3
Wet locations (Indoor)	P	P	P	P	P	P	P	P3
Damp locations	P	P	P	P	P	P	P	P
Dry locations	P	P	P	P	P	P	P	P
Encased or embedded in poured concrete on or above grade	P	N	P	P	N	P	P	N
Encased or embedded in poured concrete below grade	N	N	P	P	N	P	P	N
Direct burial i.e. soil or cover in direct contact with the raceway	P1	N	P	P	N	P	P	N
Exposed to the direct rays of the sun	P	P	P	P	P	P	P	P
Exposed to physical damage	P	P	P	P	P	P	P	P
Support of fixtures or other equipment.	N2	N2	P	P	P	P	P	P
System voltages over 600 volts, nominal.	P	P	P	P	P	P	P	P

Notes:

Note: 1. Ferrous EMT, elbows, couplings, and fittings shall be permitted to be in direct contact with the earth where provided with corrosion protection judged suitable for the conditions.

Note: 2. EMT shall be permitted to support conduit bodies no larger than the largest trade size of an entering raceway. The conduit bodies shall not contain devices or support fixtures.

Note: 3. Ferrous raceways and fittings protected from corrosion solely by enamel shall be permitted only indoors and in occupancies not subject to severe corrosive influences.

Table 315-12(b) Uses permitted and not permitted for ENT, NUC, and RNC.
P = Permitted N = Not Permitted

	ENT	NUC	RNC					
Application			**Sch. 40 PVC**	**Sch. 80 PVC**	**Type A PVC**	**Type EB PVC**	**RTRC**	**HDPE**
Outdoors	N	N	P	P	N	N	P	N
Indoors, Exposed	P1	N3	P	P	N	N	P	N
Indoors, Concealed	P1,2	N	P	P	N	N	P	N
Wet locations (Indoor)	P	N	P	P	N	N	P	N
Damp locations	P	N	P	P	N	N	P	N
Dry locations	P	N	P	P	N	N	P	N
Encased or embedded in poured concrete on or above grade	P	N	P	P	N	N	P	N
Encased or embedded in poured concrete below grade	P	P	P	P	P	P	P	P
Direct burial i.e. soil or cover in direct contact with the raceway	N	P	P	P	N	N	P	P
Exposed to the direct rays of the sun	N	N	P	P	N	N	P	N
Exposed to physical damage	N	N	N	P	N	N	N	N
Support of fixtures or other equipment.	N	N	N4	N4	N	N	N4	N
System voltages over 600 volts, nominal.	N5	P	P	P	P	P	P	P

(FPN) Extreme cold may cause some types of nonmetallic raceways to become brittle and, therefore, more susceptible to damage from physical contact.

Notes:

Note: 1. In any building not exceeding three floors above grade.

Note: 2. Where used in any building exceeding three floors above grade, the walls, floors, and ceilings, including suspended ceilings, behind which the tubing is concealed shall provide a thermal barrier of material that has at least a 15-minute finish rating, as identified in listings of fire-rated assemblies. The 15-minute finish-rated thermal barrier shall be permitted to be used for combustible or noncombustible walls, floors, and ceilings.

(FPN): A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

Note: 3. The conductor or the cable portion of the assembly, where suitable, shall be permitted to extend within the building for termination purposes, in accordance with Section 300-3.

Note: 4. Conduit shall be permitted to support conduit bodies no larger than the largest trade size of an entering raceway. The conduit bodies shall not contain devices or support fixtures.

Note: 5. ENT shall be permitted in accordance with Article 600.

Table 315-12(c) Uses permitted and Not permitted for FMC, FMT, LFMC, and LFNC.
P = Permitted N = Not Permitted

	FMC		FMT		LFMC	LFNC	
Application	**Steel**	**Alum**			**Type 1**	**Type 2**	**Type 3**
Outdoors	N1	N1	N	P	P2	P2	P2
Indoors, Exposed	P	P	P3	P	P	P	P
Indoors, Concealed	P	P	P3	P	P	P	P
Wet locations	N1	N1	N	P	P	P	P
Damp locations	P	P4	N	P	P	P	P
Dry locations	P	P	P3	P	P	P	P
Encased or embedded in poured concrete on, above and below grade	N	N	N	P2	P2	P2	P2
Direct burial i.e. soil or cover in direct contact with the raceway	N	N	N	P2	P2	P2	P2
Exposed to physical damage	N	N	N	N	N	N	N
Support of fixtures or other equipment.	N	N	N	N	N	N	N
Where flexibility is required for installation, operation, or maintenance.	P	P	N	P	P	P	P
Lengths over 6 ft (1.83 m).	P	P	N	P	N6	P	N6
System voltages over 600 volts, nominal.	N7,8	N7,8	P3,5	N7,8	N7	N7	N7

(FPN): Extreme cold may cause some types of nonmetallic conduit to become brittle and, therefore, more susceptible to damage from physical contact.

Notes:

Note: 1. If the conductors are approved for the specific conditions and the installation is such that liquid is not likely to enter raceways or enclosures to which the conduit is connected.
Note: 2. Where listed and marked for the purpose.
Note: 3. For branch circuits only.
Note: 4. Not permitted where installed in direct contact with masonry.
Note: 5. For system voltages of 1000 volts maximum.
Note: 6. LFNC shall be permitted where longer length is essential for a required degree of flexibility.
Note: 7. Flexible conduit shall be permitted in accordance with Article 600.
Note: 8. FMC and LFMC shall be permitted in accordance with Section 430-123.

315-23. Size. Permitted sizes for raceways shall be as shown in Table 315-23.

315-25. Bends.

(a) General. Bends of raceways shall be so made that the raceway will not be damaged and its internal diameter will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose. Bends of ENT, FMC, FMT, LFMC, LFNC, and NUC shall be permitted to be made manually.

(b) Number of Bends.

There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.

(c) Radius of Curve. The radius of the curve to the centerline of a bend shall not be less than as shown in Table 315-25.

315-30. Reaming and Threading.

(a) Reaming and Trimming. All cut ends of raceways covered in this article shall be reamed or otherwise trimmed to remove rough edges. Reaming and trimming shall not be required where fittings are inside the raceway.

(b) Threaded.

(1) EMT shall not be threaded. Where integral couplings are used, such couplings shall be permitted to be factory threaded.

(2) Where IMC or RMC is threaded in the field, a standard conduit cutting die with a 3/4-in. taper per ft (1 in 16) shall be used.

(FPN): See Standard for Pipe Threads, General Purpose (Inch), ANSI/ASME, B.1.20.1-1983.

Table 315-23. Permitted Sizes for Raceways.

P = Permitted N = Not Permitted

	Trade size (inches)									
	Metal			Nonmetallic			Flexible			
Specification	EMT	IMC	RMC	ENT	NUC	RNC	FMC	FMT	LFMC	LFNC
Minimum	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Maximum	4	4	6	2	4	6	4	3/4	4	4
3/8" permitted	N	N	P1	N	N	N	P2	P3	P2	P4

(FPN): Metric trade numerical designations for raceways are the same as those found in Extra-heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 981-1989; namely, 3/8 = 12, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103, 5 = 129, 6 = 155.

Notes to Table 315-23:
1. For enclosing the leads of motors, as permitted by Section 430-145(b).

2. Permitted for the following:
(a) Enclosing the leads of motors, as permitted in Section 430-145(b)
(b) Lengths not in excess of 6 ft (1.83 m) as part of a listed assembly, or for tap conductors to lighting fixtures as permitted in Section 410-67(c), or for utilization equipment
(c) Manufactured wiring systems, as permitted in Section 604-6(a)
(d) Hoistways, as permitted in Section 620-21(a)(1)
(e) As part of a listed assembly to connect wired fixture sections, as permitted in Section 410-77(c)

3. Permitted for the following:
(a) Lengths not in excess of 6 ft (1.83 m) as part of an listed assembly, or for lighting fixtures. See Section 410-67(c).
(b) In accordance with Sections 300-22(b) and (c)

4. Permitted for the following:
(a) Enclosing the leads of motors, as permitted in Section 430-145(b)
(b) Lengths not in excess of 6 ft (1.83 m) as part of a listed assembly, or for tap conductors to lighting fixtures as permitted in Section 410-67(c), or for utilization equipment
(c) Electric sign conductors on insulators, in accordance with Section 600-32(a)

Table 315-25. Minimum Radii for Bends (Inches)

Trade Size (inches)	ENT, IMC, RMC, RNC EMT, FMC, LFMC, LFNC	NUC	FMT	
			Fixed Bends (1)	Field Bends (2)
3/8	–	–	3-1/2	10
1/2	4	10	4	12-1/2
3/4	4-1/2	12	5	17-1/2
1	5-3/4	14	–	–
1-1/4	7-1/4	18	–	–
1-1/2	8-1/4	20	–	–
2	9-1/2	26	–	–
2-1/2	10-1/2	36	–	–
3	13	48	–	–
3-1/2	15	–	–	–
4	16	60	–	–
5	24	–	–	–
6	30	–	–	–

For SI Units: (Radius) 1 in. = 25.4 mm

Note 1 - Where bent for installation purposes and is not flexed or bent as required by use after installation.
Note 2 - Where infrequently flexed in service after installation.

315-35. Supports.
(a) General. Section 315-35 does not apply to NUC .
(b) Nonflexible Raceways.
(1) Complete System. Raceways shall be installed as a complete system, as provided in Article 300, and shall be securely fastened. RNC shall be fastened so that movement from thermal expansion or contraction will be permitted.
a. EMT shall be securely fastened at intervals not exceeding 10 ft (3.05 m). Unbroken lengths of EMT shall be permitted to be fished for concealed work in finished buildings or prefinished wall panels where such securing is impracticable.
b. IMC and RMC shall be supported at intervals not exceeding 10 ft (3.05 m).
Exception No. 1: Where made up with threaded couplings, it shall be permissible to support straight runs in accordance with Table 315-35(a), provided such supports prevent transmission of stresses to termination where conduit is deflected between supports.
Exception No. 2: For exposed vertical risers from industrial machinery, the distance between supports shall be permitted to be increased to 20 ft (6.1 m), provided that the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.
c. ENT shall be securely fastened at intervals not exceeding 3 ft.
Exception: Lengths not exceeding 6 ft (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures, as permitted in Section 410-67(c).
d. RNC shall be supported as required in Table 315-35(b). RNC listed for support at spacings other than as shown in Table 315-35(b) shall be permitted to be installed in accordance with the listing.
(2) Horizontal Runs through Framing Members.
a. Horizontal runs of EMT, IMC, or RMC supported by openings through framing members at intervals not exceeding 10 ft (3.05 m)

and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

b. Horizontal runs of ENT supported by openings through framing members at intervals not exceeding 3 ft (914 mm) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

c. Horizontal runs of RNC supported by openings through framing members at intervals not exceeding those specified in Table 315-35(b) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

(3) Distance from Fastening to Termination. Raceways shall be securely fastened within 3 ft (914 mm) of each outlet box, junction box, device box, cabinet, conduit body, or other termination.

Exception No. 1: Where approved, IMC and RMC shall not be required to be securely fastened within 3 ft (914 mm) of the service head for above-the-roof termination of a mast.

Exception No. 2: Fastening of EMT, IMC, and RMC at their termination points shall be permitted to be increased to 5 ft (1.52 m) where structural members do not readily permit fastening within 3 ft (914 mm). For EMT, this exception shall apply to unbroken lengths only.

Exception No. 3: RNC listed for securing at other than 3 ft (914 mm) shall be permitted to be installed in accordance with the listing.

Exception No. 4: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths of EMT shall be permitted to be fished.

Table 315-35(a). Support for Straight Runs of RMC or IMC Made Up with Threaded Couplings

Trade Size (inches)	Maximum Distance Between Supports (feet)
1/2 – 3/4	10
1	12
1 1/4 – 1 1/2	14
2 – 2 1/2	16
3 and larger	20

For SI units: (Supports) 1 ft = 0.3048 m.

Table 315-35(b). Support for RNC

Trade Size (inches)	Maximum Distance Between Supports (feet)
1/2–1	3
1 1/4–2	5
2 1/2–3	6
3 1/2–5	7
6	8

For SI units: (Supports) 1 ft = 0.3048 m.

(c) Flexible Raceways.
(1) Supported or Secured.
a. FMC and LFMC shall be supported and secured at intervals not exceeding 4 1/2 ft (1.37 m). Supporting and securing shall not be required where the conduit is fished or where installed in lengths not exceeding 6 ft (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures, as permitted in Section 410-67(c).
b. Where installed in lengths longer than six feet, LFNC as described in Section 315-100(d)(2) shall be securely fastened at intervals not exceeding 3 ft (914 mm) unless the conduit is fished.

(2) Distance from Fastening to Termination. LFNC, as described in Section 315-100(d)(2), installed in lengths longer than six feet, FMC, and LFMC shall be securely fastened by an approved means within 12 in. (305 mm) of each box, cabinet, conduit body, or other termination of the conduit unless:

(a) the conduit is fished, or
(b) the length does not exceed 3 ft (914 mm) at terminals where flexibility is necessary, or
(c) the length does not exceed 6 ft (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures, as permitted in Section 410-67(c).
(3) Horizontal Runs through Framing Members.
a. Horizontal runs of FMC and LFMC supported by openings through framing members at intervals not exceeding 4 1/2 ft (1.37 m) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.

315-40. Boxes. Boxes shall comply with the applicable provisions of Articles 300 and 370.

315-50. Fittings.
(a) General. Fittings shall comply with the applicable provisions of Articles 300 and 370.

(b) Expansion Fittings for RNC. Expansion fittings shall be provided for RNC to compensate for thermal expansion and contraction where the length change, in accordance with Chapter 9, Table 10, is expected to be 0.25 in. (6.36 mm) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other termination of the conduit.

(c) FMT Fittings. FMT fittings shall effectively close any openings in the connection.

(d) Angle Connectors. Angle connectors shall not be used for concealed installations of FMC, LFMC, or LFNC.

(e) Threadless Couplings and Connectors. Threadless couplings and connectors used with EMT, IMC, and RMC shall be made up tight. Where buried in masonry or concrete, they shall be concrete-tight. Where installed in wet locations, they shall be raintight.

(f) Running Threads. Running threads shall not be used on IMC or RMC for connection at couplings.

(g) Joints. Where ENT, NUC, or RNC is used, all joints between lengths of raceways and between raceways, fittings, and boxes shall be by an approved method.

(h) Bushings. Where a nonflexible raceway enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the conductor or cable from abrasion, unless the design of the box, fitting, or enclosure provides equivalent protection. See Section 300-4(f) for the protection of conductors size No. 4 or larger.

315-60. Grounding and Bonding.
(a) Grounding. Metal raceways shall be permitted as a grounding means as covered in Section 250-91(b). Where FMC or LFMC is used to connect equipment where flexibility is required, an equipment grounding conductor shall be installed.

(b) Bonding. Where an equipment bonding jumper is required, it shall be installed in accordance with Article 250, Part G.

315-70. Number of Conductors.
The number of conductors permitted in a single raceway shall not exceed the percentage fill specified in Chapter 9, Table 1, using the conduit or tubing dimensions of Chapter 9, Table 4. The number of conductors permitted in 3/8-in. FMC, FMT, or LFMC shall not exceed that specified in Table 315-70.

Table 315-70. Maximum Number of Insulated Conductors in 3/8-in. FMC, FMT, or LFMC*

Column A = Internal fitting
Column B = External fitting

Size AWG	Types RFH-2, SF-2		Types TF, XHHW, AF, TW		Types TFN, THHN, THWN		Types FEP, FEPB, PF, PGF	
	A	B	A	B	A	B	A	B
18	2	3	3	5	5	8	5	8
16	1	2	3	4	4	6	4	6
14	1	2	2	3	3	4	3	4
12	—	—	1	2	2	3	2	3
10	—	—	1	1	1	1	1	2

***In addition, one covered or bare equipment grounding conductor of the same size shall be permitted.**
b. Horizontal runs of LFNC supported by openings through framing members at intervals not exceeding 3 ft (914 mm) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.

C. Construction Specifications

315-100. Construction.
(a) EMT.
(1) Finish. EMT shall have such a finish or treatment of outer surfaces as will provide an approved durable means of readily distinguishing it, after installation, from RMC and IMC.
(2) Connector. Where EMT is coupled together by threads, the connector shall be so designed as to prevent bending of the tubing at any part of the thread.
(b) ENT. ENT shall be composed of a material that is resistant to moisture and chemical atmospheres and is flame-retardant. ENT shall be made of material that does not exceed the ignitibility, flammability, smoke generation, and toxicity characteristics of rigid (nonplasticized) polyvinyl chloride.
(c) FMC. FMC shall be constructed of helically wound, formed, interlocked metal strip
(d) LFNC. LFNC shall be flame-resistant and shall be constructed as one of the following types:
(1) a smooth seamless inner core and cover bonded together and having one or more reinforcement layers between the core and cover
(2) a smooth inner surface with integral reinforcement within the conduit wall
(3) a corrugated internal and external surface without integral reinforcement within the conduit wall
(e) NUC.
(1) General. NUC is an assembly that is provided in continuous lengths shipped in a coil, reel, or carton.
(2) Conduit. The nonmetallic conduit shall be composed of a material resistant to moisture and corrosive agents. It shall also be capable of being supplied on reels without damage or distortion and shall be of sufficient strength to withstand abuse, such as impact or crushing, in handling and during installation without damage to conduit or conductors.
(3) Conductors and Cables. Conductors and cables used in NUC shall be listed, shall be suitable for use in wet locations, and shall be as follows:
a. 600 Volts or Less. Alternating-current and direct-current circuits shall be permitted. All conductors shall have an insulation rating equal to at least the maximum nominal circuit voltage of any conductor or cable within the raceway.
b. Over 600 Volts. Conductors or cables rated over 600 volts shall not occupy the same raceway with conductors or cables of circuits rated 600 volts or less.
(f) RNC. RNC and fittings shall be of suitable nonmetallic material resistant to moisture and chemical atmospheres. For use aboveground, RNC shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, RNC shall be resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. RNC listed for the purpose shall be permitted to be installed underground in continuous lengths from a reel. Where intended for direct burial, without encasement in concrete, the RNC shall also be capable of withstanding continued loading likely to be encountered after installation.

315-107. Standard Lengths.
IMC and RMC shall be shipped in standard lengths of 10 ft (3.05 m), including coupling, one coupling to be furnished with each length. For specific applications or uses, it shall be permitted to ship lengths shorter or longer than 10 ft (3.05 m) with or without couplings and with or without threads.
315-190. Marking.
(a) Clear and Durable.
(1) Each length of EMT, ENT, and RMC shall be clearly and durably marked at intervals not exceeding 10 ft (3.05 m). See Section 110-21.
(2) IMC. In addition to the requirements of Section 315-190(a)(1), each length of IMC shall be clearly and durably identified at 2 1/2 ft (762 MM) intervals with the letters IMC.
(3) NUC. NUC shall be clearly and durably marked at least every 10 ft (3.05M) as required by Section 110-21. Identification of conductors or cables used in NUC shall be provided on a tag attached to each end of the assembly or to the side of a reel. Enclosed conductors or cables, shall be marked in accordance with Section 310-11.
(4) RNC. Each length of RNC shall be clearly and durably marked at intervals not exceeding 10 ft (3.05 m). See Section 110-21. For RNC recognized for use aboveground, markings shall be permanent. For RNC limited to underground use only, markings shall be sufficiently durable to remain legible until the material is installed.
(b) Type of Material.
(1) RNC and NUC. For NUC, the type of conduit material shall also be included in the marking. For RNC, the type of material shall also be included in the marking, unless it is visually identifiable.
(2) ENT and RNC shall be permitted to be surface-marked to indicate special characteristics of the material.
(FPN): Examples of these [optional] markings include, but are not limited to, the suffix "LS" for limited-smoke and markings such as "sunlight resistant."
(3) Corrosion-Resistant Material. Nonferrous IMC or RMC of corrosion-resistant material shall have suitable markings.
This panel desires the 1999 Code to be published with a reference note where all of the deleted articles (i.e. 331, 343, 345, 346, 347, 348, 349, 350, and 351) would have been located in the 1999 Code. The reference should indicate Article 315 has been added to replace each Article.
SUBMITTER: David Ullian Larson, Port St. Lucie, FL
RECOMMENDATION: Delete proposed Article 344 in its entirety. Keep separate articles for each raceway of circular cross section conduit, tubing and prewired assemblies.
SUBSTANTIATION: A new article is not needed. The existing articles are not difficult to find. The existing articles contain concise information. A new article would scatter this existing order into disarray. Installation errors would likely be more frequent. Education of new workers would be more difficult.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel agrees with the submitter that combining the nine articles into one article (Proposal 8-5a of the 1999 NEC cycle) would not enhance usability, therefore the individual articles have been retained.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #126)

8- 85 - (344): Reject
NOTE: The following proposal consists of Comment 8-169 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Noel Williams, Salt Lake City, UT
RECOMMENDATION: This proposal should remain accepted. The Technical Correlating Committee recommendation to keep the titles of deleted Articles with a note referencing the new Article should be followed.
SUBSTANTIATION: This proposal will go a long way in making this part of the NEC easier to use. Many objections relate to the usability of the new tables. These tables will be much easier for new users than the existing format of multiple Articles and many redundant rules. Experienced users will find the new Article somewhat difficult at first, but those difficulties are likely due mostly to the need to get used to the new arrangement. The grouping of requirements of the same type will be much easier in the long run. For example, users who wish to know whether a specific use is acceptable for some product, say EMT, will be able to find not only the permitted uses for EMT, but also suitable substitutes, or an appropriate wiring method for a condition for which EMT is not suitable. Previous codes have required searching through individual Articles to find this information.
Arguments for the status quo should be rejected.
In the interest of usability, the old Article headings with notes directing users to the new Article should be retained for at least one code cycle. The recommended headings did not appear in the Report on Proposals preprint.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 344 did not meet the requirements of usability and the objectives of the sub-task group. The sub task group to the TCC usability task group proposed reformatted individual raceway articles for user friendly code. Any comments that proposed text and which applied exclusively to Article 344 (Proposal 8-5a of the 1999 NEC cycle) are no longer applicable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #127)

8- 86 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-170 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Keith M. Whitesel, Whitesel Electric
RECOMMENDATION: Delete new Article 344. Let the existing articles stand. Combining all these articles in the name of simplification is ludicrous. The way it is now, when I want information about EMT, I go to Article 348. We know where to find the applicable information needed.
SUBSTANTIATION: None.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #128)

8- 87 - (344 (New)): Reject
NOTE: The following proposal consists of Comment 8-171 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: To organize Chapter 3 in a logical progression the Technical Correlating Committee directs that proposed new Article 315 will be numbered as new Article 344. The Technical Correlating Committee notes that the language in this Proposal as accepted by the Panel is modified by subsequent technical proposals submitted to Code-Making Panel 8. To provide the user with a ready reference as to those Proposals they are listed here:
8-58, 66, 72, 79, 109, 111a, 112, 114, 121, 126, 144, 152,157, 163, 164, 181a, 187, 199, 207,214, 222,and 295.
The Technical Correlating Committee directs the Panel to give further consideration to the affirmative comments on voting.
The Technical Correlating Committee directs the Panel to clarify the "*" note in the Title of Table 315-70 so it is clear that the note applies to all the conduit types covered by the Table.
The Technical Correlating Committee recommends to NFPA staff that they keep the present Article number and Title in place for the deleted articles and place a single paragraph following the title which states: "The material in this Article has been deleted and the requirements have been integrated into Article 344."
The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 8-85 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #129)

8- 88 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-172 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: David Cabello, Brown & Heim
RECOMMENDATION: I request that CMP 8 leave the nine raceway articles alone. They are somewhat easy to understand. The way I hear they are wanting to change, I believe they would become difficult to understand, too jumbled together.
SUBSTANTIATION: New Article 344 would be too confusing. I've been in trade seven years and believe that the articles are fine the way they are.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #130)

8- 89 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-174 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Chris Kuth, Enterprise Electric
RECOMMENDATION: I strongly urge CMP 8 to leave the nine raceway articles in the Code as they are for 1999.
SUBSTANTIATION: I've been an electrician for 5 years and think that Article 344 is much too incomprehensible to be included into Code requirements.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #131)

8- 90 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-175 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Greg Gale, Denver Electric
RECOMMENDATION: I very much hope that CMP 8 will see their way clear to leave the nine raceway articles alone in the 1999 NEC.
SUBSTANTIATION: I feel that the Code book is complex enough and the new article and 344 will make the Code book too difficult and confusing to use.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #132)

8- 91 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-176 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Harold Brown, Alison Electric Co.
RECOMMENDATION: Please extract the new article for raceways and resubmit the old.
SUBSTANTIATION: For young electricians, like myself, we are just learning the Code, it should be as basic as possible, combining Article 344 will make the Code harder to comprehend.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #133)

8- 92 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-177 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: John E. Buchanan, Jr.
RECOMMENDATION: I strongly urge CMP 8 to reject this article and leave the nine raceway articles the way they are in the Code for 1999.
SUBSTANTIATION: In my opinion, new Article 344 would be too confusing for most. The articles of now are broken down just fine.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #134)

8- 93 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-178 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Gary A. Thompson, City of Portland, OR/Rep. IAEI
RECOMMENDATION: Delete entire proposed Article 344. Reject.
SUBSTANTIATION: I do plan review, teach, and related training. My students are Canadian, West Coast States of Washington, Idaho, Montana, Utah, Oregon, Alaska, California; beginning apprentices through experienced electrical engineers. Testing engineers for word usage from the Code will produce 75 percent results. Plan review proves that most engineers (19 in 20) will test 35 percent or less. Article 344 adds confusion to an already burdened electrical engineering society.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #135)

8- 94 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-179 on Proposal 8-5 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: , Sartwell Electric Co.
RECOMMENDATION: Delete all.
SUBSTANTIATION: This proposal does nothing to increase usability.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #136)

8- 95 - (344): Reject
NOTE: The following proposal consists of Comment 8-180 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete this section or accept in principle revised as follows:
315-7 ~~Aluminum~~ Nonferrous metal raceways, fittings, and enclosures shall be permitted to be used with ~~EMT, IMC, and steel RMC.~~ ferrous metal raceways, fittings, and enclosures. ~~Steel~~ Ferrous metal raceways, fittings, and enclosures shall be permitted to be used with ~~aluminum RMC~~ nonferrous metal raceways, fittings, or enclosures. Bare conductors, where permitted to be used, shall be permitted in ferrous or nonferrous metal raceways or enclosures.
SUBSTANTIATION: This is probably one of the most disregarded rules in the Code. Is anyone prohibiting aluminum raceways clamped directly to steel framing members, or flexible aluminum conduit connected directly to RMC, EMT, or wireways, or bare copper grounding conductors in aluminum raceways? In any case, present wording of second sentence is too limited. It doesn't provide for dissimilar metal raceway-to-raceway connections, such as steel RMC to aluminum RMC or aluminum flexible conduit, or aluminum raceway to steel wireway, etc. It does not refer to flexible metal raceways, does not cover brass conduit or boxes, and does not address bare conductors in metal raceways.
The second sentence of the comment may be considered superfluous as the first sentence incorporates what it says, but may offer clarity.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #137)

8- 96 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-181 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Ruth Griffin, WDW
RECOMMENDATION: Please leave Article the same.
SUBSTANTIATION: I have been doing electrical work the past four years — new Article is not clear.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #138)

8- 97 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-182 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: James W. Blanch, DECA Electrical Contractors
RECOMMENDATION: I strongly urge CMP-8 to reject this new Article and leave the nine (9) raceway Articles in the 1999 NEC.
SUBSTANTIATION: I have been in the electrical construction industry for 7 years. I find the new Article 344 too confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #139)

8- 98 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-183 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Thomas A. Kearney, Mass Electrical Const. Comp./Rep. IBEW Local 606
RECOMMENDATION: I strongly urge CMP-8 to reject this Article and leave the existing conduit articles.
SUBSTANTIATION: It leaves too much open for interpretation and could very likely create safety hazards.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #140)

8- 99 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-184 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: John M. Flenner, Brown and Helm Electric
RECOMMENDATION: I urge CMP-8 to reject this new Article and leave the 9 raceway articles the way they are.
SUBSTANTIATION: I have been in the electrical industry for 14 years and I found the new Article 344 too confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #141)

8- 100 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-185 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Myron Terry, Olson Electric co./Rep. IBEW
RECOMMENDATION: I strongly urge CMP 8 to reject this new Article and leave the 9 raceway articles in the 1999 NEC.
SUBSTANTIATION: I have been in the electrical industry 2 years and find the new Article 344 too confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #142)

8- 101 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-186 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Bob Quintero, Walt Disney World
RECOMMENDATION: Please reject new article and leave article in present form.
SUBSTANTIATION: I feel quality and safety will be better served by leaving article in present specific form. Confusion generated by new article could be unsafe. I have been in trade for 5 years.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #143)

8- 102 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-187 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Dean R. Papa, Mass Electric Construction Co.
RECOMMENDATION: I urge that the intended Article change be deleted and, that the original Article remain intact.
SUBSTANTIATION: The change would create mass confusion due to interpretation of the Article if condensed into one Article.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #144)

8- 103 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-188 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Michael Whyers, Mass Electric Construction Co.
RECOMMENDATION: It is my feeling that CMP 8 leave the 9 raceway Articles as they are for the 1999 NEC.
SUBSTANTIATION: If amended, the possibility for confusion (at least) or misinterpretation (at most) would be greatly increased.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #145)

8- 104 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-189 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Johnnie B. Jones, J&L Electric Inc.
RECOMMENDATION: I strongly urge CMP 8 to reject this new Article and leave the 9 raceway sections the same as in the 1999 NEC.
SUBSTANTIATION: I believe the change would greatly effect the Article and actually damage a valued area of the Code making the accessibility of valuable information obscured.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #146)

8- 105 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-190 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].

SUBMITTER: Mark Tatum, Olson Electric Co.
RECOMMENDATION: I strongly reject. CMP 8 should leave the 9 raceways the same in 1999 NEC.
SUBSTANTIATION: Things can be missed easily such as supporting the different type of raceways. Uses permitted, uses not permitted.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #147)

8- 106 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-191 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Jamie D'Amico, Gordon Mark Inc.
RECOMMENDATION: I am concerned that important parts of the section will be left out. I don't like the change fro the 1999 Code book because of too much information on one section.
SUBSTANTIATION: I have been working in the trade for 8 years and I think there will be too much information in one section.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #148)

8- 107 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-192 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Brent C. Webb, Sconyers Control Services/Rep. IBEW Local 606
RECOMMENDATION: Please do not allow improper uses of raceways by combining these Articles.
SUBSTANTIATION: The 9 raceway articles in the present NEC, I feel is itemized in a fashion to keep improper uses of the raceways out of the electrical industry.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #149)

8- 108 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-193 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Darrell Bordelon, Buena Vista Construction Co.
RECOMMENDATION: I respectfully request that this revision be turned down.
SUBSTANTIATION: I have been in the electrical field for around 7 years, and I feel that the Code book needs separate articles for raceways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #150)

8- 109 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-194 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Lars D. Luhta, Mass Electric Construction Co.
RECOMMENDATION: Reject the proposed article. Leave it as it stands.
SUBSTANTIATION: Working in the trade for 6700 hours, I find it too complicated.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #151)

8- 110 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-195 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Thomas Wynn, Mass Electric co.
RECOMMENDATION: I encourage the committee to reject the new article and leave the article as is.
SUBSTANTIATION: This proposed change would be very confusing and important information could be left out.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #152)

8- 111 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-196 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Shayne Russo, Florida Electric & Controls
RECOMMENDATION: I believe that a change in this article would make it more difficult to locate desired information.
SUBSTANTIATION: I have been an electrician for 8 years and do believe that this would not be a good change.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #153)

8- 112 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-197 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Raymond D. Hoke, Walt Disney World
RECOMMENDATION: Leave article as is to prevent confusion.
SUBSTANTIATION: I've been in the trade 4 years and I find the new articles are too confusing.
PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #154)

8- 113 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-198 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Damon T. Larrimore, Mass Electrical Construction Co.
RECOMMENDATION: Would like the new proposal rejected and leave the Code book as it is.
SUBSTANTIATION: I feel the new proposal would cause too much confusion. The present set-up of the Code book is satisfactory.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #155)

8- 114 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-199 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Michael Mathers, Mass Electric
RECOMMENDATION: Reject the new article. Leave the old article.
SUBSTANTIATION: It will make the article too confusing. Leave the article as is.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #156)

8- 115 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-200 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Jack A. Gruber, Wheatland Tube Co.
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: This is extremely confusing and has not made this article more "user friendly". Installers will look at the table to see what is permitted but will not check the notes for all possible exceptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #157)

8- 116 - (344): Accept in Principle in Part
NOTE: The following proposal consists of Comment 8-201 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Ronald P. O'Riley, Innovative Education, Inc.
RECOMMENDATION: Delete new layout and return to individual Articles 345 through 351 for circular cross-sectional wiring methods. Accept the various revisions to the particular wiring method and the rewording of exceptions for Article 345 through 351.

Delete Article 331, Electrical Nonmetallic Tubing, and make it into a new Article 344 so it will be with the other circular cross-section conduits and tubing. Delete the permitting of ENT to be prewired.
SUBSTANTIATION: The new revised layout is not user friendly., It is much harder to locate information in and interpret. In the 1996 Code layout, when a person was designing or installing electrical metallic tubing, it was simple to look under the particular wiring method at hand, Article 348 Electrical Metallic Tubing. The article was then divided into very logical three parts, General, Installation, and Construction. Next was the identifying bold face headings that made it easy to find the rules for such things as use permitted, bending, supporting, and etc. This was an easy, clear cut way to locate and interpret the rules.

The Code already has grouped the circular wiring methods together between Articles 345 and 351 with the exception of ENT. Article 311 could be moved to 344 and then all the circular wiring methods would be together.

The new layout now requires the designer or the installer to reverse the procedure. Now they must first decide if they want to know something about use, bending, supporting or such. Now they must sort through all of what used to be a simple heading and or table until they find the type of raceway they are working with. The tables with their multitude of notes, which as tables will be in very small print, are going to be very hard to interpret.

I question the value of permitting prewired ENT. Past experiences with the Code shows that once the Code does something for one particular wiring method, it is found necessary to permit the same for other competitive wiring methods. Take a look at the number of tables in the Code today because a special table was suggested for nonmetallic conduit. There will no reason this should not be done with other metallic or nonmetallic flexible wiring methods.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The Panel agrees that Proposal 8-5a should not be accepted. See Panel action and statement on Proposal 8-84. The Panel offers the following comments relative to the submitter's recommendation referring to revisions to Articles 345 through 351, the renumbering of Article 331, and the deletion of prewired ENT:
1. All proposed revisions related to Articles 345 through 351 have been evaluated on their individual merits.
2. The renumbering of articles is not within the scope of CMP 8.
3. CMP -8 believes the data presented for the acceptance of prewired ENT was sufficient for the Panel to accept it.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #158)

8- 117 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-202 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Boyd T. Holt, III
RECOMMENDATION: I strongly urge CMP 8 to reject this new article and leave the nine (9) raceway articles in the1999 NEC.
SUBSTANTIATION: I have been in the electrical construction industry for 6 years. I find the new Article 344 too confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #159)

8- 118 - (344): Reject
NOTE: The following proposal consists of Comment 8-203 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Danny King, City of Fort Smith, AK
RECOMMENDATION: Reject. Hold for further study.
SUBSTANTIATION: Reject. Hold for further study.
PANEL ACTION: Reject.
PANEL STATEMENT: There was no substantiation made by the submitter. Section 4-3.3 of the Regulations Governing Committee Projects details the required content of proposals. Among other things, it requires proposals to provide a statement of the problem and substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #160)

8- 119 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-204 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Anthony Young, Calmi Electrical
RECOMMENDATION: I strongly urge CMP 8 to reject this new article and leave the nine raceway articles in the 1999 NEC.
SUBSTANTIATION: I've been using the Code for a few years, and changing this article would make it more confusing to others and myself.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #161)

8- 120 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-205 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Daniel Caddigan, Midwest Interstate Electrical Const. Co.
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: This proposal needs more work, although I agree with the intent of this proposal. This proposal does not enhance the usability of the NEC, in fact it detracts from the usability. Presently, all the rules for a particular conduit system are in one section. Under this proposal, they are all combined. The use of the matrix format is not user friendly when the tables each have 3-8 notes following the table. As it is, the tables do not correlate with other sections of the Code (i.e., Table 315-23 and Article 430-145(b)). This proposal needs more work.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #162)

8- 121 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-206 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Nathan Lee Hartman, Brown & Heim/Rep. IBEW
RECOMMENDATION: I strongly urge CMP 8 to reject this new article and leave the 9 raceway articles in the 1999 National Electrical Code.
SUBSTANTIATION: Being involved in the electrical construction industry, I find the new article 344 too confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #163)

8- 122 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-207 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: W. Creighton Schwan, Hayward, CA
RECOMMENDATION: This proposal, and proposal 8-5, should be REJECTED. Leave the round raceway Articles as they are in the 1996 NEC.
SUBSTANTIATION: Large Tables with many footnotes are difficult to use, and easily misread. An installer is only interested in one wiring method at a time, and the information required is much more accessible in the 1996 format. This proposed change is definitely not user friendly.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #164)

8- 123 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-208 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Ray C. Mullin, Ray C. Mullin Books
RECOMMENDATION: Delete entire new Article 344 and revert back to original arrangement.
SUBSTANTIATION: I have perused this proposed new Article that combines all of the many tubular wiring methods into one Article. It is my personal feeling that although the intent of the combing is well intended, that the rearrangement will cause more confusion to the user. When I want to look up something in the NEC such as nonmetallic-sheathed cable, I refer to the article relating to nonmetallic-sheathed cable. I do not want to be confused with a multitude of references, footnotes, FPNs, exceptions, etc. that are not related to nonmetallic-sheathed cable.
The NEC is difficult to use.
There will be confusion and much unnecessary time consumed trying to sort out what the user is looking for in the NEC.
I commend the committee on its efforts to combine all of the tubular raceway material into one article, but I am afraid that it needs more time to "soak" before making the final decision.
Let's hold off for another Code cycle on this major proposed change.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #165)

8- 124 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-209 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Eric Jones, Cogburn Bros. Electric, Inc./Rep. IBEW Local 606
RECOMMENDATION: I would like to request that CMP 8 reject this new article. I would like to see the nine raceway articles remain in the 1999 Code.
SUBSTANTIATION: In my 15 years as a journeyman electrician and foreman, I have found the separate raceway articles to be clear and concise. It is my opinion that the new Article 344 is too vague and confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #166)

8- 125 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-210 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Al Caine, State of Idaho
RECOMMENDATION: Reject.
SUBSTANTIATION: This proposal would make the Code more difficult to use. I prefer the individual articles.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #167)

8- 126 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-212 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Michael Taylor, Jr.
RECOMMENDATION: I strongly urge CMP 8 to reject this new articles and leave the nine raceway articles in the 1999 NEC.
SUBSTANTIATION: I have been informed of the Code change and by myself being new to the trade, I have had to use the NEC code book and have found it somewhat difficult and sometimes confusing, so I make a plea that the Code article on nine raceways remain the same and will not be changed in the 1999 NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #168)

8- 127 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-214 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Richard E. Loyd, R&N Assoc.
RECOMMENDATION: Please reconsider and reject this proposal.
SUBSTANTIATION: As a member of the task working group and the Panel, I believe we did complete the task that we were requested to do by the Usability Task Committee in developing this article and it certainly has not been wasted time. The draft does provide a clearer picture of some of the Code inconsistencies and also provided ideas on what type of changes would be user friendly. After spending hours of time in finding further changes that are needed for correlation with the 1996 Code and accepted proposals other than 8-5a, we must conclude that the rewrite does not provide the user friendliness anticipated. To make such a dramatic change without accomplishing that goal would be a disservice to the Code. There is a good chance that you will not hear from a lot of users. That does not mean they necessarily agree with the change. This is overwhelming in its magnitude and has not been gone through in detail at meetings around the country. Only true Code change participants are likely to realize the impact, or study it. I have heard that the group most likely to benefit from this combined article could be designers. The NEC is not a design manual, and it should be the most user friendly to installers (who generally work with one or two wiring methods at a time) and to inspectors who have to determine that a proper installation has been made.

There are some things that need to be done, but truly believe this exercise has shown that combining the articles is not the right process. There are far too many notes needed for the tables. In addition, critical information is contained beyond the tables and is sure to be ignored in many cases. There is a tendency when a matrix is provided to look only at permitted or not permitted by the majority of the people, another small percentage will follow the notes, and an even smaller percentage will follow the entire article. With today's trend of cutting back on inspection services this is especially troubling.

Some User Friendly Task Group members have agreed that while some of the rewrites are beneficial, the conduit article just does not reach that goal. While commending the effort and spending many hours to catch errors and omissions, I urge the Panel to reject this proposal and let's search for another solution.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #169)

8- 128 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-215 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Paul Logan Swift, Rainbow Elec.
RECOMMENDATION: I strongly oppose the new change and feel it would greatly decrease the content and the ability to take this test.
SUBSTANTIATION: I have been in the electrical trade for seven years and find this very disturbing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #170)

8- 129 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-216 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Craig E. Logan, Sturgeon
RECOMMENDATION: I strongly oppose the change in Article 344.
SUBSTANTIATION: I have been in the trade for four years and I feel the change in Article 344 is too confusing.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #171)

8- 130 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-217 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Paul Kempter, Electrical Contracting Services
RECOMMENDATION: I strongly oppose the change in the articles concerning raceways.
SUBSTANTIATION: I have been in the electrical construction industry for seven years and I feel that the proposed changes will only cause confusion in the requirements of the installation of various raceways.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #172)

8- 131 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-219 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Ki Hong, Grand Electric
RECOMMENDATION: I strongly oppose any change on this article.
SUBSTANTIATION: I've been in the industry for five years and I think it would make it more confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #173)

8- 132 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-220 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Richard L. Dodd, Alta Milla Electric
RECOMMENDATION: I strongly disagree with changing these articles into one article because each raceway is a little bit different and should be treated as that.
SUBSTANTIATION: I've been in the electrical industry for five years now and working with and studying the Code book. I think that changing the Code book now would be a bad idea.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #174)

8- 133 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-221 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Paul Hernandez, Luduik Electric
RECOMMENDATION: Strongly opposed to raceway revisions.
SUBSTANTIATION: I have been in trade for five years and feel that change would be too confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #175)

8- 134 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-222 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Chris Hofland, Luduik Electric
RECOMMENDATION: I strongly oppose the new changes to Article 344.
SUBSTANTIATION: I have been an electrician for five years and feel that this new article will be very confusing to myself and other members in my field.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #176)

8- 135 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-223 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: William D. Anderson, Grand Electric
RECOMMENDATION: I strongly urge CMP 8 to leave the nine raceway articles the way that they are.
SUBSTANTIATION: I have been in the electrical construction industry for 15 years. I find the new Article 344 too confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #177)

8- 136 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-224 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Troy W. Cozbey
RECOMMENDATION: I strongly oppose any changes to this article.
SUBSTANTIATION: Past experience has proven that changes to this article creates confusion.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #178)

8- 137 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-225 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: René Bellanger, North/Western Elect. Co.
RECOMMENDATION: I must forcefully oppose any major changes or deletions or compilations of conduit articles.
SUBSTANTIATION: I have been in the electrical industry since May of 1981 and would find the proposed changes very difficult to differentiate or translate effectively.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #179)

8- 138 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-226 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Joe Willis, Sturgeon Electric Co.
RECOMMENDATION: Strongly opposed to changes in article on raceways.
SUBSTANTIATION: I've been an electrician for five years and think it will be very confusing to find a certain topic.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #180)

8- 139 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-227 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Donald A. Ganiere, Ottawa, IL
RECOMMENDATION: The Panel should reject this proposal.
SUBSTANTIATION: This proposal was submitted with the object of making the NEC more user friendly. I believe it actually makes the NEC harder to use in the field. The present format of individual article for the various types of raceway should be retained.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #181)

8- 140 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-228 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: William Wusinich, IBEW/Eastern Code Advisory Gro
RECOMMENDATION: I strongly recommend to CMP 8 that they reconsider their action on this new article and reject the concept of doing away with the nine existing articles on raceways.
SUBSTANTIATION: Since the ROP meetings in Hilton Head, I have conducted four seminars on this proposed change. One was with a group of contractors, one was at an IAEI meeting and two were for groups of electricians. During the first two seminars I tried to maintain a positive attitude and sell the idea that this change would take some time to get use to but after you worked with the proposed new article you would slowly get use to it. The last two seminars I gave were very uncomfortable on my part. The audience was livid as to why this major change was made without any request from within the electrical construction industry.
The vast majority of the industry does not have a problem understanding the provisions for raceways as written in the present Code.
One person suggested that "the user friendly committee rewrite the plumbing Code and stay out of the NEC".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #182)

8- 141 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-229 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Dan Gearing, Perma Cote Industries
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: This new article was intended to make this section of the Code more user friendly. It is my opinion that the new article is confusing and leaves a lot of room for improper interpretations.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #183)

8- 142 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-230 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Paul E. Guidry, Sugar Land, TX
RECOMMENDATION: Leave raceways in independent Articles. Do not combine all raceways into one Article.
SUBSTANTIATION: The Usability Task Group (UTG) has gone overboard in it's attempt to simplify the Code by combining all raceways into one common Article. I strongly disagree with this format. While it is true that most raceways have many common features and some of the information in the independent articles is redundant, each type of raceway differs in one fashion or another. I believe this format will NOT make the Code easier to use. I urge the UTG and CMP 8 and the Correlating Committee to reconsider this decision.
PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #184)

8- 143 - (344): Reject
NOTE: The following proposal consists of Comment 8-231 on Proposal 8-52 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-52 was:
Add new wording:
"Where cables 600 volts or less are permitted in the same tray, as stated in NEC Section 318-16(f), Exception No. 2, the number of cables rated 600 volts or less shall conform to NEC Section 318-9(a)."
SUBMITTER: Danny King, City of Fort Smith, AK
RECOMMENDATION: Reject; "Hold for Further Study".
SUBSTANTIATION: Reject; "Hold for Further Study".
PANEL ACTION: Reject.
PANEL STATEMENT: There was no substantiation made by the submitter. Section 4-3.3 of the Regulations Governing Committee Projects details the required content of proposals. Among other things, it requires proposals to provide a statement of the problem and substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #185)

8- 144 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-232 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Larry E. Fuhrnian, City of Titusville, FL
RECOMMENDATION: Reject.
SUBSTANTIATION: The present Code sections dealing with separate raceways, each having a section is not improved by lumping them all together in one section. New system and raceways need new sections.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #186)

8- 145 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-233 on Proposal 8-66 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-66 was:
Add a new permitted use:
(x) 1/2" through 1" as listed manufactured prewired assembly.
SUBMITTER: David Alan Munk, Brown and Heim Electric Co./Rep. IBEW
RECOMMENDATION: I think we should reject the CMP 8 proposal and leave the nine articles on raceways in the Code.
SUBSTANTIATION: The new Article 344 is way too difficult. I've been in the trade for four years and it is confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement. The panel recognizes that the submitter's comment incorrectly references Proposal 8-66. The correct reference is Proposal 8-5a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #187)

8- 146 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-234 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: , Rep. Maryland Electrical Insp. Assn.
RECOMMENDATION: This proposal should not be accepted - it should rejected.
SUBSTANTIATION: Mr. Loyd in his explanation of negative vote explained all of the reasons it should not be accepted. The present Code is more user friendly than this proposal to an installer or teacher of the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #188)

8- 147 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-235 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Joseph T. Medford, Brown & Heim/Rep. IBEW Local 24
RECOMMENDATION: I strongly urge CMP 8 to reject this new article and leave the (9) raceway articles in the 1999 NEC.
SUBSTANTIATION: I find this article not up to standards. Article 344 is definitely too confusing to interpret.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #189)

8- 148 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-236 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Gwen Countryman, Walt Disney World
RECOMMENDATION: I strongly urge CMP 8 to reject this new article and leave the 9 raceway articles in the 1999 NEC.
SUBSTANTIATION: I have been in the electrical construction industry for 4 years. I find the new Article 344 too confusing.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #190)

8- 149 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-238 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patrick Lass, Boise City, ID, Bldg Dept.
RECOMMENDATION: Reject new article proposal.
SUBSTANTIATION: If the intent is to make the Code more user friendly this is a step backwards. When I use a particular raceway or prewired assembly, it is easier to know what I am doing when the requirements are grouped as they are in the present Code. Attention should be given to grouping requirements, not methods.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #191)

8- 150 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-239 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: David McClellan, Enterprise Elect.
RECOMMENDATION: Reject the proposal.
SUBSTANTIATION: To make an Article from what should be an appendix would add confusion to the Code and serve no real purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #192)

8- 151 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-246 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Ilan Bender, Ocal Inc.
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: This article was intended to make the code more user friendly where, in fact, it will make it less user friendly.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #193)

8- 152 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-247 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Edward W. Langschwager, Langschwager Electric Corp.
RECOMMENDATION: Delete this new section and retain the existing Articles 331, 343, 345, 346, 347, 348, 349, 350 and 351.
SUBSTANTIATION: The concept of consolidation and simplification is commendable, however, response from our employees in the field find this potential change too radical and difficult to work with. These existing articles are user friendly already!
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #194)

8- 153 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-248 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Martin J. Brett, Jr.
RECOMMENDATION: This proposal should be rejected.
SUBSTANTIATION: Placing all wiring methods into one article does not aid safety or increase the usability of the Code. Tables are confusing to read. Too many notes to qualify usage.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #195)

8- 154 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-249 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: The proposal should be rejected.
SUBSTANTIATION: The new combined article has a set of three matrix tables and accompanying notes to address the allowable uses and restrictions on the tubular raceway wiring methods. This is supposed to be a great advance in the cause of a more user-friendly, more simplified code. Actually, the combined article is anything but, with three basic tables accompanied by a total of 17 notes, seven supplementary tables, and section numbers running from 1 to 190. In total column inches it's about the same size as the articles it replaces. Users of the code never work with all the various wiring methods at the same time. We work with one or two, and we need to find the relevant requirements quickly. That will be far more difficult with this rewrite. This effort belongs in a handbook or instructional materials for untrained per-sons; it does not belong in the Code.

This isn't to say there isn't a place for this kind of exercise. It's a valuable teaching tool for journeyman classes, and it helps a panel sort out when requirement differences across wiring methods exist for a reason as opposed to a simple lack of correlation. It may have a place in some kind of handbook. No one ever asserted, as part of the substantiation, that there is a safety problem with the present Code organization. The astronomical expenses, however, that are involved in redoing training materials on wiring methods are obvious.

In the past we used to demand compelling technical justification based on safety concerns in order to make changes in the Code, or at least we were supposed to. Some of us still think that to be a valuable ideal. This proposal has no such substantiation. I can remember (on CMP 9) attempting to make a minor change on lighting and appliance branch-circuit panelboards and running into entrenched NEMA opposition because it would have forced changes in some of the labels. Where was the safety issue that they should be forced to undergo this expense? A fair question, actually, and we didn't make the change. Now let's consider the expense of shredding every training manual in the world that refers to NEC

recognized wiring method articles.
The impetus for this type of reorganization seems to have come from middle management at NFPA and not from the industry, and it certainly isn't in our interest. Although there will undoubtedly be suggestions to hold this for a cycle, I think this approach needs the proverbial stake through its heart right now, so we can go on and study Code proposals that actually ad-dress safety issues.
I am well aware of the amount of effort that went into this proposal, and for that reason this is a difficult comment to write. I am asking the panel to set aside hundreds, no, thousands of person-hours of work. I do so reluctantly, but in the firm belief that the direction given the panel was badly flawed and from a task group that was improperly supervised.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #196)

8- 155 - (344): Reject
NOTE: The following proposal consists of Comment 8-250 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: James T. Pauley, Square D Co.
RECOMMENDATION: The Panel should continue to accept the proposal with any appropriate modifications recommend by public comments.
SUBSTANTIATION: We support all of the work done by CMP 8 to make the Code more usable. This effort has led to the elimination of many inconsistencies in the present Code rules and the new Article will be a benefit to those that use the Code in their efforts to install an electrical system.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #197)

8- 156 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-251 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Reject this proposal.
SUBSTANTIATION: The Task Group and the Panel did yeoman's duty in developing this article and it certainly has not been wasted time. We believe it has provided a clearer picture of some of the Code inconsistencies and also provided ideas on what type of changes would be user friendly. After spending hours of our own time in finding further changes that are needed for correlation with the 1996 Code and accepted proposals other than 8-5a, we must conclude that the rewrite does not provide the User Friendliness anticipated. To make such a dramatic change without accomplishing that goal would be a disservice to the Code. There is a good chance that you will not hear from a lot of users. That does not mean they necessarily agree with the change. This is overwhelming in its magnitude and has not been gone through in detail at meetings around the country. Only true Code change participants are likely to realize the impact, or study it. We have heard that the group most likely to benefit from this combined article could be designers. The NEC is not a design manual, and it should be the most user friendly to installers (who generally work with one or two wiring methods at a time) and to inspectors who have to determine that a proper installation has been made.
There are some things that need to be done, but we truly believe this exercise has shown that combining the articles is not the right process. There are far too many notes needed for the Tables. In addition, critical information is contained beyond the Tables and is sure to be ignored in many cases. There is a tendency when a matrix is provided to look only at Permitted or Not Permitted by the majority of the people, another small percentage will follow the notes, and an even smaller percentage will follow the entire article. With today's trend of cutting back on inspection services this is especially troubling.
Some User Friendly Task Group members have agreed that while some of the rewrites are wonderful, the conduit article just does not reach the goal. While commending the effort and spending many hours to catch glitches ourselves, we urge the Panel to reject this proposal and let's search for another solution.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #198)

8- 157 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-253 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Ray Hoy, Idaho State Electrical Bureau/Rep. Idaho Div. of Building Safety
RECOMMENDATION: Reject the entire Article 344.
SUBSTANTIATION: This article is unnecessary. The articles relating to raceways have proven to be simple and well defined. Article 344 only serves to create misunderstanding.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #240)

8- 158 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-211 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Don B. Ivory, Idaho Electrical JATC/Rep. IBEW
RECOMMENDATION: Reject. Hold for further study.
SUBSTANTIATION: I do not believe it makes the Code better or easier to use. It would be more confusing and difficult to follow.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #241)

8- 159 - (344): Accept in Principle
NOTE: The following proposal consists of Comment 8-213 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Either reject this proposal, or at the least, hold for further study.
SUBSTANTIATION: I have provided a rewrite in government text of the changes that need to be made to this rewrite of several articles in order to correlate with the 1996 NEC and Proposals accepted in the ROP. These are far too extensive to publish without in-depth

public review. Holding for further study would provide an opportunity before the next Code for such review. To publish without providing a substantial period of time for the public to assimilate this whole concept with whatever changes are submitted during the comment period would be wrong.

We must not forget that many jurisdictions do not adopt every edition of the NEC. That was a problem when the Neher-McGrath tables were put into the Code with a future effective date, and then removed. We do not want to make the same mistake.

The support section is very important in assuring a quality installation that will maintain good joints and require less maintenance. Continuity is very important for a safe installation. This section is extremely difficult. For example, it is necessary to go to four specific sections and two general sections in order to find out the requirements for securing EMT. It is very difficult to pick out and much easier to use when located together as it is in the current NEC.

REJECTION WOULD BE A BETTER ALTERNATIVE. THE MANY HOURS SPENT ON THE LITTLE NUANCES THAT ARE DIFFICULT TO PICK UP IN TABLES, AND THE RESULTING NEED FOR SO MANY ADDITIONAL NOTES SUPPORTS THAT "USER FRIENDLINESS" HAS NOT BEEN ACHIEVED. The effort has not been totally without merit because it has revealed numerous inconsistencies in the Code that will need to be addressed next time around. It also makes one appreciate the existing Code structure. The rewrite is going to take more pages than the current text requires, not less. We do not believe it serves the purpose for which it was intended and suggest that for the 2002 Code, separate articles, all written in consistent format might provide to be more user friendly.

This rewrite also has not improved safety, but will require revision and printing of millions of dollars of literature, textbooks, and other instructional materials. While the Code changes every three years, the article references have remained consistent and much literature is written in a manner not to require changes. Let's be sure to accomplish our goal and have a really user friendly structure when we make such a monumental change.

A separate comment has been submitted by members for each suggested revision contained in the rewrite which I have provided, so only the concept of rejecting (or holding) the rewrite need be addressed by the Panel for this particular comment. The full document is supplied to assist your deliberations and provide a complete picture of the changes needed to correlate with the 1996 Code requirements and proposals accepted at the first CMP meeting.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #250)

8- 160 - (344): Accept in Principle

NOTE: The following proposal consists of Comment 8-252 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, insert subsection heading "C. Installation" before section "315-17. Dissimilar metals."
SUBSTANTIATION: To correlate with Comments to Section 315 B which suggested B. read "Application." This separates Permitted and Not Permitted Applications from Installation requirements.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #251)

8- 161 - (344): Accept in Principle

NOTE: The following proposal consists of Comment 8-240 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Richard Hill, Lea Electric/Rep. IBEW
RECOMMENDATION: Reject and hold for further review.
SUBSTANTIATION: Does not make Code easier - just consolidates - It has potential but would like to hold.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #252)

8- 162 - (344): Accept in Principle

NOTE: The following proposal consists of Comment 8-243 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Mike St. Jerr, Romar Electric/Rep. IBEW Local 291
RECOMMENDATION: Reject, hold for further study.
SUBSTANTIATION: I think it might confuse everybody because it will be bunched together instead of having each raceway under its own heading.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #253)

8- 163 - (344): Accept in Principle

NOTE: The following proposal consists of Comment 8-244 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Ron Hamilton, Tri State Electric/Rep. IBEW
RECOMMENDATION: Reject - hold for further study.
SUBSTANTIATION: Change may make use of the Code more difficult.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #242)

8- 164 - (344-1): Accept in Principle

NOTE: The following proposal consists of Comment 8-254 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, revise the Scope as follows:

315-1. Scope. This article covers the use, installation, and construction specifications for those raceways, NUCC and manufactured prewired assemblies defined in Section 315-2.

SUBSTANTIATION: The Scope of an Article should be technically complete and very specific about products covered in the Article. Article 315 includes NUCC and manufactured prewired assemblies. It should be clear these wiring methods differ from empty raceways and there may be conductor considerations. (See related comments on 315-3 and 315-7).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 8-84 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #199)

8- 165 - (344-2): Reject
NOTE: The following proposal consists of Comment 8-256 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Charles W. Forsberg, Lamson & Sessions
RECOMMENDATION: Revise the definition of RTRC:
1. Replace the "." after "specification" with A ":"
2. Add as subtypes:
Type AG with a flame retardant.
Type BG without a flame retardant.
SUBSTANTIATION: These are new designations that have just appeared in the UL listings for RTRC.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #243)

8- 166 - (344-2): Accept in Principle
NOTE: The following proposal consists of Comment 8-255 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, make the following changes to the definitions in this Section.
Coated Conduit/Tubing: Steel conduit or tubing that is provided with a corrosion protection coating that is an alternate to galvanizing, but is not supplementary.
Electrical Metallic Tubing (EMT): An unthreaded light-weight metal raceway of circular cross-section, with or without integral couplings, designed for the physical protection and routing of wire conductors and use as an equipment grounding conductor when installed utilizing appropriate fittings. ~~A ferrous or nonferrous metal raceway of circular cross section with or without integral couplings.~~
Electrical Nonmetallic Tubing (ENT): A pliable corrugated nonmetallic raceway of circular cross section that can be formed~~bent~~ by hand with a reasonable force,without the use of bending equipment. ~~but without other assistance.~~
Flexible Metal Conduit (FMC): A raceway of circular cross section made of helically wound, formed, interlocked ferrous or nonferrous metal strip. ~~A flexible ferrous or nonferrous metal raceway of circular cross section.~~
Intermediate Metal Conduit (IMC). A threaded intermediate-weight steel raceway of circular cross-section supplied with a standard conduit coupling or integral coupling. It is designed for the physical protection and routing of wire conductors and for use as an equipment grounding conductor when installed utilizing appropriate fittings. ~~A steel raceway of circular cross section, with integral or associated couplings.~~
Liquidtight Flexible Nonmetallic Conduit (LFNC): A flexible nonmetallic raceway of circular cross section having an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible nonmetallic core.
Manufactured prewired assembly. A pliable or flexible raceway containing removable conductors which are installed at the raceway manufacturing facility.
Nonmetallic Underground Conduit (NUCC): A factory assembly of conductors or cables inside a nonmetallic, smooth-walled raceway of~~with~~ a circular cross section which is capable of being reeled..
Rigid Metal Conduit (RMC). A threaded heavy-weight metal raceway of circular cross section supplied with a standard conduit coupling or integral coupling. It is designed for the physical protection and routing of wire conductors and for use as an equipment grounding conductor when installed utilizing appropriate fittings. ~~A ferrous or nonferrous metal raceway of circular cross section, with integral or associated couplings.~~
Definitions for RNFC and RTRC to be located under rigid nonmetallic conduit (RNC).
RNFC. A fiberglass reinforced epoxy raceway of circular cross section with a wall thickness conforming to Schedule 40-IPS dimensions.
RTRC: A raceway of circular cross-section made of reinforced thermosetting resin (Type BG-Underground; Type AG-Aboveground, underground, direct burial.) ~~A rigid thermosetting resin raceway with a wall thickness conforming to Schedule 40 IPS dimensions.~~
Supplementary Coating. A coating applied over standard galvanized conduit or tubing to provide additional corrosion protection in severely corrosive locations.
SUBSTANTIATION: Coated Conduit/Tubing Substantiation: "Coated" is used in Table 315-12(c) and requires definition.
Electrical Metallic Tubing Substantiation: This language more appropriately defines EMT.
Electrical Nonmetallic Tubing Substantiation: To clarify that ENT is not being "bent" by a hand bender, which the phrase "bent by hand" could be construed to mean.
Flexible Metal Conduit Substantiation: This language is from the 1996 NEC and is more descriptive than the 315 draft.
Intermediate Metal Conduit Substantiation: This language more appropriately defines IMC.
Liquidtight Flexible Nonmetallic Conduit Substantiation: To make this definition more consistent with Liquidtight Flexible Metallic Conduit (LFMC) and provide more complete information.
Manufactured prewired assembly Substantiation: This term is now used in Article 315 and requires definition.
Nonmetallic Underground Conduit Substantiation: A "C" was added after "NUC" to clarify that this is nonmetallic underground conduit with conductors installed. There is an important distinction between empty conduit and conduit with factory installed conductors. It is also important to note the pliable characteristic that is needed.
Rigid Metal Conduit Substantiation: This language more appropriately defines RMC.
RNFC Substantiation: Definition of this product which has a separate application column, was not in 8-5a.
RTRC Substantiation: An application column has been added for this nonmetallic raceway and requires definition.
Supplementary Coating Substantiation: This term is needed to differentiate between a new type of rigid conduit with a PVC coating over bare steel, as opposed to the familiar supplementary coated conduit which is PVC over galvanizing for extra protection in severely corrosive environments.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #245)

8- 167 - (344-3): Accept in Principle
NOTE: The following proposal consists of Comment 8-257 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Co
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, revise the section as follows:
315-3. Other Articles. All ~~raceway~~ installations of raceways, NUCC, and manufactured prewired assemblies in this article shall comply with other applicable provisions of this Code.
SUBSTANTIATION: Article 315 includes NUCC and

manufactured prewired assemblies. It should be clear that these wiring methods differ from empty raceways and that there may be conductor considerations. (See related comments on 315-1 and 315-7).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #246)

8- 168 - (344-7): Accept in Principle
NOTE: The following proposal consists of Comment 8-258 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should be either rejected or held for further study. However, if it is accepted, revise the section as follows:
315-7. Listing Requirements. All raceways, NUCC, and manufactured prewired assemblies covered in this article, and their associated fittings shall be listed.
SUBSTANTIATION: Article 315 includes NUCC and manufactured prewired assemblies. It should be clear that these wiring methods differ from empty raceways and that there may be conductor considerations. (See related comments on 315-1 and 315-3).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #244)

8- 169 - (344-12): Accept in Principle
NOTE: The following proposal consists of Comment 8-259 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, change subsection ~~"B. Installation"~~ to "B. Application".
SUBSTANTIATION: The word "Application" more appropriately describes the Uses Permitted and Not Permitted subsection and is the term used in the related tables. (See Correlating Comments to Section 315 C. and 315 C (New)).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #247)

8- 170 - (344-12): Accept in Principle
NOTE: The following proposal consists of Comment 8-260 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, revise this section to read as follows:
315-12. Uses Permitted and Not Permitted. Uses permitted and not permitted for raceways and assemblies covered in this article shall be those applications ~~as~~ shown in Tables 315-12(a), (b), ~~and~~ (c),and (d) and in sections (a) through (c) below.
NOTE: Application lines do not stand independently; some applications modify other applications, e.g. outdoor or indoor application reads "P", but exposed to physical damage reads "N". Therefore, the raceway could not be used indoors or outdoors where subject to physical damage.
SUBSTANTIATION: It is not clear that individual lines in the "Uses Permitted and Not Permitted" Tables 344-12(a), 12(b), 12(c), and 12(d) modify other lines, which could lead to misapplication of the products. As Mr. Forsberg noted in his affirmative comment, "The Code user must read all of the applications because one condition may modify another, i.e. 'Outdoors', 'Exposed to physical damage', and 'Systems over 600 volts, nominal.' For instance, Table 315-12(c) LFMC is permitted for 'Outdoors' and in accordance with Notes 7 and 8 for 'Systems over 600 volts, nominal', but not permitted 'Exposed to physical damage'. LFMC thus would not be permitted for that application."
The change "and (a) through (c) below" relates to Uses Permitted and Not Permitted which have been moved from other locations within the Article and are explained in Comments on Sections 315-14, 315-15 and 315-23. This additional language is needed if those comments are accepted. The relocation is necessary for a more complete "Uses Permitted and Not Permitted" Section.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

Note: The sequence no. 8-171 was not used.

(Log #200)

8- 172 - (344-12(a)): Reject
NOTE: The following proposal consists of Comment 8-262 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Charles W. Forsberg, Lamson & Sessions
RECOMMENDATION: For the Galvanized EMT column in the application, "Encased or embedded in poured concrete below grade", replace "N" with "P1".
SUBSTANTIATION: This change was noted in item 5 of the CMP 8 substantiation for this proposal, but it was overlooked by NFPA staff.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #248)

8- 173 - (344-12(a)): Accept in Principle
NOTE: The following proposal consists of Comment 8-261 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, make the following changes to Table 315-12(a):
1. Add a Fine Print Note below Table 315-12(a) as follows: "(FPN) Coated, as used in this Table, does not pertain to coatings which are applied as supplementary corrosion protection in severe corrosive environments such as those covered in Section 300-6".
2. Change Note 1 as follows: "Ferrous EMT, elbows, couplings, and fittings shall be permitted to be in direct contact with the earth or embedded in poured concrete below grade where provided with

corrosion protection judged suitable for the conditions."
3. Change "N" to "P1" for Galv. EMT "Encased or embedded in poured concrete below grade."
4. Change "P" to "P4" for Galv. and Alum. EMT "Exposed to physical damage" and add Note 4: "EMT shall not be permitted where subject to severe physical damage."
5. Change "P" to "P5" for Galv. and Alum. EMT "System voltages over 600 volts, nominal" and add Note 5: "EMT shall be permitted for system voltages over 600 V. nominal, in accordance with Section 300-37."
6. Change "N" to "P7" for Alum. EMT "Encased or embedded in poured concrete on or above grade" and add Note 7: "Aluminum EMT used in concrete or in direct contact with the earth requires supplementary corrosion protection."
7. Change "N" to "P7" for Alum. EMT "Encased or embedded in poured concrete below grade".
8. Change "N" to "P7" for Alum. EMT "Direct Burial".
9. Change "P" to "P6" for Coated RMC or IMC "Indoors, Exposed" and "Indoors, Concealed" and add Note 6: "Raceways having corrosion protection coatings which are alternatives to galvanizing shall not be permitted in spaces covered by Section 300-22."
SUBSTANTIATION: 1. There are conduits now on the market which utilize alternate methods of corrosion protection to galvanizing. It is important that Code users know that this type of "coated" RMC is a different type of product from galvanized RMC that has a supplementary coating applied over the galvanizing. Supplementary coatings have not been addressed in Article 346 - they are referenced in Section 300-6 and can be applied either at a factory or in the field.
2. This language is included in the 1996 NEC and should not have been deleted from the Draft of Article 315. The listing also permits such use. There is no reason to prohibit use when supplementary protection can be provided where necessary.
3. This is an errata listed in the Substantiation to Proposal 8-5a.
4. The current code does not permit EMT where subject to severe physical damage.
5. EMT has been identified for Installations of over 600 Volts. It will now be shown in Section 300-37 (ROP 13-37) as an aboveground wiring method.

6. Since the Task Force that drafted Article 315 included separate columns for galvanized and aluminum EMT, it is necessary to be specific as to the requirements for each type. Listing requires supplementary corrosion protection for aluminum EMT in these applications.
7. See Substantiation directly above.
8. See Substantiation above.
9. There is a type of RMC now available which uses a PVC coating as an alternate to galvanizing (not supplementary to galvanizing) and which should be subject to the same restrictions as nonmetallic products are in Section 300-22.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #201)

8- 174 - (Table 344-12(a) Note 2): Reject
NOTE: The following proposal consists of Comment 8-263 on Proposal 8-5 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-5 was:
Delete Article 331–Electrical Nonmetallic Tubing
Delete Article 343–Nonmetallic Underground Conduit With Conductors
Delete Article 345–Intermediate Metal Conduit
Delete Article 346–Rigid Metal Conduit
Delete Article 347–Rigid Nonmetallic Conduit
Delete Article 348–Electrical Metallic Tubing
Delete Article 349–Flexible Metallic Tubing
Delete Article 350–Flexible Metal Conduit
Delete Article 351–Liquidtight Flexible Metal Conduit and Liquidtight Flexible Nonmetallic Conduit
Add new Article 315–Wiring Methods–Conduit And Tubing

A. General

315-1. Scope.
This article covers the use, installation, and construction specifications for conduit and tubing.

315-2. Definitions.

Electrical Metallic Tubing (EMT): A metal raceway of circular cross section with associated couplings, connectors, and fittings.

Electrical Nonmetallic Tubing (ENT): A pliable corrugated nonmetallic raceway of circular cross section with integral or associated couplings, connectors, and fittings. A pliable raceway is a raceway that can be bent by hand with a reasonable force, but without other assistance.

Flexible Metal Conduit (FMC): A flexible metal raceway of circular cross section with associated fittings.

Flexible Metallic Tubing (FMT): A metal raceway of circular cross section and associated fittings that is flexible, and liquidtight without a nonmetallic jacket.

Intermediate Metal Conduit (IMC): A metal raceway of circular cross section with integral or associated couplings, connectors, and fittings.

Liquidtight Flexible Metal Conduit (LFMC): A raceway of circular cross section having an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core with associated fittings.

Liquidtight Flexible Nonmetallic Conduit (LFNC): A flexible nonmetallic raceway of circular cross section with associated fittings.

Nonmetallic Underground Conduit (NUC): A factory assembly of conductors or cables inside a nonmetallic, smooth-walled conduit with a circular cross section with associated fittings.

Rigid Metal Conduit (RMC): A metal raceway of circular cross section with associated couplings, connectors, and fittings.

Rigid Nonmetallic Conduit (RNC): A nonmetallic raceway of circular cross section with associated couplings, connectors, and fittings.

315-3. Other Articles.
All installations of conduit or tubing shall also comply with other applicable provisions of this *Code.*

315-7. Listing Requirements.
All conduit, tubing, and their associated fittings shall be listed.

B. Installation

315-12. Uses Permitted and Not Permitted.
Uses permitted and not permitted for conduit and tubing shall be as shown in Table 315-12(a),(b) or (c).

Table 315-12(a). Uses Permitted and Not Permitted for EMT, IMC, and RMC.

P = Permitted N = Not Permitted

	EMT		IMC	RMC			
Application	Galv	Alum	Galv	Galv	Alum	Other Non-ferrous	Coated
Outdoors	P	P	P	P	P	P	P
Indoors, Exposed	P	P	P	P	P	P	P
Indoors, Concealed	P	P	P	P	P	P	P
Wet locations (Indoor)	P	P	P	P	P	P	P
Damp locations	P	P	P	P	P	P	P
Dry locations	P	P	P	P	P	P	P
Encased or embedded in poured concrete on or above grade	P	N	P	P	N	P	P
Encased or embedded in poured concrete below grade	N	N	P	P	N	P	P
Direct burial i.e. soil or cover in direct contact with the conduit or tubing	P1	N	P	P	N	P	P
Exposed to the direct rays of the sun	P	P	P	P	P	P	P
Exposed to physical damage	P	P	P	P	P	P	P
Support of fixtures or other equipment.	N2	N2	P	P	P	P	P
System voltages over 600 volts, nominal.	P	P	P	P	P	P	P

Notes:
Note: 1. Ferrous EMT, elbows, couplings, and fittings shall be permitted to be in direct contact with the earth where protected by corrosion protection and judged suitable for the condition.
Note: 2. Except conduit bodies no larger than the largest trade size of the tubing.

Table 315-12(b) Uses permitted and not permitted for ENT, NUC, and RNC.

	ENT	NUC	RNC					
Application		with conductors	Sch. 40 PVC	Sch. 80 PVC	Type A PVC	Type EB PVC	RTRC	HDPE
Outdoors	N	N	P	P	N	N	P	N
Indoors, Exposed	P1,2	N3	P	P	N	N	P	N
Indoors, Concealed	P2	N	P	P	N	N	P	N
Wet locations (Indoor)	P	N	P	P	N	N	P	N
Damp locations	P	N	P	P	N	N	P	N
Dry locations	P	N	P	P	N	N	P	N
Encased or embedded in poured concrete on or above grade	P	N	P	P	P	N	P	N
Encased or embedded in poured concrete below grade	P	P	P	P	P	P	P	P
Direct burial i.e. soil or cover in direct contact with the conduit or tubing	N	P	P	P	N	N	P	P
Exposed to the direct rays of the sun	N	N	P	P	N	N	P	N
Exposed to physical damage	N	N	N	P	N	N	N	N
Support of fixtures or other equipment.	N	N	N4	N4	N	N	N4	N
System voltages over 600 volts, nominal.	N5	P	P	P	P	P	P	P

(FPN) Extreme cold may cause some types of nonmetallic conduits to become brittle and, therefore, more susceptible to damage from physical contact.

Notes:
Note: 1. In any building not exceeding three floors above grade.
Note: 2. Where used in any building exceeding three floors above grade, the walls, floors, and ceilings, including suspended ceilings, behind which the tubing is concealed shall provide a thermal barrier of material that has at least a 15-minute finish rating, as identified in listings of fire-rated assemblies. The 15-minute finish-rated thermal barrier shall be permitted to be used for combustible or noncombustible walls, floors, and ceilings.
(FPN): A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.
Note: 3. Exception: The conductor or the cable portion of the assembly, where suitable, shall be permitted to extend within the building for termination purposes, in accordance with Section 300-3.
Note: 4. Except conduit bodies no larger than the largest trade size of an entering raceway. The conduit bodies shall not contain devices or support fixtures.
Note: 5. Except as permitted in Article 600.

Table 315-12(c) Uses permitted and Not permitted for FMC, FMT, LFMC, and LFNC.

	FMC		FMT	LFMC	LFNC		
Application	Steel	Alum			Type 1	Type 2	Type 3
Outdoors	N1	N1	N	P	P2	P2	P2
Indoors, Exposed	P	P	P3	P	P	P	P
Indoors, Concealed	P	P	P3	P	P	P	P
Wet locations	N1	N1	N	P	P	P	P
Damp locations	P	P4	N	P	P	P	P
Dry locations	P	P	P3	P	P	P	P
Encased or embedded in poured concrete on, above and below grade	N	N	N	P2	P2	P2	P2
Direct burial i.e. soil or cover in direct contact with the conduit or tubing	N	N	N	P2	P2	P2	P2
Exposed to physical damage	N	N	N	N	N	N	N
Support of fixtures or other equipment.	N	N	N	N	N	N	N
Flexibility	P	P	N	P	P	P	P
Lengths over 6 ft (1.83 m).	P	P	N	P	N6	P	N6
System voltages over 600 volts, nominal.	N7,8	N7,8	P3,5	N7,8	N7	N7	N7

(FPN): Extreme cold may cause some types of nonmetallic conduits to become brittle and, therefore, more susceptible to damage from physical contact.

Notes:
Note: 1. If the conductors are approved for the specific conditions and the installation is such that liquid is not likely to enter raceways or enclosure to which the conduit is connected.
Note: 2. Where listed and marked for the purpose.
Note: 3. Branch circuits only.
Note: 4. Not permitted where installed in direct contact with masonry.
Note: 5. For system voltages of 1000 volts maximum.
Note: 6. LFNC shall be permitted where longer length is essential for a required degree of flexibility.
Note: 7. Except as permitted in Article 600.
Note: 8. Except as permitted in Section 430-123.

Definitions of abbreviations used in Tables 315-12(a),(b), and (c) entries:

Flexibility: Where flexibility is required for installation, operation, or maintenance.

RTRC: Rigid Thermosetting Resin Conduit.

HDPE: High Density Polyethylene Conduit

315-14. Temperature Limitations.
(a) LFMC and LFNC shall not be permitted where any combination of ambient and conductor insulation temperatures will produce an operating temperature in excess of that for which the material is listed.
(b) ENT and RNC:
(1) ENT and RNC shall not be permitted where subject to ambient temperatures exceeding those for which the material is listed.
FPN: The ambient of PVC conduit and tubing is limited to 50 degrees C (122 degrees F) for application of this section.
(2) ENT and RNC shall not be permitted for conductors whose insulation temperature limitation would exceed those for which the conduit or tubing are listed.

315-15. Corrosive Influences.
In locations subject to severe corrosive influences or where subject to chemicals, conduit and tubing shall be made of materials specifically approved for the environment and shall comply with Section 300-6.

315-17. Dissimilar Metals.
Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.
Exception: Aluminum fittings and enclosures shall be permitted to be used with EMT, IMC and steel RMC. Steel fittings and enclosures shall be permitted to be used with aluminum RMC.

315-23. Size.
Permitted sizes for conduit and tubing shall be as shown in Table 315-23.

Table 315-23. Permitted Sizes for Conduit and Tubing.

P = Permitted N = Not Permitted

Trade size (inches)

	Metal			Nonmetallic			Flexible Conduit			
Specification	EMT	IMC	RMC	ENT	NUC	RNC	FMC	FMT	LFMC	LFNC
Minimum	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Maximum	4	4	6	2	4	6	4	3/4	4	4
3/8" permitted	N	N	P1	N	N	N	P2	P3	P2	P4

(FPN): Metric trade numerical designations for conduits and tubing are the same as those found in Extra-heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 981-1989; namely, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103.

Notes to Table 315-23:
1. For enclosing the leads of motors, as permitted by Section 430-145(b).

2. Permitted for the following:
(a) Enclosing the leads of motors, as permitted in Section 430-145(b)
(b) Lengths not in excess of 6 ft (1.83 m) as part of a listed assembly, or for tap conductors to lighting fixtures as permitted in Section 410-67(c), or for utilization equipment
(c) Manufactured wiring systems, as permitted in Section 604-6(a)
(d) Hoistways, as permitted in Section 620-21(a)(1)
(e) As part of a listed assembly to connect wired fixture sections, as permitted in Section 410-77(c)

3. Permitted for the following:
(a) Lengths not in excess of 6 ft (1.83 m) as part of an listed assembly, or for lighting fixtures. See Section 410-67(c).
(b) In accordance with Sections 300-22(b) and (c)

4. Permitted for the following:
(a) Enclosing the leads of motors, as permitted in Section 430-145(b)
(b) Lengths not in excess of 6 ft (1.83 m) as part of a listed assembly, or for tap conductors to lighting fixtures as permitted in Section 410-67(c), or for utilization equipment
(c) Electric sign conductors on insulators, in accordance with Section 600-32(a)

315-25. Bends .
(a) General. Bends of conduit and tubing shall be so made that the conduit or tubing will not be damaged and its internal diameter will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose.
Exception: Bends of ENT, FMT, LFMC, LFNC, and NUC shall be permitted to be made manually.
(b) Number of Bends.
There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.
(c) Radius of Curve. The radius of the curve to the centerline of any field bend shall not be less than as shown in Table 315-25(a).
Exception No. 1: Field bends of FMT shall have a minimum radius not less than as shown in Table 315-25(b).
Exception No. 2: Field bends of NUC shall conform to their listing requirements.

Table 315-25(a). Minimum Radii for Conduit Bends (Inches)

Size of Conduit	Radius to Center of Conduit
1/2	4
3/4	4 1/2
1	5 3/4
1 1/4	7 1/4
1 1/2	8 1/4
2	9 1/2
2 1/2	10 1/2
3	13
3 1/2	15
4	16
5	24
6	30

For SI units: (Radius) 1 in. = 25.4 mm.

Table 315-25(b). Minimum Radii for FMT (Inches)

Trade Size	Minimum Radius	
	Fixed Bends 1	Flexing Bends 2
3/8	3 1/2	10
1/2	4	12 1/2
3/4	5	17 1/2

note 1 - Not flexed or bent after installation.
note 2 - Infrequently flexed after installation.
For SI units: (Radius) 1 in. = 25.4 mm.

315-30. Reaming and Threading.
(a) Reamed.
(1) All cut ends of EMT, FMC, IMC, and RMC shall be reamed or otherwise finished to remove rough edges.
Exception: FMC, where fittings that thread into the convolutions are used.

(b) Threaded.
(1) EMT shall not be threaded. Where integral couplings are used, such couplings shall be permitted to be factory threaded.
(2) Where IMC or RMC is threaded in the field, a standard conduit cutting die with a 3/4-in. taper per ft (1 in 16) shall be used.
(FPN): See Standard for Pipe Threads, General Purpose (Inch), ANSI/ASME, B.1.20.1-1983.

315-35. Supports.
a) General. Section 315-35 does not apply to NUC .
(b) Nonflexible Conduit and Tubing.
(1) Complete System. Conduit and tubing shall be installed as a complete system, as provided in Article 300, and shall be securely

fastened. RNC shall be fastened so that movement from thermal expansion or contraction will be permitted.

a. EMT shall be securely fastened at intervals not exceeding 10 ft (3.05 m).

Exception: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths of electrical metallic tubing shall be permitted to be fished.

b. IMC and RMC shall be supported at intervals not exceeding 10 ft (3.05 m).

Exception No. 1: Where made up with threaded couplings, it shall be permissible to support straight runs in accordance with Table 315-35(a), provided such supports prevent transmission of stresses to termination where conduit is deflected between supports.

Exception No. 2: For exposed vertical risers from industrial machinery, the distance between supports shall be permitted to be increased to 20 ft (6.1 m), provided that the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.

c. ENT shall be securely fastened at intervals not exceeding 3 ft.

Exception: Lengths not exceeding 6 ft (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures, as permitted in Section 410-67(c).

d. RNC shall be supported as required in Table 315-35(b).
Exception: RNC listed for support at spacings other than as shown in Table 315-35(b) shall be permitted to be installed in accordance with the listing.

(2) Horizontal Runs through Framing Members.
a. Horizontal runs of EMT, IMC, or RMC supported by openings through framing members at intervals not exceeding 10 ft (3.05 m) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

b. Horizontal runs of ENT supported by openings through framing members at intervals not exceeding 3 ft (914 mm) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

c. Horizontal runs of RNC supported by openings through framing members at intervals not exceeding those specified in Table 315-35(b) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

(3) Distance from Fastening to Termination. Conduit and tubing shall be securely fastened within 3 ft (914 mm) of each outlet box, junction box, device box, cabinet, conduit body, or other termination.

Exception No. 1: Where approved, IMC and RMC shall not be required to be securely fastened within 3 ft (914 mm) of the service head for above-the-roof termination of a mast.

Exception No. 2: Fastening of EMT, IMC, and RMC at their termination points shall be permitted to be increased to 5 ft (1.52 m) where structural members do not readily permit fastening within 3 ft (914 mm). For EMT, this exception shall apply to unbroken lengths only.

Exception No. 3: RNC listed for securing at other than 3 ft (914 mm) and support at spacings other than as shown in Table 315-35(b) shall be permitted to be installed in accordance with the listing.

Table 315-35(a). Support for Straight Runs of Rigid or Intermediate Metal Conduit Made Up with Threaded Couplings

Conduit Size (inches)	Maximum Distance Between Supports (feet)
1/2 – 3/4	10
1	12
1 1/4 – 1 1/2	14
2 – 2 1/2	16
3 and larger	20

For SI units: (Supports) 1 ft = 0.3048 m.

Table 315-35(b). Support for Rigid Nonmetallic Conduit

Conduit Size (inches)	Maximum Distance Between Supports (feet)
1/2–1	3
1 1/4–2	5
2 1/2–3	6
3 1/2–5	7
6	8

For SI units: (Supports) 1 ft = 0.3048 m.

(c) Flexible Conduit and Tubing.

(1) Supported or Secured.
a. FMC and LFMC shall be supported and secured at intervals not exceeding 4 1/2 ft (1.37 m).
Exception: Where the conduit is fished.

b. LFNC shall be securely fastened at intervals not exceeding 3 ft (914 mm).

Exception: Where the conduit is fished.
(2) Distance from Fastening to Termination. FMC, LFMC, and LFNC shall be securely fastened by an approved means within 12 in. (305 mm) of each box, cabinet, conduit body, or other conduit termination.

Exception No. 1: Where the conduit is fished.

Exception No. 2: Lengths not exceeding 3 ft (914 mm) at terminals where flexibility is necessary.

Exception No. 3: Lengths not exceeding 6 ft (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures, as permitted in Section 410-67(c).

(3) Horizontal Runs through Framing Members.
a. Horizontal runs of FMC and LFMC supported by openings through framing members at intervals not exceeding 4 1/2 ft (1.37 m) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.

b. Horizontal runs of LFNC supported by openings through framing members at intervals not exceeding 3 ft (914 mm) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.

315-40. Boxes and Fittings.
(a) General. Boxes and fittings shall comply with the applicable provisions of Articles 300 and 370.

(b) Expansion Fittings for RNC. Expansion fittings shall be provided for rigid nonmetallic conduit to compensate for thermal expansion and contraction where the length change, in accordance with Chapter 9, Table 10, is expected to be 0.25 in. (6.36 mm) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.

(c) Flexible Conduit and Tubing.
(1) Angle Connectors. Angle connectors shall not be used for concealed raceway installations of FMC, LFMC, or LFNC.

(2) FMT Fittings. FMT fittings shall effectively close any openings in the connection.

315-50. Couplings and Connectors.
(a) Threadless. Threadless couplings and connectors used with EMT, IMC, and RMC shall be made up tight. Where buried in masonry or concrete, they shall be concretetight. Where installed in wet locations, they shall be raintight.

(b) Running Threads. Running threads shall not be used on IMC or RMC for connection at couplings.

(c) Joints. Where ENT, NUC, or RNC is used, all joints between lengths of conduit or tubing and between conduit or tubing and couplings, fittings, and boxes shall be by an approved method.

315-55. Bushings.
Where nonflexible conduit or tubing enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the conductor or cable from abrasion, unless the design of the box, fitting, or enclosure provides equivalent protection. See Section 300-4(f) for the protection of conductors size No. 4 or larger.
315-60. Grounding and Bonding.
(a) Grounding. Metal conduit and tubing shall be permitted as a grounding means as covered in Section 250-91(b). Where FMC or LFMC is used to connect equipment where flexibility is required, an equipment grounding conductor shall be installed.

(b) Bonding. Where an equipment bonding jumper is required, it shall be installed in accordance with Article 250, Part G.

315-70. Number of Conductors.
The number of conductors permitted in a single conduit or tubing shall not exceed the percentage fill specified in Chapter 9, Table 1, using the conduit or tubing dimensions of Chapter 9, Table 4. The number of conductors permitted in 3/8-in. FMC, FMT, or LFMC shall not exceed that specified in Table 315-70.

C. Construction Specifications

315-100. Construction.
(a) EMT.
(1) Finish. EMT shall have such a finish or treatment of outer surfaces as will provide an approved durable means of readily distinguishing it, after installation, from rigid metal conduit.
(2) Connector. Where EMT is coupled together by threads, the connector shall be so designed as to prevent bending of the tubing at any part of the thread.
(b) ENT. ENT shall be composed of a material that is resistant to moisture and chemical atmospheres and is flame-retardant. Electrical nonmetallic tubing shall be made of material that does not exceed the ignitibility, flammability, smoke generation, and toxicity characteristics of rigid (nonplasticized) polyvinyl chloride.

(c) FMC. FMC shall be constructed of helically wound, formed, interlocked metal strip

(d) LFNC. LFNC shall be flame-resistant and shall be constructed as one of the following types:
(1) a smooth seamless inner core and cover bonded together and having one or more reinforcement layers between the core and cover
(2) a smooth inner surface with integral reinforcement within the conduit wall
(3) a corrugated internal and external surface without integral reinforcement within the conduit wall
(e) NUC.
(1) Conduit. The nonmetallic conduit shall be composed of a material resistant to moisture and corrosive agents. It shall also be capable of being supplied on reels without damage or distortion and shall be of sufficient strength to withstand abuse, such as impact or crushing, in handling and during installation without damage to conduit or conductors.
(2) Conductors and Cables. Conductors and cables used in nonmetallic underground conduit with conductors shall be listed, shall be suitable for use in wet locations, and shall be as follows:

a. 600 Volts or Less. Alternating-current and direct-current circuits shall be permitted. All conductors shall have an insulation rating equal to at least the maximum nominal circuit voltage of any conductor or cable within the conduit.

b. Over 600 Volts. Conductors or cables rated over 600 volts shall not occupy the same conduit with conductors or cables of circuits rated 600 volts or less.

Table 315-70. Maximum Number of Insulated Conductors in 3/8-in. FMC, FMT, or LFMC*

Column A = With fitting inside conduit
Column B = With fitting outside conduit

Size AWG	Types RFH-2, SF-2		Types TF, XHHW, AF, TW		Types TFN, THHN, THWN		Types FEP, FEPB, PF, PGF	
	A	B	A	B	A	B	A	B
18	2	3	3	5	5	8	5	8
16	1	2	3	4	4	6	4	6
14	1	2	2	3	3	4	3	4
12	—	—	1	2	2	3	2	3
10	—	—	1	1	1	1	1	2

*In addition, one covered or bare equipment grounding conductor of the same size shall be permitted.

(f) RNC. RNC conduit and fittings shall be of suitable nonmetallic material resistant to moisture and chemical atmospheres. For use aboveground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Conduits listed for the purpose shall be permitted to be installed underground in continuous lengths from a reel. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading likely to be encountered after installation.

315-107. Standard Lengths.
IMC and RMC shall be shipped in standard lengths of 10 ft (3.05 m), including coupling, one coupling to be furnished with each length. For specific applications or uses, it shall be permitted to ship lengths shorter or longer than 10 ft (3.05 M) with or without couplings and with or without threads.

315-190. Marking.
(a) Clear and Durable.
(1) Each length of ENT, RMC, and RNC shall be clearly and durably marked at intervals not exceeding 10 ft (3.05 m). See Section 110-21.
(2) IMC. In addition to the requirements of Section 315-190(a)(1), each length of IMC shall be clearly and durably identified at 2 1/2 ft (762 MM) intervals with the letters IMC.
(3) NUC. NUC shall be clearly and durably marked at least every 10 ft (3.05M) as required by Section 110-21. Identification of conductors or cables used in NUC shall be provided on a tag attached to each end of the assembly or to the side of a reel. Enclosed conductors or cables, shall be marked in accordance with Section 310-11.
(4) RNC. For RNC recognized for use aboveground, markings shall be permanent. For RNC limited to underground use only, markings shall be sufficiently durable to remain legible until the material is installed.

(b) Type of Material.
(1) RNC and NUC. For NUC, the type of conduit material shall also be included in the marking. For RNC, the type of material shall also be included in the marking, unless it is visually identifiable.
(2) ENT and RNC shall be permitted to be surface-marked to indicate special characteristics of the material.
(FPN): Examples of these [optional] markings include, but are not limited to, the suffix "LS" for limited-smoke and markings such as "sunlight resistant."

(3) Corrosion-Resistant Material. Nonferrous IMC or RMC of corrosion-resistant material shall have suitable markings.

SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in principle revised as follows:
Table 315-12(a), Note 2. Except conduit bodies no larger than the largest trade size of the tubing. The conduit bodies shall not contain devices or support fixtures or other equipment.
Table 315-12(b), Note 4. Except conduit bodies no larger than the largest trade size of ~~an entering raceway~~ the conduit. The conduit bodies shall not contain devices or support fixtures or other equipment.
315-35(a)(1)a. Add:
Exposed installations of electrical metallic tubing on rooftops with a slope of less than 4 in. (102 mm) in 12 in. (305 mm) shall be securely fastened within 3 ft (914 mm) on each side of couplings.
315-35(a)(1)b Exception No. 1:
Where made up with threaded couplings, it shall be permissible to support horizontal straight runs in accordance with Table 315-35(a), provided such supports prevent transmission of stresses to termination where conduit is deflected between supports.
315-35(a)(1)b, Exception No. 2:
For exposed vertical risers from ~~industrial machinery~~ stationary equipment, the distance between supports shall be permitted to be increased to 20 ft (6.1 m), provided that the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.
Table 315-70. Change the number of conductors in each column (A and B) to the next higher number. Revise asterisk note: ~~In addition~~ One ~~covered or bare~~ equipment grounding conductor not larger than the circuit conductors ~~of the same size~~ shall be permitted, if it is bare or has the same type insulation as the circuit conductors. An equipment grounding conductor shall be counted in applying this table.
SUBSTANTIATION: The proposed revision for Table 315-12(a) Note 2 and Table 315-12(b) Note 4 is editorial to correlate the notes for similar wording and to clarify that other equipment is not to be supported. It states this in the tables but the notes indicate exception to the "other equipment" prohibition. Note 4 can be construed as permitting a conduit body with no devices and not supporting fixtures, but supporting other equipment such as photocells, horns, speakers, etc. The comment for Section 315-15(a)(1) is an adjunct to Panel Action on Proposal 8-157 relating to loss of EMT continuity on rooftops. The separations I have observed appeared to be caused to a great extent by lack of support adjacent to both sides of couplings. Where one support is within 3 ft or less of a coupling and the next support is 10 ft away, the EMT is more susceptible to separation due to human activity. Where roofs cannot be readily walked upon, this requirement is not so important.
315-35(a)(1)b, Exception No. 2: While there is a need for this exception for industrial machinery there is also a need for other equipment. A plant could have two equipments adjacent to each other, one designated industrial machinery, the other not so designated. This exception could be utilized for one but not the other an Authority Having Jurisdiction may reasonably permit both under Section 90-4, or use Section 315-35(a)(1)b, Exception No. 1 for extended lengths since a vertical riser may be "straight". This type installation is being routinely done and accepted as can be verified by visits to department stores, markets, home building supply centers, etc. Table 315-70. In general, a single conductor in a raceway is prohibited by Section 300-3(b). Section 250-91(b), Exception permits the metal conduits as a grounding means under certain conditions, or a bonding jumper could be used outside a raceway not over 6 ft. However, the omission of an EGC does not increase the number of circuit conductors permitted by the table. If column B permits 3 No. 12 THHN conductors plus one No. 12 covered grounding conductor, a better use of resources would be to permit 4 conductors with a user choice whether one is an EGC. "Covered" and "same size" are deleted as covered conductors designated in the past as "weatherproof" type have a thicker covering than types in the table, and "same size" literally does not permit a smaller EGC which may be otherwise permitted.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #202)

8- 175 - (344-12(a), FPN (New)): Reject
NOTE: The following proposal consists of Comment 8-264 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Dan Gearing, Perma Cote Industries
RECOMMENDATION: Add a new fine print note to read:
Coated, as used in this table is not the coating applied over galvanized RMC as supplementary protection in severely corrosive environments such as those in the (FPN) to 300-6.
Also, the note number should be placed by the heading "Coated" in the table.
SUBSTANTIATION: This is necessary to make sure a new PVC over nongalvanized steel is not mistakenly used in severely corrosive environments where the galvanic action beneath a supplementary coating of PVC is needed in case of damage to the PVC. The new product only provides one layer of protection, not two.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #203)

8- 176 - (344-12(b)): Reject

NOTE: The following proposal consists of Comment 8-266 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].

SUBMITTER: Charles W. Forsberg, Lamson & Sessions

RECOMMENDATION: For RTRC RNC, make RTRC the heading to cover 2 columns:

1. Label the current RTRC column, "AG".
2. Add a second column under RTRC labeled "BG".
3. The application entries for the "BG" column will be, "N,N,N,N,N,N,N,P,P,N,N,N,P".

SUBSTANTIATION: Types AG and BG RTRC have recently been added to the UL listing and should be included in this table.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 8-85.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #249)

8- 177 - (344-12(b)): Accept in Principle

NOTE: The following proposal consists of Comment 8-265 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].

SUBMITTER: Patricia Horton, Elaine Thompson, Allied Tube & Conduit

RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, make the following changes to Table 315-12(b):

1. Change Note 1 as follows: "ENT in straight lengths, or as a manufactured prewired assembly, shall be permitted Iin any building not exceeding three floors above grade."
2. Change the first sentence of Note 2 as follows: "Where ENT, including manufactured prewired assemblies, is used in any building exceeding three floors above grade, the walls, floors, and ceilings, including suspended ceilings, behind which the tubing is concealed shall provide a thermal barrier of material that has at least a 15-minute finish rating, as identified in listings of fire-rated assemblies."
3. Change the acronym for NUC to NUCC throughout the Table, Notes, and Text.
4. Change "P" to "P7" for ENT "Wet locations" and add Note 7: "Fittings identified for this purpose shall be used for connections."
5. Revise Note 5 as follows: "~~Also~~ ENT shall be permitted under a concrete slab on grade where the ENT is placed upon sand or approved screenings."
6. Change "P6" to "P7" for ENT "Encased or embedded in poured concrete below grade".
7. Delete "6" from the ENT columns "indoors, exposed", "indoors, concealed", "wet locations", "damp locations", "dry locations".
8. Change "N5" to "N" for ENT "System voltages over 600 volts, nominal".
9. Change "P" to "P12" for all RNC "System voltages over 600 volts, nominal" columns.

Add new Note 12: "Where unshielded cables over 600V nominal are installed in RNC or NUCC, the conduit shall be encased in not less than 3 in. (76mm) of concrete. (ROP 13-35).

10. Add "13" to all Application lines of RTRC except "concrete below grade", "exposed to physical damage", and "system voltages over 600 volts". Add a new Note 13 as follows: "Only RTRC Type AG is permitted. RTRC Type B is permitted only underground with or without concrete encasement."
11. Add a new column to the right of RTRC entitled "RFNC" with the following references:

"P14" for Application lines 1 through 7 ("Outdoors" through "encased or embedded in poured concrete on or above grade") and for "Exposed to the direct rays of the sun."

"P" for "Encased or embedded in poured concrete below grade" and "Direct burial."

"N" for "Support of fixtures or other equipment."

"P12" for "System voltage over 600 volts, nominal."

12. Add a new Note 14 as follows: "RNFC marked "Rigid Nonmetallic Conduit Underground" is not permitted in these applications. (Source UL Directory.)"
13. Place a new section headed "Manufactured Prewired Assemblies" to the right of column "HDPE." Divide this from the other columns with a heavier vertical line. Subdivide the new column into two columns: "NUCC" (Move the column for "NUC" from its current position next to ENT and change the acronym to "NUCC") and "ENT."

In the new prewired ENT column, add the following references:

Outdoors	N
Indoors, Exposed	P1
Indoors, Concealed	P1,2
Wet locations	P
Damp locations	P
Dry locations	P
Encased or embedded in poured concrete on or above grade	P7
Encased or embedded in poured concrete below grade	P7
Direct burial	N
Exposed to the direct rays of the sun	N
Exposed to physical damage	N
Support of fixtures	N
System voltages over 600	N

14. Add a superscript 6 after ENT under prewired.
15. Add a new Note 8 as follows: "NUCC shall be permitted in underground locations subject to severe corrosive influences as covered in Section 300-6 and where subject to chemicals for which the assembly is specifically approved."
16. Add a new Note 9 as follows: "NUCC cover requirements shall be as required in Tables 300-5 and 710-4(b) (New Table 300-50 per proposal 3-148) for RNC".
17. Add a new Note 10 as follows: "NUCC 600 Volts or Less. Alternating-current and direct-current circuits shall be permitted. All conductors shall have an insulation rating equal to at least the maximum nominal circuit voltage of any conductor or cable within the raceway."
18. Add a new Note 11 as follows: "NUCC over 600 Volts. Conductors or cables rated over 600 volts shall not occupy the same raceway with conductors or cables or circuits rated 600 volts or less.
19. Change "P" to "P9,10,11" for NUCC "encased or embedded in poured concrete below grade."
20. Change "P" to P"8,9,10,11" for NUCC "Direct Burial."
21. Change "P" to "P11" for NUCC "System voltages over 600 volts, nominal."
22. Add a new note 12 to NUCC "Systems Voltages over 600V, nominal."

SUBSTANTIATION: 1. Panel 8 accepted the addition of prewired ENT (ROP 8-66). The Note was also rewritten in sentence format to be consistent with other Notes.

2. Panel 8 accepted the addition of prewired ENT (ROP 8-66).
3. NUCC stands for "Nonmetallic underground conduit with conductors." This change is necessary to clarify that this type of conduit is shipped from the factory with conductors installed and is not an empty raceway. It also eliminates confusion with other N/M conduit which is marked for underground use only.
4. This language is in the 1996 NEC (331-3(7) and should continue to be included.
5. Note 5 has been rewritten in sentence form to be consistent with other Notes. Panel 8 accepted ENT for this use (ROP 8-58).
6. Note 6 has been deleted (see Substantiation above). Note 7 is required in order to retain important language from the l996 NEC which was omitted from the Draft of Article 315.
7. A separate column has been added for prewired ENT. As a result, Note 6 is no longer needed in this column.
8. Note 5 in the Draft refers to ENT under a concrete slab. This is the wrong reference for this application. We think the reference was supposed to be for electric signs. The TCC directed that Note 5 to Table 315-12(b) be deleted (ROP 8-71). The Task Group must have added a new Note 5.
9. This requirement has been moved from Article 710 to Article 300. It is an important consideration and should be so noted in the 600Volt columns. It also correlates with Panel 13 action and current section 710-4(b).
10. RTRC was not specifically mentioned in Article 347 of the NEC. Since the Task Group specifically included RTRC in a column in Table 315-12(b), it is necessary to be specific as to its listed uses. There are two types of RTRC: Type AG and Type BG. Type BG is only permitted underground with or without concrete encasement, according to its listing.

11. Type RFNC conduit was not specifically mentioned in Article 347 of the 1996 NEC. Since the Task Group that drafted Article 315 specifically included the other types of Rigid Nonmetallic Conduits, this type should also be included. The Notes which govern the Uses Permitted and Not Permitted for RFNC are according to its listing.
12. The Note is included so that the product will be applied according to its listing.
13. Both NUCC and prewired ENT are different from the other types of raceways in this Article. They are shipped from the factory with conductors installed. They should be separate from the other types of raceways . "NUC" was changed to "NUCC" for greater clarity: "Nonmetallic Underground Conduit with Conductors". Prewired ENT is shown in its own column for greater clarity and to separate it from the other raceways that do not have factory-installed conductors. Although the Uses Permitted and Not Permitted are the same as ENT at this time, a separate column provides the ability to review prewired requirements independently in the future. Also, the prewired sizes are limited.
14. A separate column has been added for prewired ENT. Note 6 clarifies that the full size range is not permitted.
15. To pick up language that was deleted from the 1996 NEC (343-3(4). This information is necessary to assure proper application of the product.
16. To pick up language that was deleted from the 1996 NEC (343-3(1). This information is necessary to assure proper application of the product.
17. Voltage requirements should be included in the Uses Permitted and Not Permitted section of the Article. These are important considerations when applying the product. Even though the conduit is shipped from the factory with conductors installed, they are removable in the field and this note will assure proper application.
18. Voltage requirements should be included in the Uses Permitted and Not Permitted section of the Article. These are important considerations when applying the product. Even though the conduit is shipped from the factory with conductors installed, they are removable in the field and this note will assure proper application.
19. These references are necessary for the proper application of NUCC. (See the Substantiations for Notes 9, 10, and 11 above).
20. These references are necessary for the proper application of NUCC. (See the Substantiations for Notes 8, 9, 10, and 11 above).
21. This reference is necessary for the proper application of NUCC.
22. The conduit is HDPE and should have same cover requirements as other RNC.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #204)

8- 178 - (344-12(b) Note 5): Accept in Principle
NOTE: The following proposal consists of Comment 8-267 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Charles W. Forsberg, Lamson & Sessions
RECOMMENDATION: Do not delete Note 5 until after the comment cycle is complete.
SUBSTANTIATION: If Proposal 18-124 is rejected, it is not proper to delete Note 5. It is proper to wait until action on Public Comments is completed before deleting this note.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The note referenced by the submitter is not applicable based on the panel's action on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #205)

8- 179 - (Table 344-12(b) Note 7): Reject
NOTE: The following proposal consists of Comment 8-268 on Proposal 8-66 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-66 was:
Add a new permitted use:
(x) 1/2" through 1" as listed manufactured prewired assembly.
SUBMITTER: William Wusinich, IBEW/Eastern Code Advisory Group
RECOMMENDATION: I urge CMP 8 to reconsider their action taken on this proposal and reject the concept of prewired ENT.
SUBSTANTIATION: After reading the fact finding report which was submitted with Proposal 8-66, I discovered that the test was performed using 200 ft lengths of ENT containing three circuit conductors of #10 size only. Table C-2 on page 945 of the 1996 NEC permits 15-#10. I would think that this would present a whole new set of problems while installing this product. The additional weight will put a severe strain on the ENT itself when being installed through partitions, (wood or metal).
The proposal does not limit this product to a maximum of three conductors, nor is there any limitation to the length of this product.
Other prewired assemblies have an outer wrapping of mylar or paper around the conductors for additional protection to the conductors. This product does not have such a wrapping. My concerns would be damage to the circuit conductors while installing this product and while cutting the outer sheath.
I have no problem with the product being used as a raceway. Install it, secure and support it according to the NEC. After it is firmly fixed in place then pull the conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal was held because of the reference to Table 344-12(b). The proposal itself pertains to Pre-Wired ENT which was accepted by the panel for Article 331 in the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #206)

8- 180 - (344-12(c)): Accept in Principle
NOTE: The following proposal consists of Comment 8-269 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, make the following changes to Table 315-12(c): (Substantiation for each revision is numbered correspondingly.) (A complete Table as it would appear with suggested changes is provided on disk. Document name: Article315(344)Tables.doc.)
1. Revise Note 1 as follows: "FMC shall be permitted outdoors and in wet locations where ~~If~~ the conductors are approved for the specific conditions and the installation is such that liquid is not likely to enter raceways or enclosures to which the conduit is connected.
2. Revise Note 2 as follows: "LFMC and FNC shall be permitted ~~W~~where listed and marked for the purpose.
3. Revise Note 3 as follows: "FMT shall be permitted ~~F~~for branch circuits only."
4. Revise Note 4 as follows: "Aluminum FMC shall ~~N~~not be permitted where installed in direct contact with masonry.
5. Revise Note 5 as follows: "FMT shall be permitted ~~F~~for system voltages of 1000 volts maximum.
6. Revise Note 6 as follows: "Types A and C LFNC shall be permitted where a longer length is approved as essential for a required degree of flexibility."
7. Change "flexible conduit" to "FMC and LFMC."
8. Change "P" to "P11,12" for FMC Steel and Alum. "Indoors, Exposed" and "Indoors, Concealed".
9. Add new Note 11 as follows: "FMC shall be permitted in lengths not in excess of 6 ft. (1.83m): (1) for utilization equipment (2) as part of a manufactured listed prewired assembly (3) for tap connections to lighting fixtures as permitted in Section 410-67(c). FMC shall also be permitted for manufactured wiring systems as permitted in Section 604-5(a), and as part of a listed assembly to connect wired fixture sections as permitted in Section 410-77(c).

10. Add new Note 12 as follows: "FMC in 3/8 trade size shall be permitted in lengths not in excess of 6 ft. (1.83m) as part of an approved assembly or for lighting fixtures. (See Section 410-67(C). The number of conductors in 3/8 trade size shall not exceed that permitted in Table 350-12.
11. Change "P3" to "P3,13" for FMT "Indoors, Exposed" and "Indoors, Concealed". Add new Note 13 as follows: "FMT shall be permitted in lengths not in excess of 6 ft. (1.83m) as part of an approved prewired assembly or for lighting fixtures. See Section 410-67(c).
12. Change "P" to "P9" for LFMC "Indoors, Exposed" and "Indoors, Concealed". Add a new Note 9 to read as follows: "LFMC is not a general wiring method and shall be permitted to be used only where conditions of installation, operation, or maintenance require flexibility or protection from liquids, vapors, or solids.
13 Change "P" to "P10" for LFNC Type A, Type B, Type C "Indoors, Exposed" and "Outdoors, Exposed". Add new Note 10 to read as follows: "LFNC is not a general wiring method and shall be permitted to be used only where (1) flexibility is required for installation, operation, or maintenance; (2) protection of the contained conductors is required from vapors, liquids, or solids, (3) outdoors, (note 2) and (4) for direct burial (note 2.)"
SUBSTANTIATION: 1. The Note has been rewritten in sentence form to make it consistent with the format of the other Notes.
2. The Note has been rewritten in sentence form to make it consistent with the format of the other Notes.
3. The Note has been rewritten in sentence form to make it consistent with the format of the other Notes.
4. The Note has been rewritten in sentence form to make it consistent with the format of the other Notes.
5. The Note has been rewritten in sentence form to make it consistent with the format of the other Notes.
6. Since there are three different types of LFNC, it is necessary to differentiate among the three and to be specific as to which types are permitted for specific uses. This Note agrees with the Uses Permitted in the 1996 Code (351-23(3)).
7. All flexible conduit is not permitted for this application.
8. To correlate with the instruction of the TCC.
9. To correlate with the instruction of the TCC on Proposal 3-125 and with existing Article 350-10 from the 1996 NEC.
10. To correlate with the instruction of the TCC on Proposal 3-125 and with existing Article 350-10 from the 1996 NEC.
11. To correlate with the instruction of the TCC on Proposal 3-125 and to correlate with 349-10 of the 1996 NEC.
12. By putting the information about LFMC in this product matrix (Table 315-12(C)), it is not clear anymore that this is not a general wiring method. This must be made clear. The sentence also includes important information contained in 351-4(1) and 351-4(2) of the 1996 NEC and perhaps inadvertently dropped from the Article 315 Draft.
13. By putting the information about LFNC in this product matrix, it is not clear that this is not a general wiring method. This must be made clear. (See Panel Statement to Proposal 8-214: "The panel does not intend LFNC to be used as a general purpose wiring method.") The sentence also includes important information contained in 351-23(a)(1) and (2).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #207)

8- 181 - (Table 344-12(c)): Reject
NOTE: The following proposal consists of Comment 8-270 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Charles W. Forsberg, Lamson & Sessions
RECOMMENDATION: For columns LFMC and LFNC for applications "Indoors, Exposed" and "Indoors, Concealed", add the appropriate number for a new note, and a new note:
x. Shall be permitted only where conditions of installation, operation, or maintenance require flexibility or protection from liquids, vapors, or solids.
SUBSTANTIATION: This will provide continuity for the proper use of these wiring methods, based on current NEC rules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #208)

8- 182 - (344-14): Accept in Principle
NOTE: The following proposal consists of Comment 8-271 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, move Section 315-14 to become the second paragraph of Section 315-12 (a).
SUBSTANTIATION: In the 1996 NEC, the text now covered in Section 315-14 is included in the "Uses Not Permitted" Sections of the respective articles. These temperature requirements should continue to be included in the "Uses Permitted and Not Permitted" Section of new Article 315 to assure that these important considerations are not overlooked and that the products are properly applied.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #209)

8- 183 - (344-15): Accept in Principle
NOTE: The following proposal consists of Comment 8-272 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, move Section 315-15 to Section 315-12b and revise as follows:
344-12. (b) Corrosive Locations and Raceway Degradation.
(1) Metal Raceways. Metal raceways that utilize materials approved for the installation shall be permitted where subject to airborne or splash chemical exposure. Coated metal raceways subject to airborne and splash chemical exposure and ultraviolet degradation shall be permitted where materials approved for the installation are utilized.
(2) Nonmetallic Raceways.
a. Nonmetallic raceways subject to ultraviolet degradation shall be permitted where materials approved for the installations are utilized. Nonmetallic raceways shall be listed as sunlight resistant.
b. Nonmetallic raceways that utilize materials approved for the installation shall be permitted where subject to airborne or splash exposure to chemical solvents.
(FPN):See Section 300-6 for protection against corrosion.
SUBSTANTIATION: These requirements for corrosive locations belong in Section 315-12 "Uses Permitted and Not Permitted". Table 315-12(a), for example, already contains four Notes concerning corrosion protection.
The sentence structure has been changed to more appropriately fit the sentence structure of a "Use Permitted".
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #210)

8- 184 - (344-15(b)(1)): Reject
NOTE: The following proposal consists of Comment 8-273 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Charles W. Forsberg, Lamson & Sessions
RECOMMENDATION: Delete, ".... shall utilize materials approved for the installation and".
SUBSTANTIATION: Section 344-7 already requires nonmetallic raceways to be listed. To further add the requirement for "approval" by the authority having jurisdiction is not warranted.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #211)

8- 185 - (344-23): Accept in Principle
NOTE: The following proposal consists of Comment 8-274 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study.
However, if it is accepted, do the following:
(1) Move Section 315-23, Table, and Notes to Table, to Section 315-12.
(2) Add 315-12(c) to read: Size. Permitted sizes for raceways shall be as shown in Table 315-12(d).
(3) Renumber the Table as Table 315-12(d) and revise the Table and Notes as shown on the attached Table.
SUBSTANTIATION: Table 315-23 "Permitted Sizes for Raceways" limits the uses permitted to certain sizes of raceways. Including "Size" text and Table in Section 315-12 "Uses Permitted and Not Permitted" completes the Article by putting all Use requirements in one section.
Panel 8 accepted the addition of 1/2 through 1 Manufactured Prewired ENT (Proposal 8-66). The Table has been changed to add Manufactured Prewired ENT. A separated column is necessary because the size range is different from empty ENT.
The words "inches" and "Trade Size" and the inch (") designator after 3/8 and in the heading have been deleted. The terminology used today is "trade size" without referencing inches or metric - the numbers are merely designators. Trade has been added before Size in the heading.
Notes have been rewritten in mandatory language for consistency with language in other Tables in Article 315.
Note 4(b) has been revised to agree with the language of Note 2(b) which was developed as a result of the Panel action on Proposal 8-181a. Also to correlate with the instruction of the TCC on Proposal 3-125.
Note 4(c) was deleted per TCC directive to correlate with Panel action on Proposal 8-222.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #212)

8- 186 - (344-25(a)): Accept in Principle
NOTE: The following proposal consists of Comment 8-275 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, change "identified" to" designed" in the following sentence, "Field bends shall be made only with bending equipment ~~identified~~ designed for the purpose."
SUBSTANTIATION: Bending equipment is not "identified" for the purpose as defined in the NEC. The word "designed" is more technically correct.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #213)

8- 187 - (344-25(a)): Accept in Principle
NOTE: The following proposal consists of Comment 8-276 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study.
However, if it is accepted, add the words "without the use of equipment" to the last sentence of 315-25(a) to read as follows: "Bends of ENT, FMC, FMT, LFMC, LFNC and NUCC shall be permitted to be made manually without the use of equipment."
SUBSTANTIATION: Some sizes of EMT, IMC and RMC are bent "manually" with a hand bender. This addition clarifies the difference between bending by hand and bending with a hand bender.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #214)

8- 188 - (344-35): Reject
NOTE: The following proposal consists of Comment 8-277 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Replace the proposed Section 315-35 with the following:
315-35. Supports. This section does not apply to NUC. All other raceways covered in this article shall comply with (a) or (b) below.
(a) Nonflexible Raceways. Nonflexible raceways shall be installed as a complete system, as provided for in Article 300, and be securely fastened at intervals not exceeding those specified in Table 315-35(a) and its notes.

Table 315-35(a) Nonflexible Raceways

Installation Requirement	Distance (In Feet)				
	EMT	ENT	IMC	RMC	RNC
Shall be securely fastened at intervals not exceeding	10a	3b	-	-	I
Shall be securely fastened at a distance from each outlet box, junction box, device box, cabinet, conduit body, or other termination at a distance not exceeding	3 a f	3 b	3 c f	3 c f	3 g
Shall be supported at intervals not exceeding	-	-	10 c d	10 c d	h
Horizontal runs hall be supported at intervals and securely fastened at distances not exceeding	k	m	k	k	o

For SI units: 1 ft = 0.3048 m

Notes to Table 315-35(a):

a. Unbroken lengths (without coupling) of EMT shall be permitted to be fished for concealed work in finished buildings or prefinished wall panels where such securing is impracticable.

b. ENT shall be permitted to be installed without being secured for lengths not exceeding 6 ft (1.83 m) from a fixture terminal connection for tap connections to lighting fixtures.

c. The distance between supports for straight runs of conduit shall be permitted in accordance with Table 315-35(a)(1), provided that the conduit is made up with threaded couplings, and such supports prevent transmission of stresses to termination where conduit is deflected between supports.

d. The distance between supports shall be permitted to be increased to 20 ft (6.1 m) for exposed vertical risers from industrial machinery, provided that the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.

e. Where approved, IMC and RMC shall not be required to be securely fastened within 3 ft (914 mm) of the service head for above-the-roof termination of a mast.

f. Fastening of EMT, IMC and RMC at their termination points shall be permitted to be increased to 5 ft (1.52 m) where structural members do not readily permit fastening within 3 ft (914 mm). For EMT, this exception shall apply to unbroken lengths only.

g. RNC listed for securing at other than 3 ft (914 mm) shall be permitted to be installed in accordance with the listing.

h. RNC shall be supported as required in Table 315-35(a)(2). RNC listed for support at spacings other than as shown in Table 315-35(a)(2) shall be permitted to be installed in accordance with the listing.

i. RNC shall be fastened so that movement from thermal expansion or contraction will be permitted.

k. Horizontal runs of EMT, IMC, or RMC supported by openings through framing members at intervals not exceeding 10 ft (3.05 m) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

m. Horizontal runs of ENT supported by openings through framing members at intervals not exceeding 3 ft (914 mm) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

o. Horizontal runs of RNC supported by openings through framing members at intervals not exceeding those specified in Table 315-35(a)(2) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

Table 315-35(a)(1). Support for Straight Runs of RMC or IMC Made Up with Threaded Couplings.

Trade Size (inches)	Maximum Distance Between Supports (Feet)
1/2 - 3/4	10
1	12
1 1/4 - 1 1/2	14
2 - 2 1/2	16
3 and larger	20

For SI units: (Supports) 1 ft = 0.3048 m

Table 315-35(a)(2). Support for RNC

Trade Size (inches)	Maximum Distance Between Supports (feet)
1/2-1	3
1 1/4-2	5
2 1/2-3	6
3 1/2-5	7
6	8

For SI unit: (Supports) 1ft - 0.3048 m.

(b) Flexible Raceways. Flexible raceways shall be supported or secured at intervals not exceeding those specified in Table 315-35(b).

Table 315-35(b). Flexible Raceways

Installation Requirement	Distance (In Feet)		
	FMC	LFMC	LFNC
Shall be supported and secured at intervals not exceeding	4 1/2 a	4 1/2 a	3 b
Shall be securely fastened by an approved means at a distance from each box,cabinet, conduit body, or other termination of the conduit not exceeding	1 c	1 c	1 c
Horizontal runs supported at intervals and securely fastened at distances not exceeding	d	d	c

For SI units: 1 ft = 0.3048

Notes to Table 315-35(b):

a. Supporting and securing shall not be required where the conduit is fished or where installed in lengths not exceeding 6 ft (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures, as permitted in Section 410-67(c).

b. Where installed in lengths longer than six ft LFNC as described in Section 315-100(d)(2) shall be securely fastened at intervals not exceeding 3 ft (914 mm) unless the conduit is fished.

c. LFNC, as described in Section 315-100(d)(2), installed in lengths longer than 6 ft, FMC, and LFMC shall not be required to be securely fastened within 1 ft (0.3048 m) when one of the following conditions are met:

1. The conduit is fished, or
2. The length does not exceed 3 ft (9.14 mm) at terminals where flexibility is necessary, or
3. The length does not exceed 6 ft (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures, as permitted in Section 410-67(c).

d. Horizontal runs of FMC and LFMC supported by openings through framing members at intervals not exceeding 4 1/2 ft (1.37 m) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.

e. Horizontal runs of LFNC supported by openings through framing members at intervals not exceeding 3 ft (914 mm) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.

SUBSTANTIATION: Conversion of the wording in the proposed section into a tabular form will make the requirements more understandable and enforceable.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #215)

8- 189 - (344-35(b)(1)): Accept in Principle
NOTE: The following proposal consists of Comment 8-278 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, move the first sentence of 315-35 (1) to the General section.
SUBSTANTIATION: This sentence should not apply only to nonflexible raceways. Placing it in General resolves that problem.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #216)

8- 190 - (344-35(b)(1)): Accept in Principle
NOTE: The following proposal consists of Comment 8-279 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, move the second sentence of 315-35 (b)(1) to become the third sentence of 315-35d. (Probably need some renumbering.)
SUBSTANTIATION: This sentence is a general requirement for RNC and the relocation is more appropriate.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #217)

8- 191 - (344-35(b)(1)c): Reject
NOTE: The following proposal consists of Comment 8-280 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise as follows: ~~ENT shall be permitted to be installed without being secured for lengths not exceeding 6 ft (1.83m) from a fixture terminal connection for tap connections to lighting fixtures. For installations other than described above , the tubing shall be secured at least every 3 ft (914mm).~~

ENT shall be secured at least every 3 ft (914mm). Where ENT is installed from a fixture terminal connection for tap connections to lighting fixtures, lengths not exceeding 6 ft. (1.83m) are not required to secured. Manufactured prewired assemblies and coiled or reeled ENT shall be supported and secured the same as straight lengths.

SUBSTANTIATION: This section has been restructured to put the basic rule first and to provide more positive language. No technical change to the existing text is intended. The sentence regarding prewired and coiled ENT has been added so it is clear the same support and securing requirements apply.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #218)

8- 192 - (344-35(b)(1)c): Reject
NOTE: The following proposal consists of Comment 8-281 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise as follows:
~~ENT shall be permitted to be installed without being secured for lengths not exceeding 6 ft (1.83m) from a fixture terminal connection for tap connections to lighting fixtures. For installations other than described above , the tubing shall be secured at least every 3 ft (914mm).~~
ENT shall be secured at least every 3 ft (914mm). Where ENT is installed from a fixture terminal connection for tap connections to lighting fixtures, lengths not exceeding 6 ft. (1.83m) are not required to secured. Manufactured prewired assemblies and coiled or reeled ENT shall be supported and secured the same as straight lengths.
SUBSTANTIATION: This section has been restructured to put the basic rule first and to provide more positive language. No technical change to the existing text is intended. The sentence regarding prewired and coiled ENT has been added so it is clear the same support and securing requirements apply.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #219)

8- 193 - (344-35(b)(3) Exception No. 3): Reject
NOTE: The following proposal consists of Comment 8-282 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Delete this exception.
SUBSTANTIATION: It is redundant to 315-35 d -- if revision is accepted. Otherwise, it is redundant to existing 315-35(b)(1), last sentence.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #220)

8- 194 - (344-53(b)(3) Exception No. 4): Reject
NOTE: The following proposal consists of Comment 8-283 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Delete this Exception.
SUBSTANTIATION: It is redundant to 315-35(b)(1)a.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #221)

8- 195 - (344-60(a)(1)): Reject
NOTE: The following proposal consists of Comment 8-284 on Proposal 8-157 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-157 was:
Article 348-1 should be split into two sections to comply with the NEC style manual. Also additional text is shown underline to read as follows.
348-1. Uses Permitted. The use of electrical metallic tubing shall be permitted for both exposed and concealed work.
A separate equipment grounding conductor, sized as required by Section 250-95, shall be installed in all electrical metallic tubing.
SUBMITTER: Noel Williams, Salt Lake City, UT
RECOMMENDATION: This proposal should remain accepted in principle although I think "accepted in principle in part" would be a more appropriate description of the action that was taken.
SUBSTANTIATION: I agree with the comments of Lilly. This proposal provides a partial solution. If EMT is used in locations where it is subjected to abuse sufficient to cause breakage of fittings, then the EMT is probably being misapplied. However, I have seen many installations of EMT, especially in larger sizes, that have existed for many years without the damage described. While the addition of an equipment grounding conductor won't hurt, it won't solve problems where the EMT is subject to such physical damage.
The term "severe physical damage" is not defined in the NEC, but in my view, much of the damage described is severe physical damage. The same actions that would cause breakage and disconnection of 1/2 in. EMT would not cause similar damage in 2 in. EMT. Not all rooftops are the same either. Many of the failures described should be attributed to poor design choices and misapplication of the product rather than to some fault of the product itself.
Requiring a separate equipment grounding conductor in all EMT installations is clearly overkill. The vast majority of EMT is not installed in conditions where the EMT will be climbed on or stepped on.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #222)

8- 196 - (Table 344-70): Reject
NOTE: The following proposal consists of Comment 8-287 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Charles W. Forsberg, Lamson & Sessions
RECOMMENDATION: In the title of this table, place an "*" after "FMC" and "FMT".
SUBSTANTIATION: This will satisfy the concern of the Technical Correlating Committee in the "Note" to this proposal in the ROP.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #223)

8- 197 - (344-100): Accept in Principle
NOTE: The following proposal consists of Comment 8-288 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, change subsection heading "~~C.~~ Construction Specification" to "D. Construction Specifications."

SUBSTANTIATION: To correlate with Comment on Section 315B and 315C (New).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #224)

8- 198 - (344-100(3) and (b)): Accept in Principle
NOTE: The following proposal consists of Comment 8-289 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, move sections 315-100(3)(a) and (b) to Table 315-12(b), Notes 10 and 11.
SUBSTANTIATION: Voltage considerations more appropriately belong in the "Uses Permitted and Not Permitted" Section.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #225)

8- 199 - (344-100(3)): Reject
NOTE: The following proposal consists of Comment 8-290 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise to read:
"NUCC is ~~an~~ factory assembly of conduit and cable or conductors that is..."
SUBSTANTIATION: To clarify what constitutes the "assembly."
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 8-85 for panel action and panel statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #226)

8- 200 - (344-100(b)): Reject
NOTE: The following proposal consists of Comment 8-291 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8- 84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise the last sentence regarding ENT as follows: In addition, ENT, as a prewired manufactured assembly, ~~is provided~~ shall be in continuous lengths ~~shipped in a coil, reel, or carton.~~ and shall be made of material which can be coiled or reeled without damage to the tubing or conductors during handling or installation.
SUBSTANTIATION: The existing text is informational only -- not a construction specification. If prewired ENT continues to be accepted the revised text is critical from a construction aspect to assure that all producers meet this important criteria. This text is similar to that for NUCC.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-85.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #227)

8- 201 - (344-190): Accept in Principle
NOTE: The following proposal consists of Comment 8-292 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, insert a new subsection heading "E. Marking" before 344-190.
SUBSTANTIATION: Marking is an important consideration for properly identifying conduit and should have a separate subsection in order to make the information easier to find.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #228)

8- 202 - (344-190(1)): Accept in Principle
NOTE: The following proposal consists of Comment 8-293 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, change the first sentence as follows: (1) EMT and RMC. Each length shall be clearly and durably marked at intervals not exceeding 10 ft.(3.05m).
SUBSTANTIATION: To be consistent with the structure of 315-190(2),(3) and (4) and to make the information on these products easier to find.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #229)

8- 203 - (344-190(5)): Accept in Principle
NOTE: The following proposal consists of Comment 8-294 on Proposal 8-5a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. [See Proposal 8-84 (Log #125)].
SUBMITTER: Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: We believe this rewrite should either be rejected or held for further study. However, if it is accepted, add "ENT" to the beginning of the first sentence.
SUBSTANTIATION: To be consistent with the structure of 315-190 (2), (3), and (4) and to make the information on this product easier to find.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 345 — INTERMEDIATE METAL CONDUIT: TYPE IMC

(Log #1223)

8- 204 - (345): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION:
Revise Article 345 to read as follows:
Article 345 Intermediate Metal Conduit: Type IMC

A. General

345-1. Scope. This article covers the use, installation, and construction specifications for Intermediate Metal Conduit (IMC) and associated fittings.

345-2. ~~345-1.~~ Definition.
Intermediate Metal Conduit (IMC). ~~Intermediate metal conduit is a listed~~ A steel raceway of circular cross section with integral or associated couplings, approved for the installation of electrical conductors and used with ~~listed~~ fittings to provide electrical continuity.

345-3. ~~345-2~~ Other Articles.
Installations for IMC ~~intermediate metal conduit~~ shall comply with ~~the~~ applicable provisions ~~of the applicable provisions sections~~ of Article 300.

345-6. Listing Requirements. IMC and associated fittings shall be listed.

B. Installation

345-10. ~~345-3.~~ Uses Permitted.

(a) All Atmospheric Conditions and Occupancies.
Use of ~~intermediate metal conduit~~ IMC shall be permitted under all atmospheric conditions and occupancies. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. ~~Intermediate metal conduit shall be permitted as an equipment grounding conductor.~~

Exception: Aluminum fittings and enclosures shall be permitted to be used with steel IMC ~~intermediate metal conduit~~.

(b) Corrosion Protection. IMC ~~Intermediate metal conduit~~, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and judged suitable for the condition.

~~FPN: See Section 300-6 for protection against corrosion.~~

(c) Cinder Fill. IMC ~~Intermediate metal conduit~~ shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 2 in. (50.8 mm) thick; where the conduit is not less than 18 in. (457 mm) under the fill; or where protected by corrosion protection and judged suitable for the condition.

~~FPN: See Section 300-6 for protection against corrosion.~~

~~345-5.~~ (d) Wet Locations. All supports, bolts, straps, screws, etc., shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

FPN: See Section 300-6 for protection against corrosion.

345-20. ~~345-6~~ Size.
(a) Minimum. IMC ~~conduit~~ smaller than 1/2-in. ~~electrical~~ trade size shall not be used.

(b) Maximum. IMC ~~conduit~~ larger than 4-in. ~~electrical~~ trade size shall not be used.

(FPN): Metric trade numerical designations for ~~intermediate metal conduit~~ IMC are ~~the same as those found in Extra heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 981-1989; namely,~~ 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103.

345-22. ~~345-7.~~ Number of Conductors ~~in Conduit.~~
The number of conductors or cables ~~in a single conduit~~ shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9~~., using the conduit dimensions of Table 4, Chapter 9.~~

345-24. ~~345-10~~. Bends -- How Made.
Bends of IMC ~~intermediate metal conduit~~ shall be so made so that the conduit will not be damaged and so that the internal diameter of the conduit will not be effectively reduced. The radius of the curve of the inner edge of any field bend shall not be less than indicated in Table ~~346-10~~ 346-24.

Exception: For field bends for conductors without lead sheath and made with a single operation (one shot) bending machine designed for the purpose, the minimum radius shall not be less than indicated in Table ~~346-10~~ 346-24, Exception.

345-26. ~~345-11.~~ Bends -- Number in One Run.
There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.

345-28. ~~345-8~~. Reaming and Threading.
All cut ends ~~of conduits~~ shall be reamed or otherwise finished to remove rough edges. Where conduit is threaded in the field, a standard cutting die with a 3/4-in. taper per foot (1 in 16) shall be used.

FPN: See Standards for Pipe Threads, General Purpose (Inch), ANSI/ASME B.1.20.1-1983.

345-30. ~~345-12.~~ Securing and Supporting.
IMC ~~Intermediate metal conduit~~ shall be installed as a complete system as provided in Article 300 and shall be securely fastened in place and supported in accordance with (a) and (b).

(a) Securely Fastened.
Each ~~intermediate metal conduit~~ IMC shall be securely fastened within 3 ft (914 mm) of each outlet box, junction box, device box, cabinet, conduit body, or other conduit termination. Fastening shall be permitted to be increased to a distance of 5 ft (1.52 m) where structural members do not readily permit fastening within 3 ft (914 mm). Where approved, conduit shall not be required to be securely fastened within 3 ft (914 mm) of the service head for above-the-roof termination of a mast.

(b) Supports.
IMC ~~Intermediate metal conduit~~ shall be supported in accordance with one of the following.

(1) Conduit shall be supported at intervals not exceeding 10 ft (3.05 m).

(2) The distance between supports for straight runs of conduit shall be permitted in accordance with Table ~~346-12~~ 346-30(b)(2), provided the conduit is made up with threaded couplings, and such supports prevent transmission of stresses to termination where conduit is deflected between supports.

(3) Exposed vertical risers from industrial machinery shall be permitted to be supported at intervals not exceeding 20 ft (6.1 m), provided the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.

(4) Horizontal runs of IMC ~~intermediate metal conduit~~ supported by openings through framing members at intervals not exceeding 10 ft (3.05 m) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

345-40. ~~345-13.~~ Boxes and Fittings.
~~See~~ Boxes and fittings shall comply with the applicable provisions of Article 370.

345-42. ~~345-9.~~ Couplings and Connectors.

(a) Threadless. Threadless couplings and connectors used with conduit shall be made tight. Where buried in masonry or concrete, they shall be the concretetight type. Where installed in wet locations, they shall be the raintight type.

(b) Running Threads. Running threads shall not be used on conduit for connection at couplings.

345-46. ~~345-15~~ Bushings.
Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the wire from abrasion unless the design of the box, fitting, or enclosure is such as to afford equivalent protection.

FPN: See Section 300-4(f) for the protection of conductors sizes No. 4 and larger at bushings.

345-56. ~~345-14~~. Splices and Taps.
Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies.

345-60. Grounding.
IMC shall be permitted as an equipment grounding conductor.

C. Construction Specifications.

345-120. ~~345-16(c).~~ Marking.
Each length shall be clearly and durably marked at least every 5 ft (1.52 m) with the letters IMC. Each length shall be marked as required in the first sentence of Section 110-21.
~~345-16(b). Corrosion-Resistant Material.~~ Nonferrous conduit of corrosion-resistant material shall have suitable markings.

345-130. ~~345-16(a)~~ Standard Lengths.
The standard length of IMC ~~intermediate metal conduit~~ shall be 10 ft (3.05 m), including an attached coupling, and each end shall be threaded. Longer or shorter lengths with or without coupling and threaded or unthreaded shall be permitted.
SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements.
Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.
The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.
A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.
For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.
Explanation of proposed renumbering and editorial changes;

- **Title** — **The text "Type" and the acronym "IMC" added**
- **345-1** — **New Scope added to conform with the style manual.**
- **345-2**
  (1) Definition renumbered from Section 345-1 to 345-2.
  (2) "IMC" acronym added.
  (3) "Intermediate Metal Conduit" capitalized as it is a proper name of a product.
  (4) Listing requirements relocated to new Section 345-6.
- **345-3**
  (1) Other Articles renumbered from Section 345-2 to 345-3.
  (2) Delete product name and replace with acronym "IMC".
  (3) Text revised for clarity.
- **345-6** — **New section to relocate listing requirements for IMC and associated fittings. Listing requirements for the conduit and fittings came from 345-2 (99 NEC).**
- **345-10**
  (1) Uses Permitted renumbered from Section 345-3 to 345-10.
  (2) Delete product name and replace with acronym "IMC" (four places).
  (3)Relocated equipment grounding to 345-60.
  (4)Subparagraph (d) added for Wet Locations relocated from 345-5.
  (5) Deleted Fine Print Note (two places) made redundant by adding new subparagraph (d).
- **345-20**
  (1) Size renumbered from Section 345-6 to 345-20.
  (2) Delete product name and replace with acronym "IMC" (three places).
  (3) The word "electrical" was deleted as it added nothing to the clarity of this section (two places).
  (4) Delete the text reference to the standard from which the metric trade numerical designations were taken.
- **345-22**
  (1) Number of Conductors renumbered from 345-7 to 345-22.
  (2) Reword section adding reference to cables for clarity.
  (3) Removed the reference to conduit for clarity (two places).
  (4) Deleted the text "using the conduit dimensions of Table 4, Chapter 9", which is not required for understanding this application.
- **345-24**
  (1) Bends-How Made renumbered from 345-10 to 345-24.
  (2) Delete product name and replace with acronym "IMC".
  (3) Corrected Table reference (two places).
- **345-26** — **Bends-Number in One Run renumbered from 345-11 to 345-26.**
- **345-28**
  (1) Reaming and Threading renumbered from 345-8 to 345-28.
  (2) Delete "of conduit" for clarity.
- **345-30**
  (1) Securing and Supporting renumbered from 345-12 to 345-30.
  (2) Deleted product name and replaced with acronym "IMC" (four places)
  (3) Corrected Table reference.

- 345-40
  (1) Boxes and Fittings renumbered from 345-13 to 345-40.
  (2) Revised text for clarity.

- 345-46 Bushings renumbered from 345-15 to 345-46

- 345-56 Splices and Taps renumbered from 345-14 to 345-56.

- 345-60 New Section for the grounding requirements. Text moved from 345-3 (99 NEC).

- 345-120
  (1) Marking requirements relocated from 345-16(b) and 345-16(c).
  (2) Section Tiltle "Corrosion Resistant Material" deleted since the text reference is to the marking.

- 345-130
  (1) Standard Lengths renumbered from 345-16(a) to 345-130.
  (2) Deleted product name and replaced with acronym "IMC".

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	Common Numbering System for the Circular Raceway Articles
	Article 3XX, <title>: <acronym>
	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.
3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.
3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete proposed 345-3.
Delete proposed 345-40.
In proposed 345-22 delete the words "or cables."
Delete second sentence of proposed 345-56.
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 345-3, 345-40 and second sentence of 345-56 are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
There was no technical substantiation provided to add the words "or cables" as part of the rewrite of 345-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1280)

8- 205 - (345): Accept
Note: The Technical Correlating Committee notes that the actions on this Proposal will be integrated into the revised sections by the action on Proposal 8-204 and is also modified by the action on Proposal 8-216.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION:
Revise as follows:
345-3 (c) Cinder Fill. Intermediate metal conduit shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 50 mm (2 in.)~~2 in. (50.8 mm)~~ thick; where the conduit is not less than 450 mm (18 in.)~~18 in. (457 mm)~~ under the fill; or where protected by corrosion protection and judged suitable for the condition.
345-6 (a) Minimum. Conduit smaller than metric designator 16 (1/2) ~~1/2 in. electrical trade size~~ shall not be used.
345-6 (b) Maximum. Conduit larger than metric designator 103 (4) ~~4 in. electrical trade size~~ shall not be used.
FPN: Metric trade numerical designations for intermediate metal conduit are the same as those found in Extra-heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 981-1989; namely, 16 = 1/2~~1/2 = 16~~, 21 = 3/4~~3/4 = 21~~, 27 = 1~~1 = 27~~, 35 = 1 1/4~~1 1/4 = 35~~, 41 = 1 1/2~~1 1/2 = 41~~, 53 = 2~~2 = 53~~, 63 = 2 1/2~~2 1/2 = 63~~, 78 = 3~~3 = 78~~, 91 = 3 1/2~~3 1/2 = 91~~, and 103 = 4~~4 = 103~~.
345-8 All cut ends of conduits shall be reamed or otherwise finished to remove rough edges. Where conduit is threaded in the field, a standard cutting die with a taper of 1 in 16 (3/4-in. taper per foot)~~(1 in 16)~~ shall be used.
345-12 (a) Securely Fastened. Each intermediate metal conduit shall be securely fastened within 900 mm (3 ft)~~3 ft (914 mm)~~ of each outlet box, junction box, device box, cabinet, conduit body, or other conduit termination. Fastening shall be permitted to be

increased to a distance of 1.5 m (5 ft) ~~(1.52 m)~~where structural members do not readily permit fastening within 900 mm (3 ft)~~3 ft (914 mm)~~. Where approved, conduit shall not be required to be securely fastened within 900 mm (3 ft) ~~(914 mm)~~ of the service head for above-the-roof termination of a mast.

345-12 (b) (1) Conduit shall be supported at intervals not exceeding 3 m (10 ft) ~~(3.05 m)~~.

345-12 (b) (3) Exposed vertical risers from industrial machinery shall be permitted to be supported at intervals not exceeding 6 m (20 ft) ~~(6.1 m)~~, provided the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.

345-12 (b) (4) Horizontal runs of intermediate metal conduit supported by openings through framing members at intervals not exceeding 3 m (10 ft) ~~(3.05 m)~~ and securely fastened within 900 mm (3 ft) ~~914 mm)~~ of termination points shall be permitted.

345-16 (a) Standard Lengths. The standard length of intermediate metal conduit shall be 3.05 m (10 ft) ~~(3.05 m)~~, including an attached coupling, and each end shall be threaded. Longer or shorter lengths with or without coupling and threaded or unthreaded shall be permitted.

345-16 (c) (c) Marking. Each length shall be clearly and durably marked at least every 1.5 m (5 ft) ~~(1.52 m)~~ with the letters IMC. Each length shall be marked as required in the first sentence of Section 110-21.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #2068)

8- 206 - (345-1 (New)): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION:

Add a Scope section to Article 345 to read as follows:

345-1. Scope. The provisions of this article covers the use, installation, and construction specifications requirements of intermediate metal conduit.

Renumber remaining sections.

SUBSTANTIATION: Each Article should have a scope section.

The NEC style manual on style also shows a scope article.

To keep the Articles consistent all Articles should be similar.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 8-204.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3180)

8- 207 - (345-1 (New)): Accept in Principle

SUBMITTER: Tim Andrassy, Steel Tube Inst.

RECOMMENDATION:

Add a new section to read:

Scope. This article covers the use, installation, and construction requirements for Intermediate Metal Conduit (IMC), elbows, couplings and associated fittings.

SUBSTANTIATION: Several articles in the Code contain a section on "Scope" which is helpful in providing an overview of what the article covers or will cover. This new Scope for IMC contains references to elbows, couplings and associated fittings, which are all currently addressed in several sections of Article 345 and are important to the proper use of this product.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 8-204.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2197)

8- 208 - (345-1-Intermetal Metal Conduit): Accept in Principle

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION:

Revise as follows:

Intermediate metal conduit is a listed steel raceway of circular cross section with integral or associated couplings, ~~approved~~ for the installation of electrical conductors and used with listed fittings to provide electrical continuity.

SUBSTANTIATION: A definition in the NEC cannot presuppose acceptance by the authority having jurisdiction (approved). The listing already qualifies intermediate metal conduit for use in accordance with Article 345 of the NEC. See the UL General Information for Electrical Equipment 1999. The NEC Style Manual 2.2.2 states, "Definitions shall not contain requirements or recommendations." Requiring intermediate metal conduit to be approved to comply with the definition is a requirement. This definition should be written similar to other related definitions, for example, see 331-1 first paragraph.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action on Proposal 8-209.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3181)

8- 209 - (345-1-Intermetal Metal Conduit): Accept

Note: The Technical Correlating Committee understands that this action revises the accepted text in 345-2 in Proposal 8-204.

SUBMITTER: Tim Andrassy, Steel Tube Inst.

RECOMMENDATION:

Revise the definition to read:

Intermediate Metal Conduit (IMC) is a steel threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated coupling and appropriate fittings. ~~listed steel raceway of circular cross section with integral or associated couplings, approved for the installation of electrical conductors and used with listed fittings to provide electrical continuity.~~

SUBSTANTIATION: This definition aids in differentiating between wiring methods. Also, if accepted this definition will be proposed for a trinational standard under development. More detailed definitions will be beneficial in encouraging international use of the NEC. Also, steel is the only material to be used for IMC. Proof of equivalency to rigid was required before IMC was accepted.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:
BERMAN: This proposal should be rejected. This definition contains uses permitted, which are covered elsewhere in Article 345. The definition in Proposal 8-204 is preferred.

(Log #1428)

8- 210 - (345-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION:
Delete 345-2 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-204.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3166)

8- 211 - (345-3): Accept in Principle in Part
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Split into Uses Permitted and Uses Not Permitted and number appropriately, as follows:
Uses Permitted: IMC, elbows, couplings and fittings shall be permitted
(a) Exposed and Concealed. For exposed and concealed work, under all
atmospheric conditions and occupancies;
(b) In Concrete and Direct Contact with Soil.
(1) In concrete;
(2) In direct contact with the soil;
(c) Corrosive Environment. In environments subject to severe corrosive influences where
protected by corrosion protection judged suitable for the condition.
FPN: See Section 300-6 for protection against corrosion.
(d) Cinder Fill. In or under cinder fill where subject to permanent moisture
where protected on all sides by a layer of noncinder concrete not less than
2 in. (50.8 mm) thick; where the conduit is not less than 18 in. (457 mm)
under the fill; or where protected by corrosion protection and judged
suitable for the condition.
(e) Equipment Grounding. As an equipment grounding conductor where installed in compliance
with Article 250.
Uses Not Permitted. IMC, elbows, couplings and associated fittings protected solely by enamel shall not be permitted to be used:
(a) Outdoors, including underground;
(b) In locations subject to severe corrosive influences.
FPN: See Section 300-6 for protection against corrosion.
SUBSTANTIATION: To provide a Uses Permitted and Uses Not Permitted Section which is formatted to be more consistent with other Code Articles for usability and clarity.
∑ The information on dissimilar metals which currently appears in 345-3 has been deleted. A separate proposal has been submitted to create a new section on Dissimilar Metals.
∑ The UL listing clearly permits IMC in concrete without supplementary protection. The listing also states that IMC does not generally require supplementary protection in direct contact with soil; the new (c) clarifies that additional protection could be required in severely corrosive locations. The title of this Section was revised from Corrosion Protection to Corrosive Environments as a more appropriate title
∑ In (b), "earth" was changed to "soil" in the heading and text for terminology consistent with the listing information.
PANEL ACTION: Accept in Principle in Part.
Accept in principle by adoption of the wording in proposed 345-10 in Proposal 8-204 with the following modification:
Change the title of proposed section 345-10(b) to "Corrosive Environments."
The proposed section "Uses Not Permitted" is not accepted.
PANEL STATEMENT: The panel's action on Proposal 8-204 satifies the concerns of the submitter, except that the proposed new section "Uses Not Permitted" is not accepted as enamel coated IMC is not produced.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #258)

8- 212 - (345-3(a)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Add the following wording at the end of the third sentence:
"where an application of a listed grounding continuity liquid or compound has been applied to all threaded portions of the intermediate metal conduit raceway".
The last sentence will now read:
"Intermediate metal conduit shall be permitted as an equipment grounding conductor where an application of a listed grounding continuity liquid or compound has been applied to all threaded portions of the intermediate metal conduit raceway."
SUBSTANTIATION: Other than a separate equipment grounding conductor being run with the circuit or feeder conductors, the metallic raceway is the best equipment grounding conductor we have. But just as a separate grounding conductor must be properly terminated or spliced with listed devices, a metallic raceway must be terminated or joined together in an approved manner. The problems of corrosion at threaded joints in metallic raceways has been well-documented. The resulting high resistance connections prevent the installations from being in conformance with the requirements of Section 250-2(d) and the integrity of the ground fault path is severely diminished. The addition of this requirement will be another step toward the accomplishment of the purpose of the code. — "The practical safeguarding of persons and property from hazards arising from the use of electricity."
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not identified that there are any products available that have been evaluated for use with metal raceways and will meet the intent of this proposal. Factory cut threads are protected against corrosion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #413)

8- 213 - (345-3(a), Articles 346, 347, 348-1): Reject
SUBMITTER: Salem L. Wardi, First Choice Electric
RECOMMENDATION:
Add sections to 345-3(a), 346, 347, 348-1 for each pipe run from distribution panel or power panel we should run grounding wire with circuit in the same raceway to meet 250-1 14.
SUBSTANTIATION: For every lighting fixture required to be grounded and equipment ground - if used with romax, MC or AC cable two wires plus the ground to the junction box where there is hot and neutral from the panel - the grounding connectors are leftover in the box.
PANEL ACTION: Reject.
PANEL STATEMENT: There was no specific recommendation made by the submitter. Section 4-3.3(c) of the Regulations Governing Commitee Projects requires proposals to include proposed text, including the words to be added, revised (and how revised), or deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3072)

8- 214 - (345-3(a)): Accept in Principle
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION:
Delete the text regarding dissimilar metals from 345-3(a) and the exception and add a new section to read:
xxx. Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Aluminum fittings and enclosures shall be permitted to be used with steel intermediate metal conduit.
SUBSTANTIATION: The cautionary information on dissimilar metals is more appropriate in a separate section.

PANEL ACTION: Accept in Principle.
In Proposal 8-204 delete the second sentence and exception in 345-10(a) .
Add proposed language to 8-204 as amended: 345-14. Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.
Aluminum fittings and enclosures shall be permitted to be used with ~~steel intermediate metal conduit~~ IMC.
PANEL STATEMENT: The removal of the product name and use of the acronym complies with the style manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3183)

8- 215 - (345-3(a)): Accept in Principle
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION:
Delete the text regarding dissimilar metals from 345-3(a) and the Exception and add a new section to read:
xxx. Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Aluminum fittings and enclosures shall be permitted to be used with steel intermediate metal conduit.
SUBSTANTIATION: A companion proposal to split 345-3 into Uses Permitted and Uses Not Permitted has been submitted. The cautionary information on dissimilar metals is more appropriate in a separate section.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-214.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3073)

8- 216 - (345-6): Accept in Principle
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION:
Revise this section and the FPN to read:
(a) Minimum. IMC ~~Conduit~~ smaller than 1/2 (16) ~~in. electrical trade size~~ shall not be used.
(b) Maximum. IMC ~~Conduit~~ larger than 4 (103) ~~in. electrical trade size~~ shall not be used.
FPN: The Trade Sizes and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-x.
~~FPN: Metric trade numerical designations for intermediate metal conduit are the same as those found in Extra-heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 81-1989; namely, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103.~~
SUBSTANTIATION: To correlate with proposal submitted to CMP 3 to add a table showing English and Metric trade size designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code, which is no longer needed. Metric trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code.
PANEL ACTION: Accept in Principle.
The panel accepts in principle the addition of the new FPN to read as follows:
FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions.
The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of the word "conduit" with the acronym "IMC" and the deletion of "in. electrical trade size" by action on Proposals 8-204 and 8-205.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-204 and 8-205.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #CP803)

8- 216a - (345-7): Accept
Note: The Technical Correlating Committee understands that this action is added to the accepted text in 345-22 in Proposal 8-204.
SUBMITTER: CMP 8
RECOMMENDATION:
Add new second paragraph to 345-7 to read:
"Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9."
SUBSTANTIATION: The proposed language clarifies that cables, where permitted elsewhere in the code, are allowed to be used in a raceway. It also provides clear direction on how to determine raceway fill where cables are installed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #366)

8- 217 - (345-9(a), 346-9(a)): Accept in Principle
Note: The Technical Correlating Committee understands that this action added to the accepted text in 345-42(a) in Proposal 8-204.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION:
Add to (a):
Threadless couplings and connectors shall not be used on threaded conduit ends.
SUBSTANTIATION: I have seen hundreds of such uses of threadless couplings on threaded conduit ends where they were expedient due to labor saving and cost of Erickson type couplings, where conduit installation was difficult due to size and amount of rebar restricted space and impossibility of threading together of conduit bends. A judgment call by the authority having jurisdiction to allow this was based on lack of specific mention in U.L. listing and no data whether this was in violation of Section 250-2(d). A reasonable assumption is that a set-screw or compression type coupling installed on threads provides a questionable compliance with Section 250-2(d). The UL white book doesn't appear to provide any help for enforcement of Section 110-3(b).
PANEL ACTION: Accept in Principle.
Accept the proposal with modification to read:
Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.
PANEL STATEMENT: There are threadless fittings that are listed and the required markings indicate suitablity for use with threaded conduit ends.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3069)

8- 218 - (345-10): Accept
Note: The Technical Correlating Committee understands that this recommendation becomes the last sentence of, and deletes the Exception to, 345-24 of Proposal 8-204.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION:
Revise the last sentence to read as follows and delete the exception:
The radius of the curve of any field bend to the centerline of the conduit ~~of the inner edge of any field bend~~ shall not be less than indicated in Table 346-10.
~~Exception: For field bends for conductors without lead sheath and made with a single operation (one shot) bending machine designed for the purpose, the minimum radius shall not be less than that indicated in table 346-10, Exception.~~
NOTE: This is a companion proposal to one for Section 346-10 and it is intended that the revised Table 346-10 suggested in that proposal would apply.

SUBSTANTIATION: Manufacturers of bending equipment measure to the centerline. This revised text and table clarifies the measurement in accordance with current field practice. The proposal defines that measurements are to the centerline regardless of the bender type. Lead sheath conductors are no longer made, therefore that option has been deleted and the one-shot bender information has been included in the new table.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2869)

8- 219 - (345-11, 346-11): Reject
SUBMITTER: Bruce Mitchell, Thornton, CO
RECOMMENDATION:
Revise text to read as follows:
The cumulative total of all angles formed by bending of the conduit between pull points (e.g. conduit bodies and boxes) shall not exceed 360°.
SUBSTANTIATION: Current language is imprecise and could be interpreted as implying that any bend greater than a quarter (90°) is not allowed.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text adequately explains the requirements for conduit bends. Four quarter bends is used as an example and does not limit the angle of any bend to 90 degrees or less.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4401)

8- 220 - (345-12(b)(2)): Accept
SUBMITTER: Martin J. Brett, Jr., Wheatland Tube Co./Rep. AISI
RECOMMENDATION:
Change section to read:
(2) The distance between supports for straight runs of conduit shall be permitted in accordance with Table 346-12(b)(2), provided the conduit is made up with threaded couplings, and such supports prevent transmission of stresses to termination where conduit is deflected between supports.
SUBSTANTIATION: The current reference to Table 346-12 is incorrect. The correct reference should be to Table 346-12(b)(2).
PANEL ACTION: Accept.
PANEL STATEMENT: This is editorial in nature.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3070)

8- 221 - (345-12(b)(3)): Accept in Part
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION:
Revise Section 345-12(b)(3) as follows:
Exposed vertical risers from stationary equipment or fixtures ~~industrial machinery~~ shall be permitted to be supported at intervals not exceeding 20 ft (6.1 m), provided the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.
SUBSTANTIATION: To correlate with the change to 346-12(b)(3), which was made to the 1999 NEC. IMC is equivalent to rigid conduit, with physical characteristics equal or greater than RMC.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: The panel agrees with the proposed removal of the words "industrial machinery," but does not concur that the permission should apply to stationary equipment and fixtures. See panel action and statement on Proposal 8-222.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
COX: I disagree with the panel statement that the equipment must be fastened to the floor. When this section was originally put in the code, the submitter's intention was to be able to wire heavy equipment that would not move during operation without fastening it to the floor. Whatever term we use for this equipment, we should not require it to be fastened to the floor to meet the provisions of this section.
GRIFFITH: Although I support the idea that the application, in the case of equipment, should be limited to "fixed equipment", no substantiation has been provided to deny the application to "stationary industrial machinery". Countless installations of heavy (stationary) industrial machinery are in existence without any known problems. Section 345-12(b)(3) should read, "Exposed vertical risers from fixed equipment or stationary industrial machinery shall be...".
COMMENT ON AFFIRMATIVE:
BERMAN: Panel Action should have been Accept in Principle in Part, not Accept in Part. The Panel accepted the removal of the words "industrial machinery", but not the addition of "stationary equipment or fixtures". However, the Panel referred to its action and statement on Proposal 8-222, where "fixed equipment" was accepted.
LOYD: The proposal should be accepted. The panel went beyond the submitter's proposal without any substantiation. The submitter only asked that "stationary equipment or fixtures" be added to the types of equipment that could be supported at intervals not exceeding 20 ft (6.1 m), provided the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available. This change was to correlate with the change to 346-12(b)(3), which was made to the 1999 NEC.
IMC is permitted for the same uses as RMC. No substantiation was presented to limit this product's use or to show that any safety problems have occurred because of the change to 346-12(b)(3).

(Log #4208)

8- 222 - (345-12(b)(3)): Accept in Principle
Note: The Technical Correlating Committee understands that this action revises 345-30(b)(3) of Proposal 8-204.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION:
Revise as follows:
Exposed vertical risers from fixed or stationary equipment ~~industrial machinery~~ shall be permitted to be supported at intervals not exceeding 20 ft (6.1 m), provided the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.
SUBSTANTIATION: This is the 1999 change for rigid metal conduit, now to be correlated with Article 345. The actual wording of this proposal corresponds to a companion proposal to limit the allowance to fixed or stationary equipment and not cover fixtures. Please refer to the proposal to Section 346-12(b)(3) for more information.
PANEL ACTION: Accept in Principle.
In the proposed text delete the words "or stationary."
PANEL STATEMENT: Stationary equipment is usually not moved, but fixed equipment is fastened in place. Stationary equipment may be moved, thus possibly damaging fittings and couplings.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
COX: See my Explanation of Negative Vote on Proposal 8-221.
GRIFFITH: See my Explanation of Negative Vote on Proposal 8-221.
COMMENT ON AFFIRMATIVE:
BERMAN: Panel Action should have been Accept in Part, not Accept in Principle. The Panel accepted the removal of the words "industrial machinery" and the addition of "fixed equipment", but not the addition of "stationary equipment".

LOYD: The proposal should be accepted. This change was proposed in order to correlate with the 1999 Code change to the Rigid Metal Conduit section 346-12(b)(3). The words "stationary equipment" appear at least nine times in the code. The submitter did not ask for the deletion of the words "stationary equipment". No substantiation was provided nor were there any problems noted to justify this deletion.
Article 345 covers IMC, which is permitted for the same uses as RMC. No substantiation was provided nor was there any problems noted to justify the deletion of "stationary equipment".

(Log #1068)

8- 223 - (345-15, FPN): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION:
Change "No. 4" to "4 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #278)

8- 224 - (345-16(a)): Reject
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION:
Change to read:
"The standard length of IMC shall be 10 ft (3.05 m). Longer or shorter lengths with or without couplings shall be permitted."
SUBSTANTIATION: Creates language consistent with EMT and RMC.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation is not correct. The standard length is 10 feet (3.05 m) including a coupling.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #283)

8- 225 - (345-16(a)): Reject
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION:
Change to read:
"the standard length of IMC shall be 10 ft (3.05 m). Longer or shorter lengths with or without couplings shall be permitted."
SUBSTANTIATION: Creates language consistent with EMT and RMC.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-224.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3071)

8- 226 - (345-16(b)): Accept
Note: The Technical Correlating Committee understands that this action deletes the last sentence of 345-120 in Proposal 8-204.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION:
Delete this section and renumber as necessary.
~~Corrosion Resistant Material. Nonferrous conduit of corrosion resistant material shall have suitable markings.~~
SUBSTANTIATION: There is no nonferrous IMC. This is a specific product, which is required to be steel rigid to be equivalent to rigid. Only steel has been tested for equivalency. The test standard requires steel.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #277)

8- 227 - (345-16(c)): Accept
Note: The Technical Correlating Committee understands that the revision is to the second sentence of 345-120 of Proposal 8-204.
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION:
Revise the last sentence to read:
"Each length shall be marked as required in Section 110-21."
SUBSTANTIATION: Creates consistent marking language. More than the first sentence applies. Reference to the Section 110-21 in total is proper.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #282)

8- 228 - (345-16(c)): Accept in Principle
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION:
Revise the last sentence to read:
"each length shall be marked as required in Section 110-21."
SUBSTANTIATION: Creates consistent marking language. More than the first sentence applies. Reference to the Section 110-21 in total is proper.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 227.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
BERMAN: Typographical error - Panel Statement should reference Proposal 8-227.

(Log #3055)

8- 229 - (345-17 (New)): Accept
Note: The Technical Correlating Committee understands that the recommendation becomes new text to 345-6 of Proposal 8-204.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION:
Add a new section to read:
Listing Requirements. Intermediate Metal Conduit (IMC), factory elbows and couplings, and associated fittings shall be listed.
SUBSTANTIATION: An individual section is needed to cover this important requirement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3182)

8- 230 - (345-17 (New)): Accept in Principle
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION:
Add a new section to read:
Listing Requirements. Intermediate Metal Conduit (IMC), factory elbows and couplings, and associated fittings shall be listed.

SUBSTANTIATION: This is a companion proposal to 345-1 which revised the definition for IMC and removed the current reference to its listing. An individual Section is needed to cover this important requirement.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-229.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 346 — RIGID METAL CONDUIT: TYPE RMC

(Log #1224)

8- 231 - (346): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION:
Revise Article 346 to read as follows:

Article346—Rigid Metal Conduit: Type RMC

A. General

346-1. Scope. This article covers the use, installation, and construction specifications for Rigid Metal Conduit (RMC) and associated fittings.

346-2. ~~346-1~~. Definition. ~~Rigid metal conduit is a listed~~ Rigid Metal Conduit (RMC). A metal raceway of circular cross section with integral or associated couplings, approved for the installation of electrical conductors and used with ~~listed~~ fittings to provide electrical continuity.

346-3. ~~346-2~~. Other Articles. Installations for RMC ~~rigid metal conduit~~ shall comply with ~~the provisions of the~~ applicable provisions ~~sections~~ of Article 300.

346-6. Listing Requirements. RMC and associated fittings shall be listed.

B. Installation

346-10. ~~346-3~~. Uses Permitted.

(a) All Atmospheric Conditions and Occupancies. Use of RMC ~~rigid metal conduit~~ shall be permitted under all atmospheric conditions and occupancies. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. ~~Rigid metal conduit shall be permitted as an equipment grounding conductor.~~ Ferrous raceways and fittings protected from corrosion solely by enamel shall be permitted only indoors and in occupancies not subject to severe corrosive influences. Aluminum fittings and enclosures shall be permitted to be used with steel RMC ~~rigid metal conduit~~, and steel fittings and enclosures shall be permitted to be used with aluminum RMC ~~rigid metal conduit~~.

(b) Corrosion Protection. ~~Rigid metal conduit~~ RMC, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and judged suitable for the condition.

~~FPN: See Section 300-6 for protection against corrosion.~~

(c) Cinder Fill. ~~Rigid metal conduit~~ RMC shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 2 in. (50.8 mm) thick; where the conduit is not less than 18 in. (457 mm) under the fill; or where protected by corrosion protection and judged suitable for the condition.

~~FPN: See Section 300-6 for protection against corrosion.~~

(d) ~~346-5.~~ Wet Locations. All supports, bolts, straps, screws, etc., shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

FPN: See Section 300-6 for protection against corrosion.

346-20. Size.

(a) Minimum. ~~Rigid metal conduit~~ RMC smaller than 1/2-in. ~~electrical~~ trade size shall not be used.

Exception: For enclosing the leads of motors as permitted in Section 430-145(b).

(b) Maximum. ~~Rigid metal conduit~~ RMC larger than 6-in. ~~electrical~~ trade size shall not be used.

FPN: Metric trade numerical designations for ~~rigid metal conduit~~ RMC are ~~the same as those found in Extra heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 981-1989; namely,~~ 3/8 = 12, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103, 5 = 129, and 6 = 155.

346-22. Number of Conductors ~~in Conduit~~.

The number of conductors or cables ~~in a single conduit~~ shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9~~, using the conduit dimensions of Table 4, Chapter 9~~.

346-24. ~~346-10.~~ Bends — How Made. Bends ~~of rigid metal conduit~~ shall be made so that the conduit will not be damaged and that the internal diameter of the conduit will not be effectively reduced. The radius of the curve of the inner edge of any field bend shall not be less than indicated in Table 346-24 ~~346-10.~~

Table 346-24. ~~346-10.~~ Radius of Conduit Bends

[1999 NEC® Table 346-10. Radius of Conduit Bends here]

Exception: For field bends for conductors without lead sheath and made with a single operation (one shot) bending machine designed for the purpose, the minimum radius shall not be less than that indicated in Table 346-24~~346-10~~, Exception.

Table 346-24. ~~346-10.~~ Exception, Radius of Conduit Bends

[1999 NEC® Table 346-10. Exception, Radius of Conduit Bends here]

346-26. ~~346-11.~~ Bends — Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.

346-28. ~~346-8.~~ Reaming and Threading. All cut ends ~~of conduits~~ shall be reamed or otherwise finished to remove rough edges. Where conduit is threaded in the field, a standard cutting die with a 3/4-in. taper per foot (1 in 16) shall be used.

FPN: See Standards for Pipe Threads, General Purpose (Inch), ANSI/ASME B.1.20.1-1983.

346-30. ~~346-12.~~ Securing and Supporting. ~~Rigid metal conduit~~ RMC shall be installed as a complete system as provided in Article 300 and shall be securely fastened in place and supported in accordance with (a) and (b).

(a) Securely Fastened. ~~Each rigid metal conduit~~ RMC shall be securely fastened within 3 ft (914 mm) of each outlet box, junction box, device box, cabinet, conduit body, or other conduit termination. Fastening shall be permitted to be increased to a distance of 5 ft (1.52 m) where structural members do not readily permit fastening within 3 ft (914 mm). Where approved, conduit shall not be required to be securely fastened within 3 ft (914 mm) of the service head for above-the-roof termination of a mast.

(b) Supports. ~~Rigid metal conduit~~ RMC shall be supported in accordance with one of the following.

(1) Conduit shall be supported at intervals not exceeding 10 ft (3.05 m).

(2) The distance between supports for straight runs of conduit shall be permitted in accordance with Table 346-30(b)(2) ~~346-12(b)(2)~~, provided the conduit is made up with threaded couplings, and such supports prevent transmission of stresses to termination where conduit is deflected between supports.

(3) Exposed vertical risers from stationary equipment or fixtures shall be permitted to be supported at intervals not exceeding 20 ft (6.1 m), provided the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.

(4) Horizontal runs of ~~rigid metal conduit~~ RMC supported by openings through framing members at intervals not exceeding 10 ft (3.05 m) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

Table 346-30(b)(2). ~~346-12(b)(2).~~ Supports for Rigid Metal Conduit

[1999 NEC® Table 346-12(b)(2). Supports for Rigid Metal Conduit here]

346-40. ~~346-13.~~ Boxes and Fittings. ~~See~~ Boxes and fittings shall comply with the applicable provisions of Article 370.

346-42. ~~346-9.~~ Couplings and Connectors.

(a) Threadless. Threadless couplings and connectors used with conduit shall be made tight. Where buried in masonry or concrete, they shall be the concretetight type. Where installed in wet locations, they shall be the raintight type.

(b) Running Threads. Running threads shall not be used on conduit for connection at couplings.

346-46. ~~346-15.~~ Bushings. Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the wire

from abrasion unless the design of the box, fitting, or enclosure is such as to afford equivalent protection.

FPN: See Section 300-4(f) for the protection of conductors sizes No. 4 and larger at bushings.

346-56. ~~346-14.~~ Splices and Taps. Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies.

346-60. Grounding. ~~Rigid metal conduit~~ RMC shall be permitted as an equipment grounding conductor.

C. Construction Specifications.

346-120. ~~346-16(c).~~ Marking. Each length shall be clearly and durably identified in every 10 ft (3.05 m) as required in the first sentence of Section 110-21. ~~346-16(b) Corrosion Resistant Material.~~ Nonferrous conduit of corrosion-resistant material shall have suitable markings.

346-130. ~~346-16(a).~~ Standard Lengths. The standard length of ~~rigid metal conduit~~ RMC shall be 10 ft (3.05 m), including an attached coupling, and each end shall be threaded. Longer or shorter lengths with or without coupling and threaded or unthreaded shall be permitted.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements.

Review of public comments led the Panel to conclude that the proposed Article 344 had not realized its goal of a more user-friendly Code language. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.

The Sub-Task Group was asked to address possibilities such as revising the rejected 1999 proposal based on the public comments, developing one or more articles to address the requirements presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

Explanation of proposed renumbering and editorial changes.

A general change in the rewrite of Article 346 was to add the acronym "RMC" and use it to replace Rigid Metal Conduit throughout the Article. The reason some Sections were moved in their entirety is to provide a uniform format of Section reference across all the circular raceway Articles.

- Title The text "Type" and acronym "RMC" added.

- 346-1
  - (1) New Scope added to conform to the NEC® style manual.

- 346-2
  - (1) Definition relocated from 346-1 to 346-2.
  - (2) "Rigid Metal Conduit" capitalized, as it is a proper name of a product.
  - (3) Acronym "RMC" added .
  - (4) Listing requirements relocated to 346-6.

- 346-3
  - (1) Other Articles relocated from 346-2 to 346-3.
  - (2) Delete product name and replace with acronym "RMC".
  - (3) Text revised for clarity.

- 346-6
  - (1) Relocate existing text to new 346-20.
  - (2) Rename Section "Listing Requirements"
  - (3) Relocate listing requirements for RMC and associated fittings from 346-2.

- 346-10

  (a)
  - (1) Uses Permitted relocated from 346-3 to 346-10.
  - (2) Delete product name and replace with acronym "RMC" (three places).
  - (3) Relocate equipment grounding to 346-60

  (b)
  - (1) Delete product name and replace with acronym "RMC".
  - (2) Delete the FPN reference made redundant by adding new subparagraph (d) that already contains the reference.

  (c)
  - (1) Delete product name and replace with acronym "RMC".
  - (2) Delete the FPN reference made redundant by adding new subparagraph (d) that already contains the reference.

  (d)
  - (1) Subparagraph (d) added for "Wet Locations" relocated from 346-5.

- 346-20 New Section
  - (1) Size relocated from 346-6 to 346-20.
  - (2) Delete product name and replace with acronym "RMC" (three places).
  - (3) Word "electrical" deleted as it added nothing to the clarity of the section.
  - (4) Delete the text reference to the standard from which the metric trade numerical designations were taken.
  - (5) Add trade size 3/8 and associated metric designator 12 as it is recognized in Section 430-145(b).

- 346-22 New Section
  - (1) Number of Conductors relocated from 346-7 to 346-22.
  - (2) Delete Section title text "in Conduit" for uniformity across raceway Articles.
  - (3) Add text "or cables" for clarity.
  - (4) Removed text "in single conduit" because it does not aid usability.
  - (5) Delete the text "using the conduit dimensions of Table 4, Chapter 9", which is not required for understanding and application.

- 346-24 New Section
  - (1) Bends-How Made relocated from 346-10 to 346-24.
  - (2) Delete text "of rigid metal conduit". Not needed for application since Article 346 covers Rigid Metal Conduit.
  - (3) Correct Table reference, from 346-10 to 346-24, caused by relocation of text and renumbering of Section (four places).

- 346-26 New Section
  - (1) Bends-Number in One Run relocated from 346-11 to 346-26.

- 346-28 New Section
  - (1) Relocated from 346-8 to 346-28.
  - (2) Delete text "of conduits" which is not needed for clarity.

- 346-30 New Section

(1) Securing and Supporting relocated from 346-12 to 346-30.
(2) Deleted product name and replaced with acronym "RMC" (four places).

(3) Correct Table reference, from 346-12(b)(2) to 346-30(b)(2), caused by relocation of text and renumbering of Section (two places).

· 346-40 New Section
(1) Boxes and Fittings relocated from 346-13 to 346-40.
(2) Text added for consistency among Articles without a change in requirement or intent.

· 346-42 New Section
(1) Couplings and Connectors relocated from 346-9 to 346-42.

· 346-46 New Section
(1) Bushings relocated from 346-15 to 346-46

· 346-56 New Section
(1) Splices and Taps relocation from 346-14 to 346-56.

· 346-60 New Section
(1) Text relocated from 346-3(a), third sentence.
(2) Deleted product name and replaced with acronym "RMC".

· 346-120 New Section
(1) Marking requirements relocated from 346-16(c) to 346-120.
(2) Text from 346-16(b) relocated to 346-120 and Section title "Corrosion Resistant Material" deleted. Since text reference is to marking it is more appropriate here.

· 346-130 New section
(1) Relocated from 346-16(a) to 346-130.
(2) Deleted product name and replaced with acronym "RMC".

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	Common Numbering System for the Circular Raceway Articles
	Article 3XX, <title>: <acronym>
	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.
3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.
3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete from the proposal: 346-3, 346-40, and the second sentence of 346-56.
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP 8 recommends approval of the scope section by the TCC.
The proposed 346-3, 346-40 and second sentence of 346-56 are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1281)

8- 232 - (346): Accept
Note: The Technical Correlating Committee notes that the revisions to the metric units in this recommendation will be implemented in the rearrangement of Proposal 8-231. The Technical Correlating Committee understands that the FPN in this Proposal is deleted by the action on Proposal 8-244.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
346-3 (c) Cinder Fill. Rigid metal conduit shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 50 mm (2 in.) ~~(50.8 mm)~~ thick; where the conduit is not less than 450 mm (18 in.) ~~(457 mm)~~ under the fill; or where protected by corrosion protection and judged suitable for the condition.
346-6 (a) Minimum. Rigid metal conduit smaller than metric designator 16(1/2) ~~in. electrical trade size~~ shall not be used.
346-6-(b) Maximum. Rigid metal conduit larger than metric designator 155 (6)~~in. electrical trade size~~ shall not be used.
FPN: Metric trade numerical designations for rigid metal conduit are the same as those found in Extra-heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 981-1989; namely, 16 = 1/2~~1/2 = 16~~, 21 = 3/4~~3/4 = 21~~, 27 = 1~~1 = 27~~, 35 = 1 1/4~~1 1/4 = 35~~, 41 = 1 1/2~~1 1/2 = 41~~, 53 = 2~~2 = 53~~, 63 = 2 1/2~~2 1/2 = 63~~, 78 = 3~~3 = 78~~, 91 = 3 1/2~~3 1/2 = 91~~, 103 = 4 ~~4 = 103~~, 129 = 5~~5 = 129~~, and 155 = ~~66 = 155~~. 346-8 All cut ends of conduits shall be reamed or otherwise finished to remove rough edges. Where conduit is threaded in the field, a standard cutting die with a 1 in 16 taper (1-in. taper per foot) ~~(1 in 16)~~ shall be used.

Table 346-10. Radius of Conduit Bends

Metric Designator	Trade Size	Conductors Without Lead Sheath	
		mm	in.
16	1/2	100	4
21	3/4	125	5
27	1	150	6
35	1 1/4	200	8
41	1 1/2	250	10
53	2	300	12
63	2 1/2	375	15
78	3	450	18
91	3 1/2	525	21
103	4	600	24
129	5	750	30
155	6	900	36

Table 346-10. Exception, Radius of Conduit Bends

Metric Designator	Trade Size	Radius to Center of Conduit	
		mm	in.
16	1/2	100	4
21	3/4	110	4 1/2
27	1	140	5 3/4
35	1 1/4	180	7 1/4
41	1 1/2	200	8 1/4
53	2	240	9 1/2
63	2 1/2	265	10 1/2
78	3	330	13
91	3 1/2	380	15
103	4	400	16
129	5	610	24
155	6	760	30

346-12 (a) Securely Fastened. Each rigid metal conduit shall be securely fastened within 900 mm (3 ft) ~~(914 mm)~~ of each outlet box, junction box, device box, cabinet, conduit body, or other conduit termination. Fastening shall be permitted to be increased to a distance of 1.5 m (5 ft) ~~(1.52 m)~~ where structural members do not readily permit fastening within 900 mm (3 ft) ~~(914 mm)~~. Where approved, conduit shall not be required to be securely fastened within 900 mm (3 ft) ~~(914 mm)~~ of the service head for above-the-roof termination of a mast.

346-12 (b) (1) Conduit shall be supported at intervals not exceeding 3 m (10 ft) ~~(3.05 m)~~.

346-12 (b) (3) Exposed vertical risers from stationary equipment or fixtures shall be permitted to be supported at intervals not exceeding 6 m (20 ft) ~~(6.1 m)~~, provided the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.

346-12 (b) (4) Horizontal runs of rigid metal conduit supported by openings through framing members at intervals not exceeding 3 m (10 ft) ~~(3.05 m)~~ and securely fastened within 900 mm (3 ft) ~~(914 mm)~~ of termination points shall be permitted.

346-16 (a) Standard Lengths. The standard length of rigid metal conduit shall be 3.05 m (10 ft) ~~(3.05 m)~~, including an attached coupling, and each end shall be threaded. Longer or shorter lengths with or without coupling and threaded or unthreaded shall be permitted.

346-16 (c) Marking. Each length shall be clearly and durably identified in every 3 m (10 ft) ~~(3.05 m)~~ as required in the first sentence of Section 110-21.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.

In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #2070)

8- 233 - (346-1 (New)): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add a Scope section to Article 346 to read as follows:

346-1. Scope. The provisions of this article covers the use, installation, and construction specifications requirements of rigid metal conduit.

Renumber remaining sections.

SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.

Table 346-12(b)(2). Supports for Rigid Metal Conduit

Metric Designator	Trade Size	Maximum Distance Between Rigid Metal Conduit Supports	
		m	ft
16 – 21	1/2 – 3/4	3.0	10
27	1	3.7	12
35 – 41	1 1/4 - 1 1/2	4.3	14
53 – 63	2 – 2 1/2	4.9	16
78 and larger	3 and larger	6.1	20

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-231.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3184)

8- 234 - (346-1 (New)): Accept in Principle
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Add a new section to read:
Scope. This article covers the use, installation, and construction requirements for Rigid Metal Conduit (RMC), elbows, couplings, and associated fittings.
SUBSTANTIATION: Several articles in the Code contain a section on "Scope", which is helpful in providing an overview of what the article covers or will cover. This new Scope for RMC includes references to elbows, couplings and associated fittings, which are all currently addressed in several sections of Article 346 and are important to the proper use of this product.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-231.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3185)

8- 235 - (346-1): Accept
Note: The Technical Correlating Committee understands that this action revises the text of 346-2 accepted in Proposal 8-231.
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise the definition to read:
Rigid Metal Conduit (RMC) is a threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated coupling and appropriate fittings. RMC is generally made of steel (ferrous) with protective coatings or aluminum (nonferrous). Special use types are silicone bronze and stainless steel. ~~listed metal raceway of circular cross section with integral or associated couplings, approved for the installation of electrical conductors and used with listed fittings to provide electrical continuity.~~
SUBSTANTIATION: This definition aids in differentiating between wiring methods. Also, if accepted this definition will be proposed for a tri-national standard under development. More complete definitions will be beneficial in encouraging international use of the NEC. There are a lot of questions in the field regarding what articles cover aluminum and other specialized conduits. There is also confusion over the terms "ferrous" and "nonferrous". This provides clarity.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
BERMAN: This proposal should be rejected. This definition contains uses permitted and construction requirements, which are covered elsewhere in Article 346. The definition in Proposal 8-231 is preferred.

(Log #4209)

8- 236 - (346-1, Exception (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add an exception as follows:
Exception: Rigid metal conduit made from stainless steel or from nonferrous metals other than aluminum shall be permitted to be approved.
SUBSTANTIATION: This exception will prove useful on swimming pools for brass conduit, since as of our last survey of listees under the DYWV category the listed material is no longer available. It will also prove to be useful in specialized industrial occupancies where stainless steel and other special alloys are used, also without listing because such relatively small quantities aren't practical to have listed. Although listing is certainly an option that the authority having jurisdiction could fall back on, in many jurisdictions this will prove too expensive and cumbersome for the limited cases where this allowance is needed. Listing would be a nice feature if it were practical in all cases, but in these limited instances it doesn't appear to be so. I certainly think that this section shouldn't be the engine that effectively drives brass conduit out of Article 680 applications, for example.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel maintains its position that all RMC be listed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2198)

8- 237 - (346-1-Rigid Metal Conduit): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Rigid metal conduit is a listed metal raceway of circular cross section with integral or associated couplings, ~~approved~~ for the installation of electrical conductors and used with listed fittings to provide electrical continuity.
SUBSTANTIATION: A definition in the NEC cannot presuppose acceptance by the authority having jurisdiction (approved). The listing already qualifies intermediate metal conduit for use in accordance with Article 346 of the NEC. See the UL General Information for Electrical Equipment 1999. The NEC Style Manual 2.2.2 states, "Definitions shall not contain requirements or recommendations." Requiring intermediate metal conduit to be approved to comply with the definition is a requirement. This definition should be written similar to other related definitions, for example, see 331-1 first paragraph.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-235.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1429)

8- 238 - (346-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 346-2 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-231.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3168)

8- 239 - (346-3): Accept in Principle in Part
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Split into Uses Permitted and Uses Not Permitted and number appropriately, as follows:
Uses Permitted: RMC, elbows, couplings and fittings shall be permitted
(a) Exposed and Concealed. For exposed and concealed work, under all atmospheric conditions and occupancies;

(b) In Concrete and Direct Contact with Soil.
(1) In concrete;
(2) In direct contact with the soil;
Exception: Aluminum RMC in concrete or in direct contact with soil is required to be provided with supplemental protection.
(c) Corrosive Environment. In environments subject to severe corrosive
influences where protected by corrosion protection judged suitable for the
condition.
FPN: See Section 300-6 for protection against corrosion.
(d) Cinder Fill. In or under cinder fill where subject to permanent moisture
where protected on all sides by a layer of noncinder concrete not less than
2 in. (50.8 mm) thick; where the conduit is not less than 18 in. (457 mm)
under the fill; or where protected by corrosion protection and judged
suitable for the condition.
(e) Equipment Grounding. As an equipment grounding conductor where installed in compliance with Article 250.
Uses Not Permitted. RMC, elbows, couplings and associated fittings protected solely by enamel shall not be permitted to be used:
(a) Outdoors, including underground;
(b) In locations subject to severe corrosive influences.
FPN: See Section 300-6 for protection against corrosion.
SUBSTANTIATION: To provide a Uses Permitted and Uses Not Permitted Section which is formatted to be more consistent with other Code Articles for usability and clarity.
The information on dissimilar metals which currently appears in 346-3 has been deleted. A separate proposal has been submitted to create a new section on Dissimilar Metals.
The UL listing clearly permits RMC in concrete without supplementary protection. The listing also states that RMC does not generally require supplementary protection in direct contact with soil; the new (c) clarifies that additional protection could be required in severely corrosive locations. The title of this Section was revised from Corrosion Protection to Corrosive Environments as a more appropriate title.
The aluminum exception is consistent with the listing information. In (b), "earth" was changed to "soil" in the heading and text for terminology consistent with the listing information.
PANEL ACTION: Accept in Principle in Part.
Accept in principle by adoption of the wording in proposed 346-10 in Proposal 8-231 with the following modification:
Change the title of proposed section 346-10(b) to "Corrosive Environments."
The proposed section "Uses Not Permitted" is not accepted.
PANEL STATEMENT: The panel's action on Proposal 8-231 satisfies the concerns of the submitter, except that the proposed new section "Uses Not Permitted" is not accepted as enamel coated RMC is no longer produced.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #259)

8- 240 - (346-3(a)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Add the following wording at the end of the third sentence:
"where an application of a listed grounding continuity liquid or compound has been applied to all threaded portions of the intermediate metal conduit raceway".
The third sentence will now read:
"Rigid metal conduit shall be permitted as an equipment grounding conductor where an application of a listed grounding continuity liquid or compound has been applied to all threaded portions of the intermediate metal conduit raceway."
SUBSTANTIATION: Other than a separate equipment grounding conductor being run with the circuit or feeder conductors, the metallic raceway may be the best equipment grounding conductor we have. But just as a separate grounding conductor must be properly terminated or spliced with listed devices, a metallic raceway must be terminated or joined together in an approved manner. The problems of corrosion as recognized in Section 300-6 and the problem of couplings and locknuts not being set up tight enough to carry fault currents at threaded joints in metallic raceways has been well documented. This is not a problem of poor installation by our labor forces or poor inspection by code enforcement personnel. This is a problem inherent to threaded connections. The resulting high resistance connections prevent the installations from being in conformance with the requirements of Section 250-2(d) and the integrity of the ground fault path is severely diminished. The addition of this requirement will be another step toward the accomplishment of the purpose of the code — "The practical safeguarding of persons and property from hazards arising from the use of electricity." We might take a tip from the plumbing or other pipe trades that realize the extent to which threads can be made up and apply sealing compounds or other means to prevent leaks. We can also look to Section 501-4(a)(1) where at least five threads are required to cool the vapors we recognize can escape through the threads.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-212.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2069)

8- 241 - (346-3(a)): Accept in Principle
Note: The Technical Correlating Committee understands that this action is to be incorporated in the revised 346-10(a) of Proposal 8-231.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Revise section 346-3 second paragraph to read as follows:
346-3. Uses Permitted.
(a) All Atmospheric Conditions and Occupancies. Use of rigid metal conduit shall be permitted under all atmospheric conditions and occupancies. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Rigid metal conduit shall be permitted as an equipment grounding conductor. Ferrous raceways and fittings protected from corrosion solely by enamel shall be permitted only indoors and in occupancies not subject to severe corrosive influences.
Aluminum fittings and enclosures shall be permitted to be used with steel rigid metal conduit, and steel fittings and enclosures shall be permitted to be used with aluminum rigid metal conduit <u>where not subject to corrosive influences</u>.
SUBSTANTIATION: Aluminum fitting will corrode in corrosive areas and clarification is needed in the code.
This paragraph implies that corrosion protection is not required due to the location of the paragraph.
The ALUMINUM must also protected. Listed copper free aluminum fittings and enclosures will also have severe corrosion when located near the salt oceans of the world.
I have inspected industrial plants around the world and found that within 3 months corrosion to the aluminum enclosures and fittings start to become severe.
The code needs to address this concern.
PANEL ACTION: Accept in Principle.
Revise the last sentence of the proposal to read:
Aluminum fittings and enclosures shall be permitted to be used with steel rigid metal conduit, and steel fittings and enclosures shall be permitted to be used with aluminum rigid metal conduit <u>where not subject to severe corrosive influences.</u>
PANEL STATEMENT: The environments described in the substantiation are ones that present severe corrosive influences.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3187)

8- 242 - (346-3(a)): Accept
Note: The Technical Correlating Committee directs the Panel to clarify the action on this Proposal and correlate the Proposal with the action on Proposal 8-231. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Tim Andrassy, Steel Tube Inst.

RECOMMENDATION: Delete the two sentences regarding dissimilar metals from 346-3(a) and combine them into a new Section to read:

xxx. Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Aluminum fittings and enclosures shall be permitted to be used with steel rigid metal conduit, and steel fittings and enclosures shall be permitted to be used with aluminum rigid conduit.

SUBSTANTIATION: A companion proposal to split 346-3 into Uses Permitted and Uses Not Permitted has been submitted. The cautionary information on dissimilar metals is more appropriate in a separate section.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #3737)

8- 243 - (346-4 (New)): Reject

SUBMITTER: Wayne A. Lilly, Bridgewater, VA

RECOMMENDATION: Add a new Section 346-x to read as follows:

346-x. Uses Not Permitted. Nonferrous rigid metal conduit shall not be used as specified in (a) through (c) below.

(a) Nonferrous rigid metal conduit shall not be used as a mast to support conductors unless listed for the purpose.

(b) Nonferrous rigid metal conduit shall not be used in direct contact with the earth, installed within 18 in. (457 mm) of the earth, installed in concrete, or in areas subject to severe corrosive influences unless protected against corrosion in accordance with Section 300-6(b) and (c).

(c) Nonferrous rigid metal conduit shall not be used where subject to physical damage.

SUBSTANTIATION: Article 346 applies to all rigid metal conduits. This includes nonferrous metal conduit, such as aluminum RMC. The current provisions in Article 346 do not restrict the use of nonferrous rigid metal conduits for such uses as masts, earth burial, concrete encasement, and where subject to physical damage. This proposal seeks to exclude the use of nonferrous rigid metal conduit for purposes for which it is not suited. For example, aluminum RMC is not suitable for use as a mast, where in direct contact with the earth, etc. The inclusion of a provision for listing for the purpose is intended to allow nonferrous rigid metal conduit which is suitable to be utilized.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter does not provide substantiation to place the proposed restrictions on all nonferrous conduits.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #3075)

8- 244 - (346-6): Accept in Principle in Part

SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)

RECOMMENDATION: Revise this section and the FPN to read:

(a) Minimum. RMC ~~Rigid metal conduit~~ smaller than 1/2 (16) ~~1/2 in. electrical trade size~~ shall not be used.

Exception: For enclosing the leads of motors as permitted in Section 430-145(b).

(b) Maximum. RMC ~~Rigid metal conduit~~ larger than 6 (155) ~~in. electrical trade size~~ shall not be used.

FPN: The Trade Sizes and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-x.

~~FPN: Metric trade numerical designations for rigid metal conduit are the same as those found in Extra-heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 81 1989; namely, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103, 5 = 129, and 6 = 155.~~

SUBSTANTIATION: To correlate with proposal submitted to CMP 3 to add a table showing English and Metric trade size designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code, which is no longer needed. Metric trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code.

PANEL ACTION: Accept in Principle in Part.

The panel accepts in principle the addition of the new FPN to read as follows:

FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions.

The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of the words "rigid metal conduit" with the acronym "RMC" and the deletion of "in. electrical trade size" by action on Proposals 8-231 and 8-232.

PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-231 and 8-232.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #CP804)

8- 244a - (346-7): Accept

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-231. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 8

RECOMMENDATION: Add new second paragraph to 346-7 to read:

"Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9."

SUBSTANTIATION: The proposed language clarifies that cables, where permitted elsewhere in the code, are allowed to be used in a raceway. It also provides clear direction on how to determine raceway fill where cables are installed.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #3074)

8- 245 - (346-10): Accept in Principle

Note: The Technical Correlating Committee understands that the Panel action replaces the text and table of 346-24, including the Exception, accepted in Proposal 8-231.

SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)

RECOMMENDATION: Delete Table 346-10 and the exception in 346-10. Replace it with the existing Table 346-10, Exception and rename it Table 346-10, so it is no longer an exception, as shown below.

346-10. Bends—How Made. Bends of rigid metal conduit shall be made so that the conduit will not be damaged and that the internal diameter of the conduit will not be effectively reduced. ~~The radius of the curve of the inner edge of any field shall not be less than indicated in Table 346-10.~~

~~Table 346-10. Radius of Conduit Bends~~

~~Size of Conduit (in.)~~	~~Conductors Without Lead Sheath (in.)~~
~~1/2~~	~~4~~
~~3/4~~	~~5~~
~~1~~	~~6~~
~~1 1/4~~	~~8~~
~~1 1/2~~	~~10~~
~~2~~	~~12~~
~~2 1/2~~	~~15~~
~~3~~	~~18~~
~~3 1/2~~	~~21~~
~~4~~	~~24~~
~~5~~	~~30~~

~~6~~	~~36~~

~~Note: For SI units, 1 in. = 25.4 mm (radius).~~

~~Exception: For field bends for conductors without lead sheath and made with a single operation (one shot) bending machine designed for the purpose, the minimum radius shall not be less than that indicated in Table 346-10, Exception.~~

Table 346-10. Minimum Radius of Bends to Centerline of Conduit ~~Exception,~~ ~~Radius of Conduit Bends.~~

Trade Size of Conduit English/Metric		One Shot and Full Shoe Benders ~~Conductors Without Lead Sheath~~ (in.)	Other Benders (in.)
1/2	16	4	4
3/4	21	4 1/2	5
1	27	5 3/4	6
1 1/4	35	7 1/4	8
1 1/2	41	8 1/4	10
2	53	9 1/2	12
2 1/2	63	10 1/2	15
3	78	13	18
3 1/2	91	15	21
4	103	16	24
5	129	24	30
6	155	30	36

Note: For SI units, 1 in. = 25.4 mm (applies to radius columns only).

SUBSTANTIATION: Manufacturers of bending equipment measure to the centerline. This revised text and table clarifies the measurement in accordance with current field practice. The proposal defines that measurements are to the centerline regardless of the bender type. Lead sheath conductors are no longer made, therefore that option has been deleted and the one-shot bender information has been included in the new table.
PANEL ACTION: Accept in Principle.
Revise the wording in 346-10 to read as follows:
346-10. Bends-How Made. Bends of rigid metal conduit shall be made so that the conduit will not be damaged and that the internal diameter of the conduit will not be effectively reduced. The radius of the curve of any field bend to the centerline of the conduit shall not be less than indicated in Table 346-10.
Replace existing Table 346-10 and its exception and Table 346-10 exception, with the submitter's Table 346-10 as revised..
Change the title of the second column of the proposed Table 346-10 to read: "Bends Made by One Shot and Full Shoe Benders."
Replace the word "Benders" with "Bends" in the third column of proposed Table 346-10.
PANEL STATEMENT: 346-10 is revised to change the way the radius of the bend is measured. Measuring to the centerline of the conduit is in keeping with the accepted industry standard.
The title of the second column on the proposed Table 346-10 is changed to "Bends Made by One Shot and Full Shoe Benders" as the Table is applicable to bends and the revised heading agrees with the changes made to the proposed third column.
The word "Benders" is replaced with the word "Bends" in the third column so the column is applicable to bends made by other than one shot and full shoe benders. Bends made in ENT, RNC, FMC, and LFNC are examples of bends that would be made by means other than one shot and full shoe benders.
Staff is advised that action taken here will affect the proposed 346-10 and Tables 346-10 and 346-10 Exception, in Proposal 8-232. The metric equivalents for the values given in the second column of the proposed Table 346-10 can be found in Table 346-10, Exception of Proposal 8-232. The metric equivalents for the values given in the third column of the proposed Table 346-10 can be found in Table 346-10 of Proposal 8-232.
Staff is further advised that the cross reference in the Panel Statement on Proposal 8-232 is still applicable and can be used to cross reference the changes brought about by this Proposal (Proposal 8-245.)
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4446)

8- 246 - (346-11): Reject
SUBMITTER: Frants Marvin Jensen, Consolidated Engr Labs
RECOMMENDATION: Add new last sentence:
There shall not be more than 270 degrees of bend in conduit runs containing conductors over 600V. Also, consideration of Section 300-34 shall be taken into account.
SUBSTANTIATION: With the newer insulations, HV conductors are getting larger. This would reduce the pulling stress.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate technical substantiation to reduce the total degees of bends due to increased conductor sizes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #345)

8- 247 - (346-12(a), Exception (New)): Reject
SUBMITTER: Jeffrey Rettig, Umatilla, OR
RECOMMENDATION: Add an exception stating:
Rigid metal conduit less than 36 in., connected between 2 boxes, each support per 370-23, does not need to be fastened.
SUBSTANTIATION: Problem resolved: Unnecessary supports.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The support requirements for raceways are independent of the support requirements in Article 370 for boxes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #395)

8- 248 - (346-12(b)(3)): Reject
SUBMITTER: Michael A. Cuellar, Billings, MT
RECOMMENDATION: Section 346-12, subpart (b)3 suggests that a vertical fixture riser of 20 ft or less needs no support. Then changes it's mind and states you need supports at the top and bottom.
SUBSTANTIATION: This definition is not really clear and quite confusing.
PANEL ACTION: Reject.
PANEL STATEMENT: There was no specific recommendation made by the submitter. Section 4-3.3(c) of the Regulations Governing Commitee Projects requires proposals to include proposed text, including the words to be added, revised (and how revised), or deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4210)

8- 249 - (346-12(b)(3)): Accept in Principle
Note: The Technical Correlating Committee understands that the accepted text revises the text accepted in 346-30(b)(3) of Proposal 8-231.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Exposed vertical risers from fixed or stationary equipment ~~or fixtures~~ shall be permitted to be supported at intervals not exceeding 20 ft (6.1 m), provided the conduit is made up with threaded couplings, is firmly supported at the top and bottom of the riser, and no other means of intermediate support is readily available.
SUBSTANTIATION: The only legitimate use of this provision is for heavy utilization equipment unlikely to be shifted easily or frequently, and thereby threaten the integrity of the conduit drop. The Panel correctly broadened the rule from just industrial equipment, but the wording needs a little more work.
PANEL ACTION: Accept in Principle.
In the proposed text delete the words "or stationary."
PANEL STATEMENT: Stationary equipment is usually not moved, but fixed equipment is fastened in place. Stationary equipment may be moved, thus possibly damaging fittings and couplings. In accordance with the Article 100 defintion of equipment, fixtures are included.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:

AFFIRMATIVE: 10
NEGATIVE: 3
NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:
COX: See my Explanation of Negative Vote on Proposal 8-221.
GRIFFITH: Although I support the idea that the application, in the case of equipment, should be limited to "fixed equipment", no substantiation has been provided to deny the application to "stationary industrial machinery". Countless installations of heavy (stationary) industrial machinery are in existence without any known problems. Section 345-12(b)(3) should read, "Exposed vertical risers from fixed equipment or stationary industrial machinery shall be ...".
LOYD: The proposal should be rejected. The submitter has not provided a single instance of a problem of any kind with the present language. The submitter did not ask for the deletion of the words "stationary equipment" which appears nine times in the present code. No substantiation was provided nor was there any problems noted to justify the deletion of "stationary equipment or fixtures". The word "fixture" is a better word than "fixed" for describing the types of equipment i.e., desks, cash register stations, counters etc. intended for the application addressed by the change. However "fixed" is acceptable Webster defined "fixture" as follows:
fixture is; Something securely fixed in place. Something attached as a permanent appendage, apparatus, or appliance: plumbing fixtures. a. The act or process of fixing. b. The condition of being fixed.

(Log #1282)

8- 250 - (Table 346-12(c)): Reject
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add new section (c) to 346-12 as follows:
(c) Expansion Fittings. Expansion fittings for rigid metallic conduit shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 346-12(c), is expected to be 6.36 mm (1/4 in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.
SUBSTANTIATION: The change is a result of facilitating the practical application of the numeric value in SI units and is a companion proposal to section 300-7(b)(FPN) where no table was provided in the 1999 NEC for steel conduit expansion characteristics.
Also, this proposed revision is intended to comply with NFPA 1M Manual of Style Section 4.1 with the respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following. This action is a result of the NEC Technical Correlating Committee Task Group on Metrication. This soft conversion is determined as follows:

1. Temperature differential for 1°C is 1.8°F calculation:

Calculation of Temperature Differential:

	Result °F for	°C	
°F	32	0	°C
°F	33.8	1	°C
°F differential	1.8	1	°C differential

2. Expansion factor conversion to SI:

Parameter	Value
Steel (inch-lbs)	6.500E-06 in per in per °F given in NEC99
Steel (SI)	1.170E-05 mm per mm per °C calculated

Since the dimension is a per unit value for either the inch-pound or SI factors (i.e., inch per inch and mm per mm) and the temperature is the varying value, the inch-pound factor is converted by multiplying by the 1.8 degree Fahrenheit per 1 degree Centigrade differential to obtain the SI equivalent.

PANEL ACTION: Reject.
PANEL STATEMENT: Although the panel concurs with the metrication concept, the addition of this proposed text and accompanying table does more than add metric values. There is no technical substantiation to require the proposed text. The expansion characteristics of RMC and common building materials are similar. Section 300-7(b) adequately covers the requirements for expansion fittings.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1069)

8- 251 - (346-15, FPN): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 4" to "4 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

Table 346-12(c) Expansion Characteristics of Rigid Steel Conduit Coefficient of Thermal Expansion = 1.17 x 10^{-5} mm per mm per °C (0.65 x 10^{-5} in. per in. per °F

Temperature Change (°C)	Length Change of Steel Conduit (mm per m)	Temperature Change (°F)	Length Change of Steel Conduit (in. per 100 ft.)	Temperature Change °F)	Length Change of Steel Conduit (in. per 100 ft)
5	0.06	5	0.04	105	0.82
10	0.12	10	0.08	110	0.86
15	0.18	15	0.12	115	0.90
20	0.23	20	0.16	120	0.94
25	0.29	25	0.20	125	0.98
30	0.35	30	0.23	130	1.01
35	0.41	35	0.27	135	1.05
40	0.47	40	0.31	140	1.09
45	0.53	45	0.35	145	1.13
50	0.59	50	0.39	150	1.17
55	0.64	55	0.43	155	1.21
60	0.70	60	0.47	160	1.25
65	0.76	65	0.51	165	1.29
70	0.82	70	0.55	170	1.33
75	0.88	75	0.59	175	1.37
80	0.94	80	0.62	180	1.40
85	0.99	85	0.66	185	1.44
90	1.05	90	0.70	190	1.48
95	1.11	95	0.74	195	1.52
100	1.17	100	0.78	200	1.56

(Log #274)

8- 252 - (346-16(c)): Reject
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION: Change to read:
"Each length shall be marked in accordance with Section 110-21."
SUBSTANTIATION: Creates consistent marking language. More than the first sentence applies. Reference to the Section 110-21 in total is proper.
PANEL ACTION: Reject.
PANEL STATEMENT: The current wording of this section requires marking of this product every 10 feet. The proposed text would eliminate this requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3056)

8- 253 - (346-17 (New)): Accept
Note: The Technical Correlating Committee directs the panel to clarify the action on this Proposal considering the Panel Action to add a new 346-6 in Proposal 8-231. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add a new section to read:
Listing Requirements. Rigid Metal Conduit (RMC), factory elbows and couplings, and associated fittings shall be listed.
SUBSTANTIATION: This is a companion proposal to 346-1 which revised the definition for RMC and removed the current reference to its listing. An individual section is needed to cover this important requirement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3186)

8- 254 - (346-17 (New)): Accept in Principle
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Add a new section to read:
Listing Requirements: Rigid Metal Conduit (RMC), factory elbows and couplings, and associated fittings shall be listed.
SUBSTANTIATION: This is a companion proposal to 346-1 which revised the definition for RMC and removed the current reference to its listing. An individual Section is needed to cover this important requirement.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concern has been adequately addressed by the panel's action on Proposal 8-253.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 347 — RIGID NONMETALLIC CONDUIT: TYPE RNC

(Log #1225)

8- 255 - (347): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Article 347 to read as follows:
Article 347 – Rigid Nonmetallic Conduit: Type RNC

A. General

347-1. Scope. This article covers the use, installation, and construction specifications for Rigid Nonmetallic Conduit (RNC) and associated fittings.

347-2. Definition. Rigid Nonmetallic Conduit (RNC). A nonmetallic raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors.

~~347-4.~~ 347-3. Other Articles. Installation of RNC ~~rigid nonmetallic conduit~~ shall comply with ~~the~~ applicable provisions of Article 300. ~~Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the conduit. Exception No. 1: As permitted in Section 250-134(b), Exception No. 2, for dc circuits and Section 250-134(b), Exception No. 1, for separately run equipment grounding conductors. Exception No. 2: Where the grounded conductor is used to ground equipment as permitted in Section 250-142.~~

347-6. Listing Requirements. RNC and associated fittings shall be listed.

~~A.~~ B. Installation
~~347-2.~~ 347-10. Uses Permitted. The use of RNC ~~listed rigid nonmetallic conduit~~ shall be permitted under the following conditions.
FPN: Extreme cold may cause some nonmetallic conduits to become brittle and therefore more susceptible to damage from physical contact.

(a) Concealed. In walls, floors, and ceilings.
(b) Corrosive Influences. In locations subject to severe corrosive influences as covered in Section 300-6 and where subject to chemicals for which the materials are specifically approved.
(c) Cinders. In cinder fill.
(d) Wet Locations. In portions of dairies, laundries, canneries, or other wet locations and in locations where walls are frequently washed, the entire conduit system including boxes and fittings used therewith shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws, etc., shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.
(e) Dry and Damp Locations. In dry and damp locations not prohibited by Section ~~347-3~~ 347-12.
(f) Exposed. For exposed work where not subject to physical damage if identified for such use.
(g) Underground Installations. For underground installations, see Sections 300-5 and 300-50. Conduits listed for the purpose shall be permitted to be installed underground in continuous lengths from a reel.
(h) Support of Conduit Bodies. Rigid nonmetallic conduit shall be permitted to support nonmetallic conduit bodies not larger than the largest trade size of an entering raceway. The conduit bodies shall not contain devices or support fixtures or other equipment.

~~347-3.~~ 347-12. Uses Not Permitted. ~~Rigid nonmetallic conduit~~ RNC shall not be used in the following locations.
(a) Hazardous (Classified) Locations.
(1) In hazardous (classified) locations, except as ~~covered~~ permitted in Sections 503-3(a), 504-20, 514-8, and 515-5
(2) In Class I, Division 2 locations, except as permitted in Section 501-4(b), Exception
(b) Support of Fixtures. For the support of fixtures or other equipment not described in Section ~~347-2(h)~~ 347-10(h).
(c) Physical Damage. Where subject to physical damage unless identified for such use.
(d) Ambient Temperatures. Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.
(e) Insulation Temperature Limitations. For conductors whose insulation temperature limitations would exceed those for which the conduit is listed.
(f) Theaters and Similar Locations. In theaters and similar locations, except as provided in Articles 518 and 520.

~~347-10.~~ 347-20. Size.
(a) Minimum. RNC ~~Rigid nonmetallic conduit~~ smaller than 1/2-in. ~~electrical~~ trade size shall not be used.

(b) Maximum. RNC ~~Rigid nonmetallic conduit~~ larger than 6-in. ~~electrical~~ trade size shall not be used.

FPN: Metric trade numerical designations for RNC ~~rigid nonmetallic conduit~~ are 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103, 5 = 129, and 6 = 155.

~~347-11.~~ 347-22. Number of Conductors. The number of conductors or cables ~~permitted in a single conduit~~ shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

~~347-13.~~ 347-24. Bends — How Made. Bends ~~of rigid nonmetallic conduit~~ shall be made so that the conduit will not be damaged and that the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose, and the radius of the curve of the inner edge of such bends shall not be less than shown in Table ~~346-10~~ 346-24.

~~347-14.~~ 347-26. Bends — Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.

~~347-5.~~ 347-28. Trimming. All cut ends shall be trimmed inside and outside to remove rough edges.

~~347-8.~~ 347-30. Securing and Supporting. RNC ~~Rigid nonmetallic conduit~~ shall be installed as a complete system as provided in Section 300-18 and shall be fastened so that movement from thermal expansion or contraction will be permitted. RNC ~~Rigid nonmetallic conduit~~ shall be securely fastened and supported in accordance with (a) and (b).

(a) Securely Fastened. ~~Each rigid nonmetallic conduit~~ RNC shall be securely fastened within 3 ft (914 mm) of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 3 ft (914 mm) shall be permitted to be installed in accordance with the listing.

(b) Supports. RNC ~~Rigid nonmetallic conduit~~ shall be supported as required in Table ~~347-8~~ 347-30. Conduit listed for support at spacings other than as shown in Table ~~347-8~~ 347-30 shall be permitted to be installed in accordance with the listing. Horizontal runs of RNC ~~rigid nonmetallic conduit~~ supported by openings through framing members at intervals not exceeding those in Table ~~347-8~~ 347-30 and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

Table ~~347-8.~~ 347-30. Support of Rigid Nonmetallic Conduit (RNC)

[*****1999 NEC Table 347-8 here*****]

~~347-15.~~ 347-40. Boxes and Fittings. ~~Rigid nonmetallic conduit shall be used only with listed fittings.~~ Boxes and fittings shall comply with the applicable provisions of Article 370.

~~347-9.~~ 347-44. Expansion Fittings. Expansion fittings for RNC ~~rigid nonmetallic conduit~~ shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Tables ~~347-9~~ 347-44(A) and (B), is expected to be 1/4-in. (6.36 mm) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.

Table ~~347-9(A).~~ 347-44(A). Expansion Characteristics of PVC Rigid Nonmetallic Conduit Coefficient of Thermal Expansion = 3.38 X 10^{-5} in./in./°F

[*****1999 NEC Table 347-9(A) here*****]

Table ~~347-9(B).~~ 347-44(B). Expansion Characteristics of Fiberglass Reinforced Conduit (Rigid Nonmetallic Conduit) Coefficient of Thermal Expansion = 1.5 X 10^{-5} in./in./°F.

[*****1999 NEC Table and 347-9(B) here*****]

~~347-12.~~ 347-46. Bushings. Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.
FPN: See Section 300-4(f) for the protection of conductors No. 4 and larger at bushings.

~~347-6.~~ 347-48. Joints. All joints between lengths of conduit, and between conduit and couplings, fittings, and boxes, shall be made by an approved method.

~~347-16.~~ 347-56. Splices and Taps. Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies.

347-60. Grounding. Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the conduit.
Exception No. 1: As permitted in Section 250-134(b), Exception No. 2, for dc circuits and Section 250-134(b), Exception No. 1, for separately run equipment grounding conductors.
Exception No. 2: Where the grounded conductor is used to ground equipment as permitted in Section 250-142.

~~B.~~ C. Construction Specifications
~~347-17. General.~~ 347-100. Construction. ~~Rigid nonmetallic conduit shall comply with the following.~~

~~347-1. Description. This article shall apply to a type of conduit~~ RNC and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use aboveground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. ~~Conduits listed for the purpose shall be permitted to be installed underground in continuous lengths from a reel.~~ Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

~~347-17.~~ 347-120. Marking. Each length of RNC ~~nonmetallic conduit~~ shall be clearly and durably marked at least every 10 ft (3.05 m) as required in the first sentence of Section 110-21. The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use above ground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.
FPN: Examples of these optional markings include but are not limited to "LS" for limited-smoke and markings such as "sunlight resistant."

SUBSTANTIATION:
The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements.

Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.

The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30

covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

Explanation of renumbering and editorial changes:

Title Acronym "RNC" added.

(Part) A. General
347-1 Scope: New section added to conform to NEC Style Manual.
347-2 Definition: New section added to conform to NEC Style Manual.
347-3 Other Articles: Equipment grounding requirements relocated to new 347-60.
347-6 Listing Requirements: New section relocating existing requirements from 347-2 and 347-15.

(Part) B. Installation
347-10 Uses Permitted: Relocated from 347-2; Reference updated in 347-10(e); 347-10(g) includes text relocated from 347-1.
347-12 Uses Not Permitted: Relocated from 347-3; Reference updated in 347-12(b). Text "covered" changed to"permitted" for clarity.
347-20 Size: Relocated from 347-10; Editorially revised.
347-22 Number of Conductors: Relocated from 347-11; Editorially revised.
347-24 Bends – How Made: Relocated from 347-13; Reference updated;
Editorially revised.
347-26 Bends – Number in One Run: Relocated from 347-14.
347-28 Trimming: Relocated from 347-5.
347-30 Securing and Supporting: Relocated from 347-8; References updated.
Table 347-30
Table – Support of Rigid Nonmetallic Conduit: Relocated from
Table 347-8.
347-40 Boxes and Fittings: Relocated from 347-15; Listing requirement
relocated to 347-6.
347-44 Expansion Fittings: Relocated from 347-9; References updated.

Table 347-44(A)
Table 347-44(A) – Expansion Characteristics of PVC: Relocated from
Table 347-9(A).

Table 347-44(B)
Table347-44(B) – Expansion Characteristics of Fiberglass: Relocated
from T347-9(B).

347-46 Bushings: Relocated from 347-12.
347-48 Joints: Relocated from 347-6.
347-56 Splices and Taps: Relocated from 347-16.
347-60 Grounding: New section relocating existing requirements from.

(Part) C. Construction Specifications
347-100 Construction: New section relocating existing requirements from
347-1 and 347-17; Editorially revised.
347-120 Marking: Relocated from 347-17.

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	Common Numbering System for the Circular Raceway Articles
	Article 3XX, <title>: <acronym>

	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.
3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.
3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete from the proposal: 347-3, 347-40, and the second sentence of 347-56.
In proposed 347-6 add: ", factory elbows," after "RNC"
In proposed 347-22 delete the words "or cables."
In 347-44 amend the text to read "Table 347 -44(A) or (B).
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 347-3, 347-40 and second sentence of Proposal 347-56

are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.

The addition of the term "factory elbows" is to harmonize this requirement with the proposed revision to other articles.
There was no technical substantiation provided to add the words "or cables" as part of the rewrite of 347-22.
The change in 347-44 clarifies that the use of both tables is not intended.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1283)

8- 256 - (347): Accept in Part
Note: The Technical Correlating Committee directs the panel to clarify the action on this Proposal and specifically state what the proper title for the table should be and to correlate that action with Proposal 8-266. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
347-3 (d) Ambient Temperatures. Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.
347-8 (a) Securely Fastened. Each rigid nonmetallic conduit shall be securely fastened within 900 mm (3 ft) ~~(914 mm)~~ of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 900 mm (3 ft) ~~(914 mm)~~ shall be permitted to be installed in accordance with the listing.
(b) Supports. Rigid nonmetallic conduit shall be supported as required in Table 347-8. Conduit listed for support at spacings other than as shown in Table 347-8 shall be permitted to be installed in accordance with the listing. Horizontal runs of rigid nonmetallic conduit supported by openings through framing members at intervals not exceeding those in Table 347-8 and securely fastened within 900 mm (3 ft) ~~(914 mm)~~ of termination points shall be permitted.
Table 347-9 (a) Expansion fittings for rigid nonmetallic conduit shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Tables 347-9(A) and (B), is expected to be 6 mm (1/4 in.) ~~(6.36 mm)~~ or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.
~~Table 347-9(A). Expansion Characteristics of PVC Rigid Nonmetallic Conduit Coefficient of Thermal Expansion = 3.38 x 10-5 in./in./°F~~
Table 347-9(B). Expansion Characteristics of Fiberglass Reinforced Conduit (Rigid Nonmetallic Conduit) Coefficient of Thermal Expansion = 1.5 x 10-5 in./in./°F
347-10 (a) Minimum. Rigid nonmetallic conduit smaller than metric designator 16 (1/2) ~~in. electrical trade size~~ shall not be used.
347-10 (b) Maximum. Rigid nonmetallic conduit larger than metric designator 155 (6) ~~in. electrical trade size~~ shall not be used.
FPN: Metric trade numerical designations for rigid nonmetallic conduit are 16 = 1/2 ~~= 16~~, 21 = 3/4 ~~= 21~~, 27 = 1 ~~= 27~~, 35 = 1fl ~~= 35~~, 41 = 1 1/2 ~~= 41~~, 53 = 2 ~~= 53~~, 63 = 2 1/2 ~~= 63~~, 78 = 3 ~~= 78~~, 91 = 3 1/2 = ~~91~~, 103 = 4 ~~= 103~~, 129 = 5 ~~= 129~~, and 155 = 6 ~~= 155~~.

347-17
Rigid nonmetallic conduit shall comply with the following.
Marking. Each length of nonmetallic conduit shall be clearly and durably marked at least every 3 m (10 ft) ~~(3.05 m)~~ as required in the first sentence of Section 110-21. The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use above ground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.
FPN: Examples of these optional markings include but are not limited to "LS" for limited-smoke and markings such as "sunlight resistant."
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.
In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.
In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept in Part.
Accept proposed text except the deletion of the title "Table 347-9(A)."
PANEL STATEMENT: The panel action is editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #2071)

8- 257 - (347-1): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a Scope section to Article 347 to read as follows:
347-1. Scope. The provisions of this article covers the use, installation, and construction specifications requirements of rigid nonmetallic conduit.
Renumber remaining sections.
SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-255.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

Table 347-8. Support of Rigid Nonmetallic Conduit

Metric Designator	Trade Size	Maximum Spacing Between Supports	
		m	ft.
16 – 27	1/2 - 1	.9	3
35 – 53	1 1/4 - 2	1.5	5
63 – 78	2 1/2 - 3	1.8	6
91 – 129	3 1/2 - 5	2.1	7
155	6	2.4	8

(Log #2225)

8- 258 - (347-1): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
DOLLINS: See Ganatra's Explanation of Negative Vote on Proposal 6-3.

(Log #838)

8- 259 - (347-2(h)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise last sentence:
"The conduit bodies shall not contain devices other than splicing devices, or support fixtures or other equipment."
SUBSTANTIATION: Edit. Clarification of intent. It does not appear the intent is to preclude splicing devices, which are literally included in the term "devices".
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the term devices in this section is clearly intended to apply to wiring devices. Conduit bodies that are listed for the purpose may contain splices that are made in accordance with Section 110-14.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2935)

8- 260 - (347-3(a)(1)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: At the end of this section delete "and". Add 501-4(b), 514-8, 515-5, and 501-4(b)
SUBSTANTIATION: This proposal adds, Class I, Division 2 wiring to uses not permitted exception. This proposal is also being submitted to CMP 14.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 501-4(b) does not currently permit this wiring method.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4013)

8- 260a - (347-3(c)): Reject
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: The proposal is to revise part (c) to read as follows:
Section 347-3(c) Physical Damage. Where subject to physical damage, unless Schedule 80 rigid nonmetallic conduit.
SUBSTANTIATION: There is always confusion when it comes to the installation of nonmetallic conduit. Most people do not realize exactly what this means "unless identified for such use". The only way one can know what is "identified for such use" is to carry the UL white book around. By removing the phrase "unless identified for such use" and placing "unless Schedule 80 rigid nonmetallic conduit" after the text "Where subject to physical damage", this code section would effectively eliminate any chance of inappropriate use of the product.
This type of specific reference to the use of Schedule 80 is made in Section 300-5(d) and Section 336-6(b). These articles specifically refer to Schedule 80 rigid nonmetallic conduit as an alternate wiring method in areas subject to physical damage. This was also done so as to prevent the misuse of Schedule 40 rigid nonmetallic conduit.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation to limit rigid nonmetallic conduit to Schedule 80 where subject to physical damage.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4211)

8- 261 - (347-3(g) (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add an additional subsection as follows:
(g) Where run from floor to floor in buildings more than 70 ft (21.3 m) above mean grade, unless encased in not less than 2 in. (50.8 mm) of concrete or concealed behind a thermal barrier as described in Section 331-3(2) and Section 331-3(5).
SUBSTANTIATION: This proposal removes a technical inconsistency in the Code, since rigid nonmetallic conduit constructed of polyvinyl chloride is the identical material as used in Electrical Nonmetallic Tubing (ENT). ENT, with a lower volume of nonmetallic material per comparable unit length, now has a more severe restriction.
In the prior cycle, CMP 8 suggested a comparison with surface nonmetallic raceway, which must run exposed, and which is also made of polyvinyl chloride. That comparison no longer applies because surface nonmetallic raceway doesn't run vertically in chases up high-rise buildings, to which this proposal now restricts itself, unlike the one in the prior cycle.
PANEL ACTION: Reject.
PANEL STATEMENT: Rigid nonmetallic conduit has been recognized for use in buildings without regard to height since 1971 and has a demonstrated record of safe use. A "technical inconsistency" is not adequate justification to accept the proposed restriction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1430)

8- 262 - (347-4): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete the first sentence which reads "Installation of rigid nonmetallic conduit shall comply with the applicable provisions of Article 300."
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-255.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2968)

8- 263 - (Table 347-8): Reject
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise Table as follows:

Table 347-8. Support of Rigid Nonmetallic Conduit

Conduit Size (in.)	Maximum Spacing Between Supports (ft)
1/2 - 1	3
1 1/4 - 2	5
2 1/2 - 3	6
3 1/2 - 5	7
6 - 8	8

SUBSTANTIATION: This proposal is a companion proposal to Table 347-10(b) Size.
If the proposal for adding 8 in. rigid nonmetallic conduit to Section 347-10(b) is accepted this proposal will address the maximum spacing between supports.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-271.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
KENDALL: See my explanation of negative comment on Proposal 8-271.

(Log #630)

8- 264 - (347-9): Reject
SUBMITTER: Larry T. Smith, Nat'l Electrical Seminars
RECOMMENDATION: Revise 347-9 to read as follows:
Expansion fittings for rigid nonmetallic conduit shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Tables 347-9(A) and (B), is expected to be 1/4 in. (6.36 mm) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations. Expansion joints shall not be required for direct buried rigid nonmetallic conduit. Expansion joints shall not be required for concrete encased rigid nonmetallic conduit unless the concrete itself has an expansion joint.
(FPN No. 1): With direct buried rigid nonmetallic conduit expansion joints are not needed because the ground has a relatively constant temperature.
(FPN No. 2): The movement of concrete encased rigid nonmetallic conduit will coincide with the expansion and contraction of the concrete. The only place where an expansion joint would be necessary is where the concrete itself has an expansion joint.
SUBSTANTIATION: The installation of expansion fittings on direct buried rigid nonmetallic conduit was discussed in detail at the Western Section IAEI meeting in Bismarck, SD last year. It is also a topic discussed in almost every code seminar that I present -- evidence of the confusion. One of my clients, a large user of rigid nonmetallic conduit, had been in good faith mistakenly installing expansion fittings on direct buried runs. I am also getting reports from seminar participants that some well meaning electrical inspectors, in various parts of the country, are requiring the installation of expansion joints in underground installations of rigid nonmetallic conduit. We need to clear the confusion.
The following paragraphs are in the document "Expansion Joints for PVC Rigid Nonmetallic Conduit" prepared by the NEMA Polymer Raceway Products (5TC) Technical Committee:
In normal circumstances, expansion joints are not needed with concrete encased nonmetallic conduit since the movement of the conduit will coincide with the expansion and contraction of the concrete. The only place where an expansion joint would be utilized is where the concrete itself has an expansion joint.
In direct burial situations, expansion joints are not needed because the ground has relatively constant temperatures. In cold areas, buried lines must be below the frost line to prevent buckling during freezing and thawing cycles. In warmer areas, the depth of cover protects against temperature extremes.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a more complex issue than the proposal addresses. The proposal does not sufficiently clarify where it is not required to install expansion fittings in underground conduit installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4212)

8- 265 - (347-9): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise follows:
Expansion fittings for rigid nonmetallic conduit shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Tables 347-9(A) and (B), ~~is expected to be 1/4 in. (6.36 mm) or greater in a straight run between~~ will exceed 1/8 in. (3.18 mm) at securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.
SUBSTANTIATION: The NEC version sets the 1/4-inch dimension as the only value. As such it is unsafe because if a conduit is rigidly secured at a wall, the entire 1/4-inch of movement will be reflected at the box, and that degree of movement will take the mounting feet right off a PVC FS box, and it will force concentric knockouts right out of an enclosure.
The hidden essence of the 1/4-inch rule is the "straight run" provision between conduit terminations. If you take a straight run and cause the conduit to expand 1/4 inch, the result at each end will be 1/8 inch worth of movement at each end, which most mounting means can accommodate, albeit barely so. This wording addresses cases where the conduit emerges from concrete or otherwise cannot move at one end. Now if you heat the same length of conduit to the same degree, the full 1/4 inch appears at one end. That's almost a guaranteed failure. The only way to cover all cases is to focus on each conduit termination. If it will tend to move no more than 1/8 inch, then its okay without the expansion fitting; otherwise the fitting should be there.
PANEL ACTION: Reject.
PANEL STATEMENT: The current language of this section adequately conveys the requirement. In addition, there is not sufficient technical substantiation to remove the straight run phrase in the requirement. The "straight run" concept is important to the application of this requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: I believe the submitter is correct in his substantiation and clear in his proposed language. This proposal should be accepted by the panel.

(Log #1284)

8- 266 - (Table 347-9(a)): Accept

Note: The Technical Correlating Committee directs the Panel to correlate the Panel Action with Proposal 8-256. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION:

Table 347-9(A) Expansion Characteristics of PVC Rigid Nonmetallic Conduit Coefficient of Thermal Expansion = 6.084 x 10^{-5} mm per mm per °C (3.38 x 10^{-5} in. per in per °F)

Temperature Change (°C)	Length Change of PVC Conduit (mm per m)	Temperature Change (°F)	Length Change of PVC Conduit (in. per 100 ft)	Temperature Change (°F)	Length Change of PVC Conduit (in. per 100 ft)
5	0.30	5	0.20	105	4.26
10	0.61	10	0.41	110	4.46
15	0.91	15	0.61	115	4.66
20	1.22	20	0.81	120	4.87
25	1.52	25	1.01	125	5.07
30	1.83	30	1.22	130	5.27
35	2.13	35	1.42	135	5.48
40	2.43	40	1.62	140	5.68
45	2.74	45	1.83	145	5.88
50	3.04	50	2.03	150	6.08
55	3.35	55	2.23	155	6.29
60	3.65	60	2.43	160	6.49
65	3.95	65	2.64	165	6.69
70	4.26	70	2.84	170	6.90
75	4.56	75	3.04	175	7.10
80	4.87	80	3.24	180	7.30
85	5.17	85	3.45	185	7.50
90	5.48	90	3.65	190	7.71
95	5.78	95	3.85	195	7.91
100	6.08	100	4.06	200	8.11

SUBSTANTIATION: The change is to facilitate practical application of the numeric value in SI units. This proposed revision is intended to comply with NFPA 1M Manual of Style Section 4.1 with the respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following. This action is a result of the NEC Technical Correlating Committee Task Group on Metrication. This soft conversion is determined as follows:

1. Temperature differential for 1°C is 1.8°F calculation:

Calculation of Temperature Differential:

Result °F for		°C	
°F	32	0	°C
°F	33.8	1	°C
°F differential	1.8	1	°C differential

2. Expansion factor conversion to SI:

NEC99	Parameter	Value	Converted Value
	PVC(Inch-lbs)	3.380E-05 in per in per °F	6.084E-05 mm per mm per °C

Since the dimension is a per unit value for either the inch-pound or SI factors (i.e., inch per inch and mm per mm) and the temperature is the varying value, the inch-pound factor is converted by multiplying by the 1.8 degree Fahrenheit per 1 degree Centigrade differential to obtain the SI equivalent.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #646)

8- 267 - (Table 347-9(a) Note (New)): Accept

Note: The Technical Correlating Committee understands that the recommendation is to become a note to Table 347-44(A) of Proposal 8-255.

SUBMITTER: Larry T. Smith, Nat'l Electrical Seminars
RECOMMENDATION: New text to read as follows:

Note: Add 30°F to the estimated temperature range when conduit is installed in direct sunlight to allow for radiant heating.

SUBSTANTIATION: Information concerning expansion joints for PVD Rigid Nonmetallic Conduit has been published by the NEMA Polymer Raceway Products (5TC) PVC Technical Committee. The following statement regarding Rigid Nonmetallic Conduit installed in direct sunlight is on page two of the publication:

Conduit installed outdoors in direct sunlight will be considerably hotter than air temperature during the day because of the absorption of the sun's heat. Expansion joints should be installed to allow for the anticipated temperature change. For direct sunlight exposure, add 30°F to ambient temperature change.

Very few installers that I talk to are aware of the need to compensate for direct sunlight exposure. A note at the bottom of Table 347-9(a) will alert Code users to add 30°F for direct sunlight exposure. I am generating a companion proposal for Table 347-9(b).

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:

LILLY: The substantiation for this proposal is for outdoor installations only. The proposed note would be applicable to all installations "in direct sunlight." This means indoor installations in direct sunlight would be required to have 30°F added to the estimated temperature change. There are many indoor installations where direct sunlight exposure occurs through skylights and other glazing. For indoor installations that do not have heat or air-conditioning, consideration of an increase in the temperature change due to direct sunlight exposure might be justified. However, if the indoor installation is in a controlled environment, where heating and air-conditioning are provided, an increase is not warranted. In these controlled environments, a temperature change of 10°F might be expected. Adding 30°F to this results in a total temperature change of 40°F. Table 347-9(A) lists a length change of 1.6 inches per 100 feet for a temperature change of 40°F. A total length of 15.625 feet would require an expansion fitting.

The substantiation did not provide information on how much direct sunlight exposure is needed before adding 30°F to the total temperature change is required. Is a fifteen-minute exposure required? Perhaps a 2-hour exposure is needed. There are many installations where the direct sunlight exposure is limited by items such as adjacent buildings. The proposed wording of the note would require the addition of 30°F for those installations with even a single minute of direct sunlight exposure.

I agree that consideration should be given to the impact direct sunlight might have on the overall temperature change of PVC RNC. However, the proposed wording would require an addition of 30°F to installations where it is not necessary to do so. This proposal should be rejected. The submitter can provide a comment that would offer language to address these issues.

(Log #1285)

8- 268 - (Table 347-9(b)): Accept in Principle

Note: The Technical Correlating Committee understands that the Panel Action replaces Table 347-44(B) of Proposal 8-255.

SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 347-9(B) as shown below.

Table 347-9(B) Expansion Characteristics of Fiberglass Reinforced Conduit (Rigid Nonmetallic Conduit) Coefficient of Thermal Expansion = 2.7 x 10^{-5} mm per mm per °C (1.5 x 10^{-5} in. per in. per °F)

Temperature Change (°C)	Length Change of FRE Conduit (mm per m)	Temperature Change (°F)	Length Change of FRE Conduit (in. per 100 ft)	Temperature Change (°F)	Length Change of FRE Conduit (in. per 100 ft)
5	0.14	5	0.09	105	1.89
10	0.27	10	0.18	110	1.98
15	0.41	15	0.27	115	2.07
20	0.54	20	0.36	120	2.16
25	0.68	25	0.45	125	2.25
30	0.81	30	0.54	130	2.34
35	0.95	35	0.63	135	2.43
40	1.08	40	0.72	140	2.52
45	1.22	45	0.81	145	2.61
50	1.35	50	0.90	150	2.70
55	1.49	55	0.99	155	2.79
60	1.62	60	1.08	160	2.88
65	1.76	65	1.17	165	2.97
70	1.89	70	1.26	170	3.06
75	2.03	75	1.35	175	3.15
80	2.16	80	1.44	180	3.24
85	2.30	85	1.53	185	3.33
90	2.43	90	1.62	190	3.42
95	2.57	95	1.71	195	3.51
100	2.70	100	1.80	200	3.60

SUBSTANTIATION: The change is to facilitate practical application of the numeric value in SI units. This proposed revision is intended to comply with NFPA 1M Manual of Style Section 4.1 with the respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following. This action is a result of the NEC Technical Correlating Committee Task Group on Metrication. This soft conversion is determined as follows:

1. Temperature differential for 1 °C is 1.8 °F calculation:

Calculation of Temperature Differential:

Result °F for		°C	
°F	32	0	°C
°F	33.8	1	°C
°F differential	1.8	1	°C differential

2. Expansion factor conversion to SI:

Parameter	Value
FRE(inch-lbs)	1.500E-05 in per in per °F given in NEC99
FRE(SI)	2.700E-05 mm per mm per °C calculated

PANEL ACTION: Accept in Principle.
In the title change: "Fiberglass Reinforced Conduit," to "Reinforced Thermosetting Resin Conduit (RTRC)"
In the table replace "FRE" with "RTRC"
PANEL STATEMENT: Changes adequately reflect the industry terminology for the product.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #647)

8- 269 - (Table 347-9(b) Note (New)): Accept
Note: The Technical Correlating Committee understands that the revision becomes a note to Table 347-44(B) of Proposal 8-255.
SUBMITTER: Larry T. Smith, Nat'l Electrical Seminars
RECOMMENDATION: New text to read as follows:
Note: Add 30°F to the estimated temperature range when conduit is installed in direct sunlight to allow for radiant heating.
SUBSTANTIATION: Information concerning expansion joints for PVD Rigid Nonmetallic Conduit has been published by the NEMA Polymer Raceway Products (5TC) PVC Technical Committee. The following statement regarding Rigid Nonmetallic Conduit installed in direct sunlight is on the page two of the publication:
Conduit installed outdoors in direct sunlight will be considerably hotter than air temperature during the day because of the absorption of the sun's heat. Expansion joints should be installed to allow for the anticipated temperature change. For direct sunlight exposure, add 30°F to ambient temperature change.
Very few installers that I talk to are aware of the need to compensate for direct sunlight exposure. A note at the bottom of Table 347-9(b) will alert Code users to add 30°F for direct sunlight exposure.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LILLY: The substantiation for this proposal is for outdoor installations only. The proposed note would be applicable to all installations "in direct sunlight". This means indoor installations in direct sunlight would be required to have 30°F added to the estimated temperature change. There are many indoor installations where direct sunlight exposure occurs through skylights and other glazing. For indoor installations that do not have heat or air conditioning, consideration of an increase in the temperature change due to direct sunlight exposure might be justified. However, if the indoor installation is in a controlled environment, where heating and air-conditioning are provided, an increase is not warranted.
The substantiation did not provide information on how much direct sunlight exposure is needed before adding 30°F to the total temperature change is required. Is a fifteen-minute exposure required? Perhaps a two hour exposure is needed. There are many installations where the direct sunlight exposure is limited by items such as adjacent buildings. The proposed wording of the note would require the addition of 30°F for those installations with even a single minute of direct sunlight exposure.
I agree that consideration should be given to the impact direct sunlight might have on the overall temperature change of Fiberglass Reinforced Conduit RNC. However, the proposed wording would require an addition of 30°F to installations where it is not necessary to do so. This proposal should be rejected. The submitter can provide a comment that would offer language to address these issues.

(Log #3039)

8- 270 - (347-10): Accept in Principle in Part
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise this section and the FPN to read:
(a) Minimum. RNC ~~Rigid nonmetallic conduit~~ smaller than 1/2 (16) ~~in. electrical trade size~~ shall not be used.
(b) Maximum. RNC ~~Rigid nonmetallic conduit~~ larger than 6 (155) ~~in. electrical trade size~~ shall not be used.
FPN: The Trade Sizes and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-1(c).
~~FPN: Metric trade numerical designations for rigid nonmetallic conduit are 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103, 5 = 129, and 6 = 155.~~
SUBSTANTIATION: To correlate with proposal submitted by NEMA to CMP 3 to add a table showing current trade sizes and metric designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code which is no longer needed. Metric designators for trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code.
PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the addition of the new FPN to read as follows:
"FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions".
The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of the words "rigid nonmetallic conduit" with the acronym "RNC" and the deletion of "in. electrical trade size" by action on Proposals 8-255 and 8-256.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-255 and 8-256.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2967)

8- 271 - (347-10(b)): Reject
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
347.10. Size.
(a) Minimum. Rigid nonmetallic conduit smaller than 1/2-in. electrical trade size shall not be used.
(b) Maximum. Rigid nonmetallic conduit larger than ~~6 in~~ 8 in. electrical trade size shall not be used.
FPN: Metric trade numerical designations for rigid nonmetallic conduit are 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103, 5 = 129, ~~and~~ 6 = 155 and 8 = 200.

SUBSTANTIATION: Industry has requested a listed 8 in. rigid nonmetallic conduit for use with electrical conductors and can be inspected to the NEC. Nonlisted 8 in. rigid nonmetallic conduit is currently being manufactured and used by the utility companies. NEMA Standard TC-2 has adopted a 8 in. conduit into their standard. Once added to the NEC, UL 651 will be revised to add the 8 in. size and allow conduits to be listed.

This proposal is a companion proposal to Table 347-8.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation offered is insufficient to warrant an increase in the maximum permitted size of RNC to 8 inches.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 1

NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:

KENDALL: 8 in. conduit has been used by the utilities for years with satisfactory results. Sometimes utilities will need to cross property that requires inspection to the NEC, and a listed product would ease the inspection process. Once the NEC requires 8 in. conduit to be listed, a listing agency can determine the physical requirements.

(Log #1070)

8- 272 - (347-12, FPN): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change "No. 4" to "4 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #3076)

8- 273 - (347-13): Accept

Note: The Technical Correlating Committee understands that the action replaces the second sentence of 347-24 of Proposal 8-255.

SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)

RECOMMENDATION: Revise the second sentence to read:

Field bends shall be made only with bending equipment identified for the purpose~~. , and the~~ The radius of the curve to the centerline ~~of the inner edge~~ of such bends shall not be less than shown in Table 346-10, column "Other Bends."

NOTE: This is a companion proposal to revise Table 346-10.

SUBSTANTIATION: This text clarifies that measurements are to be made to the centerline and provides radii consistent with other conduits.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #2187)

8- 274 - (347-16, FPN (New)): Reject

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

Splices and taps shall be made in accordance with Section 300-15. ~~See Article 370 for rules on the installation and use of boxes and conduit bodies.~~

FPN: See Article 370 for rules on the installation and use of boxes and conduit bodies.

SUBSTANTIATION: This deleted sentence is an explanatory reference to another NEC rule; therefore, it should be a fine print note. The NEC Style Manual 4.1 states, "Explanatory references shall be in fine print notes."

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 8-255

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #2825)

8- 275 - (347-17, FPN): Accept in Principle

Note: The Technical Correlating Committee understands that the action replaces the FPN of 347-120 accepted in Proposal 8-255.

SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products

RECOMMENDATION: Revise the FPN to 347-17 as follows:

FPN: Examples of these markings include but are not limited to markings suitable for limited smoke, sunlight resistant, etc. ~~"LS" for limited smoke and markings such as "sunlight resistant."~~

SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).

Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.

Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.

The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.

PANEL ACTION: Accept in Principle.

Revise the Fine Print Note to read:

"Examples of these markings include but are not limited to 'limited smoke' and 'sunlight resistant'."

PANEL STATEMENT: The revised wording adequately expresses the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

ARTICLE 348 — ELECTRICAL METALLIC TUBING: TYPE EMT

(Log #1226)

8- 276 - (348): Accept in Principle

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-289a. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Article 348 to read as follows:

Article 348 Electrical Metallic Tubing: Type EMT

A. General

348-1. Scope. This article covers the use, installation, and construction specifications for Electrical Metallic Tubing (EMT) and associated fittings.

348-2. ~~348-1.~~ Definition. Electrical Metallic Tubing (EMT). ~~Electrical metallic tubing is a listed~~ A metallic ~~tubing~~ raceway of circular cross section approved for the installation of electrical conductors when joined together with ~~listed~~ fittings.

348-3. ~~348-2.~~ Other Articles. Installations of ~~electrical metallic tubing~~ EMT shall comply with ~~the~~ applicable provisions of Article 300.

348-6. Listing Requirements. EMT and associated fittings shall be listed.

B. Installation

348-10. ~~348-4.~~ Uses Permitted.

(a) Exposed and Concealed. The use of ~~listed electrical metallic tubing~~ EMT shall be permitted for both exposed and concealed work.

(b) Corrosion Protection. Ferrous or nonferrous EMT ~~electrical metallic tubing~~, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and judged suitable for the condition.

~~(FPN): See Section 300-6 for protection against corrosion.~~

(c) ~~348-6.~~ Wet Locations. All supports, bolts, straps, screws, etc., shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.
(FPN): See Section 300-6 for protection against corrosion.

348-12. ~~348-5.~~ Uses Not Permitted. EMT ~~Electrical metallic tubing~~ shall not be used
(1) Where, during installation or afterward, it will be subject to severe physical damage.
(2) Where protected from corrosion solely by enamel.
(3) In cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 2 in. (50.8 mm) thick or unless the tubing is at least 18 in. (457 mm) under the fill.
(4) In any hazardous (classified) location except as permitted by Sections 502-4, 503-3, and 504-20.
(5) For the support of fixtures or other equipment except conduit bodies no larger than the largest trade size of the tubing. ~~Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.~~
(6) Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.
Exception: Aluminum fittings and enclosures shall be permitted to be used with steel EMT ~~electrical metallic tubing~~.

348-14. Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.
Exception: Aluminum fittings and enclosures shall be permitted to be used with steel EMT.

348-20. ~~348-7.~~ Size.

(a) Minimum. EMT ~~Tubing~~ smaller than 1/2-in. ~~electrical~~ trade size shall not be used.

Exception: For enclosing the leads of motors as permitted in Section 430-145(b).

(b) Maximum. The maximum size of EMT ~~tubing~~ shall be the 4-in. ~~electrical~~ trade size.

(FPN): Metric trade numerical designations for EMT ~~electrical metallic tubing~~ are ~~the same as those found in Extra heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 981-1989, namely,~~ 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103.

348-22. ~~348-8.~~ Number of Conductors ~~in Tubing.~~ The number of conductors or cables ~~permitted in a single tubing~~ shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

348-24. ~~348-11.~~ Bends -- How Made.

Bends ~~in the tubing~~ shall be made so that the tubing will not be damaged and the internal diameter of the tubing will not be effectively reduced. The radius of the curve of the inner edge of any field bend shall not be less than shown in Table ~~346-10~~ 346-24.

Exception: For field bends made with a bending machine designed for the purpose, the minimum radius shall not be less than indicated in Table ~~346-10~~ 346-24 Exception.

348-26. ~~348-12.~~ Bends -- Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.

348-28. ~~348-9.~~ Reaming and Threading. EMT ~~electrical metallic tubing~~ shall not be threaded. Where integral couplings are utilized, such couplings shall be permitted to be factory threaded.

All cut ends of EMT ~~electrical metallic tubing~~ shall be reamed or otherwise finished to remove rough edges.

348-30. ~~348-12. Supports.~~ Securing and Supporting. EMT ~~electrical metallic tubing~~ shall be installed as a complete system as provided in Article 300 and shall be securely fastened in place and supported in accordance with (a) and (b).

(a) Securely Fastened. ~~Each tubing length~~ EMT shall be securely fastened in place at least every 10 feet (3.05 m). In addition, ~~each tube~~ EMT shall be securely fastened within 3 ft (914 mm) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing terminations.

Exception No. 1: Fastening of unbroken lengths shall be permitted to be increased to a distance of 5 ft (1.52 m) where structural members do not readily permit fastening within 3 ft (914 mm).

Exception No. 2: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of EMT ~~electrical metallic tubing~~ shall be permitted to be fished.

(b) Supports. Horizontal runs of EMT ~~electrical metallic tubing~~ supported by openings through framing members at intervals not greater than 10 ft (3.05 m) and securely fastened within 3 ft (914 mm) of termination points shall be permitted.

348-40. ~~348-14.~~ Boxes and Fittings. Boxes and fittings shall comply with the applicable provisions of Article 370.

348-42. ~~348-10.~~ Couplings and Connectors. Couplings and connectors used with ~~tubing~~EMT shall be made up tight. Where buried in masonry or concrete, they shall be concretetight type. Where installed in wet locations, they shall be of the raintight type.

348-56. ~~348-15.~~ Splices and Taps. Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies.

C. Construction Specifications.

348-100. ~~348-16. General.~~ Construction

EMT ~~electrical metallic tubing~~ shall comply with (a) through (c) ~~(d) below~~.

(a) Cross Section. The ~~tubing~~EMT, and elbows and bends for use with the ~~tubing~~EMT, shall have a circular cross section.

(b) Finish. ~~Tubing~~EMT shall have such a finish or treatment of outer surfaces as will provide an approved durable means of readily distinguishing it, after installation, from ~~rigid metal conduit~~ Rigid Metal Conduit (RMC).

(c) Connectors. Where the ~~tubing~~EMT is coupled together by threads, the connector shall be designed so as to prevent bending of the ~~tubing~~EMT at any part of the thread.

348-120. ~~348-16(d).~~ Marking.

EMT ~~electrical metallic tubing~~ shall be clearly and durably marked at least every 10 ft (3.05 m) as required in the first sentence of Section 110-21.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements.

Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.

The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements

presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

Explanation of proposed renumbering and editorial changes;

- Title Acronym "EMT" added
- 348-1 New Scope added to conform with the style manual.
- 348-2
  (1) Definition renumbered from Section 348-1 to 348-2.
  (2) Added the acronym "EMT".
  (3) "Electrical Metallic Tubing" capitalized as it is a proper name of a product.
  (4) Listing requirements relocated to new Section 348-6.
  (5) Change "tubing" to "raceway".
- 348-3
  (1) Other Articles renumbered from Section 348-2 to 348-3.
  (2) Delete product name and replace with acronym "EMT".
  (3) Text revised for clarity.
- 348-6 New section to relocate listing requirements for EMT and associated fittings. Listing requirements for the tubing and fittings came from 348-1 (1999 NEC).
- 348-10
  (1) Uses Permitted renumbered from Section 348-4 to 348-10.
  (2) Delete product name and replace with acronym "EMT" (two places).
  (3) New (c), Wet Locations moved from 348-6 (1999 NEC).
  (4) FPN in (b) moved to new (c) for clarity.
- 348-12
  (1) Uses Not Permitted renumbered from Section 348-5 to 348-12.
  (2) Delete product name and replace with acronym "EMT" (two places).
  (3) Dissimilar metals reference moved to new 348-14.
- 348-14
  (1) New section, dissimilar metal's text moved from 348-12 (5) (1999 NEC).
  (2) Exception added for clarity (Same exception as 348-12(6) (1999 NEC)).
- 348-20
  (1) Size renumbered from Section 348-7 to 348-20.
  (2) Delete product description or product name and replace with acronym "EMT" (three places).
  (3) The word "electrical" was deleted as it added nothing to the clarity of this section (two places).
  (4) Deleted the reference to the IEC for clarity.
- 348-22
  (1) Number of Conductors renumbered from 348-8 to 348-22.
  (2) Reword section adding reference to cables for clarity.
  (3) Removed the reference to tubing for clarity (two places).
- 348-24
  (1) Bends-How Made renumbered from 348-11 to 348-24.
  (2) Delete "in the tubing" for clarity.
  (3) Corrected section and table reference.
- 348-26 Bends-Number in One Run renumbered from 348-12 to 348-26.
- 348-28
  (1) Reaming and Threading renumbered from 348-9 to 348-28.
  (2) Deleted product name and replaced with acronym "EMT" (two places).
- 348-30
  (1) Securing and Supporting renumbered from 348-12 to 348-30.
  (2) Title changed from "Supports" to "Securing and Supporting" since section addresses both subjects.
  (3) Deleted product name and replaced with acronym "EMT" (five places).
  (4) Seperated the Section into two parts for clarity.
  (5) Added text for clarity without changing the original requirement.
- 348-40 Boxes and Fittings renumbered from 348-14 to 348-40.
- 348-42 Couplings and Connectors renumbered from 348-10 to 348-42.
  Replace "tubing" with with "EMT".
- 348-56 Splices and Taps renumbered from 348-15 to 348-56.
- 348-60 New Section for the grounding requirements. Text moved from 348-2 (1999 NEC).
- 348-100
  (1) Construction renumbered and renamed from 348-16 General to 348-100 Construction.
  (2) Deleted product name or "tubing" and replaced with acronym "EMT" (6 places).
  (3) "Rigid Metal Conduit" capitalized as it is a proper name of a product. "RMC" acronym added.
  (4) Moved marking requirements to 348-120.
- 348-120
  (1) New section for marking requirments moved from 348-16(d) (1999 NEC).
  (2) Deleted product name and replaced with acronym "EMT".

PANEL ACTION: Accept in Principle.
Delete from the proposal: 348-3, 348-14 348-40, and the second sentence of 348-56.
In proposed 348-22 delete the words "or cables."
In proposed 348-30 the 1999 reference should be changed to 348-13.

PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 348-3, 348-40 and second sentence of 348-56 are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
Proposed 348-14 is deleted to eliminate redundant requirements.
There was no technical substantiation provided to add the words "or cables" as part of the rewrite of 348-22.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1286)

8- 277 - (348): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
348-5 (3) In cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 50 mm (2 in.) ~~(50.8 mm)~~ thick or unless the tubing is at least 450 mm (18 in.) ~~(457 mm)~~ under the fill.
(a) Minimum. Tubing smaller than metric designator 16 (1/2) ~~in.~~ electrical trade size shall not be used.
348-7 (b) Maximum. The maximum size of tubing shall be metric designator 103 the (4) ~~in. electrical trade size~~.
FPN: Metric trade numerical designations for electrical metallic tubing are the same as those found in Extra-heavy Duty Rigid Steel Conduits for Electrical Installations, IEC 981-1989; namely, 16 = 1/2 ~~= 16~~, 21 = 3/4 ~~= 21~~, 27 = 1 ~~= 27~~, 35 = 1 1/4 ~~= 35~~, 41 = 1 1/2 ~~= 41~~, 53 = 2 ~~= 53~~, 63 = 2 1/2 ~~= 63~~, 78 = 3 ~~= 78~~, 91 = 3 1/2 ~~= 91~~, and 103 = 4 = ~~103~~.
348-13 Electrical metallic tubing shall be installed as a complete system as provided in Article 300. Each tubing length shall be securely fastened in place at least every 3 m (10 ft) ~~(3.05 m)~~. In addition, each tube shall be securely fastened within 900 mm (3 ft) ~~(914 mm)~~ of each outlet box, junction box, device box, cabinet, conduit body, or other tubing terminations.
Exception No. 1: Fastening of unbroken lengths shall be permitted to be increased to a distance of 1.5 m (5 ft) ~~(1.52 m)~~ where structural members do not readily permit fastening within 900 mm (3 ft) ~~(914 mm)~~.
Horizontal runs of electrical metallic tubing supported by openings through framing members at intervals not greater than 3 m (10 ft) ~~(3.05 m)~~ and securely fastened within 3 ft (914 mm) of termination points shall be permitted.
348-16 (d) Marking. Electrical metallic tubing shall be clearly and durably marked at least every 3 m (10 ft) ~~(3.05 m)~~ as required in the first sentence of Section 110-21.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #367)

8- 278 - (348-1): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise 348-1 to read as follows:
348-1 Definition. Electrical Metallic tubing is a listed metallic ~~tubing~~ raceway of circular cross section approved for the installation of electrical conductors ~~when joined together with~~ and used with listed fittings to provide electrical and mechanical continuity.
SUBSTANTIATION: Editorial. Same type definition used for IMC and RMC except without a condition of tubing being joined together, to be approved for installation of conductors. Lengths of 10 ft or less may be joined to boxes, cabinets, panels, service heads, other raceways, or for support and protection of cable assemblies. The latter portion of the proposal does not require continuity, but only that listed fittings be used where it is required. Present definition basically states electrical metallic tubing is a tubing which is self evident.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-280.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2074)

8- 279 - (348-1): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a Scope section to Article 348 to read as follows:
348-1. Scope. The provisions of this article covers the use, installation, and construction specifications requirements of electrical metallic tubing.
Renumber remaining sections.
SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-276.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3188)

8- 280 - (348-1): Accept in Principle
Note: The Technical Correlating Committee understands that the action is to revise the text of 348-2 in Proposal 8-276.
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Revise the definition to read:
Electrical Metallic Tubing (EMT) is an unthreaded thinwall raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed utilizing appropriate fittings. EMT is generally made of steel (ferrous) with protective coatings, or aluminum (nonferrous). is a listed metallic tubing of circular cross section approved for the installation of electrical conductors when joined together with listed fittings
SUBSTANTIATION: This definition aids in differentiating between wiring methods. Also, if accepted this definition will be proposed for a tri-national standard under development. More detailed definitions will be beneficial in encouraging international use of the NEC". There are a lot of questions in the field regarding what articles cover aluminum and other specialized conduits. There is also confusion over the terms "ferrous" and "nonferrous". This provides clarity.
PANEL ACTION: Accept in Principle.
Revise the proposed definition to read:
"Electrical Metallic Tubing (EMT) is an unthreaded thinwall raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed utilizing appropriate fittings. EMT is generally made of steel (ferrous) with protective coatings, or aluminum (nonferrous)."
PANEL STATEMENT: The panel has amended the proposed definition to correct the submitter's error.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1431)

8- 281 - (348-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 348-2 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-276.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2072)

8- 282 - (348-4(a) (New)):

Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than 2/3 of the members eligible to vote have voted in the affirmative.

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add a new paragraph after the original text to read as follows:

(a) Exposed and Concealed. The use of listed electrical metallic tubing shall be permitted for both exposed and concealed work.

A separate equipment grounding conductor, sized as required by section 250-122, shall be installed in all electrical metallic tubing.

SUBSTANTIATION:

Grounding as provided by the EMT system is inadequate in many cases due to the separation, corrosion, loose fittings, thermal expansion, etc. This is due to inadequate code requirements on specific installation requirements causing EMT to move in such a manner that the fittings, couplings, and connectors loosen over time.

There have been many cases of human injuries due to this problem over time and across the country. In the Phoenix metropolitan area, there have been several cases of electrocution. Recently, an electrocution of an eight year old girl occurred, when the conduit came apart while she was playing on it. Another case was an electrocution of an air conditioning service technician who was taking the cover off of an ac unit with the conduit apart.

Additionally, the City of Phoenix Chief Electrical Inspector at the time, personally investigated many fires and injuries due to EMT conduit raceway failures. One such documented electrocution case occurred when a person attempted to turn on a water hose bib at a residence in Phoenix and was electrocuted. This was due to a shorted-grounded evaporative cooler motor and a broken and separated EMT conduit raceway. The metal water line had a plastic bushing which eliminated the electrical grounding continuity. The human body provided the path to ground. Even though a violation occurred, the missing bonding jumper on the isolation bushing on the water line would have no impact if the EMT raceway system was intact.

The Chief Electrical Inspector also investigated another documented serious injury which resulted in hospitalization. This occurred at the remodeling of a building in downtown Phoenix, Arizona. A power tool failed along with a broken EMT conduit raceway causing serious shock injury and near death.

Another injury was reported by a PE Electrical Engineer who personally investigated the accident. This injury took place at a Mall in Mesa, Arizona when a maintenance man came into contact with a broken EMT conduit raceway and was hurt due to a ground fault to the EMT down stream.

These are the injuries which occurred in the greater Phoenix area only. How many more deaths will it take before we take action?

"Fire investigation records of commercial buildings and military facilities show that metal raceways or cables are identified as the ignition source in a number of fires over recent years. Twelve such instances were identified in a Factory Mutual Technical Report, "A Review of Factory Mutual Technical Reports of Losses of Electrical Origin Involving Metal Conduits," by D.M. Karydas, FMRC J.I. 0N0R3.RU, July, 1986. A Shore Fire Management Report, prepared by the Naval Safety Center covering a period from April, 1982 through April, 1987 shows fires at seven U.S. military buildings were related to metallic raceways or cables. Also, the official NFPA investigation report of the tragic MGM fire indicates an arc between flexible aluminum conduit and EMT was the cause of the fire." Additionally, Factory Mutual conducted various studies on this problem and the summaries of their findings are as follows: "1. It was demonstrated that under ground fault conditions, metal conduit discontinuities release high thermal energy, visually manifested as showers of sparks, that is sufficient to ignite directly flammable gases, or pyrolyzate and melt, or even burn metallic parts (conduit fittings, etc.). 2. It was also demonstrated that under internal high-current arcing conditions, both plastic and metallic conduits suffer external wall rupture and the arcing fault releases high thermal energy to the ambient; molten metallic substance may ignite flammable material in the vicinity or at a distance from the immediate electrical fault area. No sustained fire involving conduit material itself was observed under these conditions." (Refer to 1989 TCR proposal 5-210) The panel's rejection statement on this proposal was not substantiated or answered by the panel. This raises the concern as to the technical intelligence of the panel members in response to the technical concerns that Factory Mutual's report states. The concerns to the public for safety are shown by the panel commented statements such as "Proposal would eliminate all raceways as grounding conductors. This would penalize both the good as well as the mediocre installations of wire/cable in conduit. It fails to take into account that if an equipment grounding conductor is in conduit, as recommended, that similar arcing can occur if the careless installer fails to securely attach each end of the equipment grounding conductor which is not visible after installation." Additionally, the concern of the internal arcing due to the differential impedance between the copper wire within the steel conduit raceway can be eliminated by requiring the equipment grounding conductor to be insulated. Presently over ninety percent of installations uses the insulated equipment grounding conductor. The only people who commented on the proposals are those who have an economic interest for maintaining market share and not for safety interest.

Installation(s) exposed on the surface of the roof have come apart during normal use. Also during the re-roofing of a roof, roof workmen, during the removal and installation of roofing material, have become severely shocked when the workman pick up the EMT raceway during the reroofing process. Roofers quite often move or step on the electrical conduits to install the new roofing. During this process, conduit fittings are being broken, pulled apart, or conductors damaged. Other nonelectrical trades are also called upon to perform on a roof are often not aware of the importance of grounding continuity. These persons do not take the necessary precautions to avoid damaging conduit or separating fittings.

Additionally, conduits exposed to the elements become rusted with a limited amount of ground continuity left and when moved or stepped on, they break quite easily.

Needless additional electrocutions and fires can be eliminated by the following minor change in installation requirements. By having an equipment grounding conductor installed within the raceway, the grounded appliance would have an assured means for ground return, thereby protecting the individual from shock hazard or injury. Since the only way that an appliance can remain energized, is when the conductors contained in the raceway remain continuous.

Interior raceways have the same problem as stated above, however, it has been proven everyday that the raceway system has a high impedance path. This proof is constantly shown by the fact that sensitive electronic equipments do not function correctly. Another line of reasoning involves computer grounding. A more solidly grounded conduit system would be less noisy and would help to encourage safe grounding practices for solid state equipment. Section 250-118(4) implies that this raceway system is adequate for grounding.

Section 250-118 is titled "Types of Equipment Grounding Conductors". Article 100 under definitions defines a "conductor". Nowhere in the definition of a conductor does it states that a raceway or a raceway which contains conductors is a conductor. Under the definitions, EMT is defined as a raceway. Since 250-118 only implies that a conductor can take other forms, it does not make it mandatory that these conductors are adequate as a equipment grounding conductor. If this was true, then the definition of conductor has to be revised to include any shape, any material, and so on.

Research of the standard relating to EMT shows no substantiated testing to confirm that raceways are adequate as an equipment grounding conductor. EMT Conduits have never been tested by UL or any testing laboratory as an equipment grounding conductor and there are no requirements under UL Standard 797 for resistance testing, for current testing, and for short circuit withstand testing of the conduit. In addition, UL Standard 514B does not require short circuit withstand testing for fittings and connectors. Additionally, Dr. C. Brenner, a PE electrical engineer, states that the technical article "Performance Evaluation of Steel Conduit Enclosed Power Systems" (conducted by Georgia Institute of Technology) does not address the real world conditions of broken, loose, or rusted EMT systems. The testing was done in an ideal condition and does not represent actual field application. The paper does not address the safety/hazard issue that exists when an electrical fault occurs and the metal conduit does not have a low conductivity path and a person contacts the conduit. Additionally, the Georgia Institute of Technology testing project is inadequate and does not addresses the issues of the previously mentioned Factory Mutual testing.

There is no guarantee that couplings, fittings and connectors have low impedance at the connection point. Therefore, it can not be assured that they comply with NEC 250-2(d) without a test of every branch circuit or feeder .

Where the EMT conduit is being used as the sole equipment grounding conductor, the ground path is often broken in normal field applications. As a result, equipment or a portion of the raceway may be energized with no equipment grounding to trip the overcurrent device. By installing an equipment grounding conductor within the raceway will help to ensure an effective

equipment grounding means (the grounding path remains intact) and will provide additional safety for personnel and property.

GENERAL STATEMENT TO THE PANEL

How much technical substantiation must we, the public, submit before the panel will take action and require an equipment grounding conductor in a raceway or cable which have uncontrolled impedances as used in a real world field application to conduct ground fault current and where the potential exists for people to get killed or shocked. In the past 10 years, people have submitted many code change proposals to require an equipment grounding conductor and they are constantly rejected by the panels. There has been overwhelming support for this change as documented by the TCRs and with substantiation of specific serious problem areas. The panel statements are always stating workmanship problems or design problems. The NEC is supposed to be an international safety standard. How many lives must be lost before the panel will take action?

Additional information was submitted under ROP (1998) 5-272 and 8-157 including the letters referenced above are available from NFPA.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 6

NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:

BERMAN: Proposals to require the use of a separate equipment grounding conductor in EMT (and other metal raceways) have been considered by CMPs 5 and 8 for several code cycles. Primarily, the substantiation for these proposals consists of reports of incidents where the raceway was installed improperly or used in an area subject to severe physical abuse. Damage to the raceway by other trades or nonelectrical maintenance workers has been cited. This Panel has rejected similar proposals on that basis, and no new technical substantiation has been presented to warrant a change in this position.

Installation of a separate equipment grounding conductor, as suggested by the submitter, is permitted by the NEC. Section 250-118 clearly states that the equipment grounding conductor shall be one or more or a combination of the methods specified. Field experience has shown that properly installed EMT, without a separate equipment grounding conductor, used in an area not subject to severe physical damage, will perform acceptably, and can effectively serve as the equipment grounding conductor.

All UL Listed fittings used with EMT are required to comply with a fault current test, at the same test conditions and test criteria as other Listed grounding and bonding equipment. Compliant test results signify that these products are capable of transmitting fault currents back to the overcurrent protective device.

Discussion at the CMP 8 meeting could lead one to believe that if a separate equipment grounding conductor were required in all EMT, some installers might be less likely to thoroughly check or properly tighten all connections of the raceway system. Should a fault to the tubing occur within a length of EMT that does not employ properly fastened or broken fittings or couplings, a separate equipment grounding conductor will not be of any value in transmitting that fault back to the overcurrent protective device.

DAUBERGER: This proposal is very similar to a proposal that was submitted for the 1999 code cycle. At that time we reported that the problems we have investigated indicate that "poor workmanship" coupled with some "abuse" has been the cause of the problems. The manufacturers have responded by writing "installation guidelines" to assure proper installations. In addition, the substantiation for proposal 8-282 is exactly the same as that provided for the 1999 code. Therefore, no new substantiation has been provided which means that there is inadequate justification to require the installation of a separate grounding equipment conductor in all EMT installations.

DOLLINS: Where EMT and any other wiring method is installed and maintained in accordance with the NEC and their listing, the wiring method will perform as intended. The substantiation cites wiring methods that are installed where it will be damaged, exposed to corrosive environment, or that are poorly maintained. These conditions are already addressed by the code. If EMT is not suitable for a given condition of installation or use, an alternative wiring method should be used. It is not necessary to require a separate equipment grounding conductor for all installations of EMT.

JANNOT: CMP 8 rejected Proposal 8-8 that would have removed EMT from 250-118 as an acceptable equipment grounding conductor. Acceptance of this proposal (8-282) would seem to be in conflict with the panel's action on Proposal 8-8. EMT is, in fact, acceptable as an equipment grounding conductor when installed and maintained properly.

This same proposal with identical substantiation was submitted as Proposal 8-157 in the last code cycle. It was initially accepted in principle by requiring that a separate equipment grounding conductor be installed in all exposed rooftop installations of EMT. After public review and comment the proposal was rejected. Absolutely no new substantiation has been provided to justify accepting this proposal at this time.

LILLY: In comparing this proposal to Proposal 8-157 made in the 1998 NEC ROP, there is no new substantiation provided. For other than a few minor word changes, the wording in the substantiation of this proposal is exactly as found in 8-157. The substantiation presents situations of inadequate maintenance, poor workmanship, improper installation, product abuse, and failure on the part of workman to report damaged installations. The final disposition of Proposal 8-157 is found in the actions taken by Panel 8 on Comment Numbers 8-308 and 8-321 as found in the 1998 NEC ROC. Panel 8 rejected the concept that an equipment-grounding conductor be installed in EMT. The panel members should review Comment Number 8-321 as found in the 1998 NEC ROC. This comment offers good reasoning as to why this proposal should be rejected.

Category FKAV, Electrical Metallic Tubing Fittings, found on page 25 of Underwriters Laboratories 1999 General Information Directory states that listed EMT fittings are "considered suitable for grounding where installed in accordance with the National Electrical Code." UL has a testing program for EMT fittings that include pullout, continuity, and fault current testing.

348-4(a) requires EMT to be listed. EMT is to be securely fastened as required by 348-13. Expansion fittings are required for EMT by 300-7(b). 348-4(b) requires corrosion protection for concrete installations, where in direct contact with the earth, and where subject to severe corrosive influences. 348-6 requires protection of EMT, and "all supports, bolts, straps, screws, etc." against corrosion. EMT is to be installed within the parameters established in Sections 348-4 and 348-5 and in accordance with other applicable code requirements. 348-10 requires couplings and connectors for EMT to be made up tight. 90-1(b) anticipates "proper maintenance" will occur and states "This code contains provisions that are considered necessary for safety. Compliance therewith and proper maintenance will result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use."

The present code requirements for expansion fittings, securing, permitted and not permitted uses, corrosion protection, listing, and installation provide for a safe EMT installation. The authority having jurisdiction, the installer and the owner are responsible for code compliant installations and maintenance. Rust broken and loose fittings and physical damage of the tubing are illustrations of inadequate maintenance, and misapplication of the raceway.

See my Explanation of Negative Vote on Proposal 2-283.

LOYD: This proposal should have been rejected for insufficient substantiation. The submitter did not substantiate the need to add a redundant equipment-grounding conductor in installations of EMT.

Although I recognize the effort Mr. Renscok has made to gather the information, the information submitted with the proposal is old material that has been submitted in previous code cycles with similar proposals that were rejected. All of the information related only to the Phoenix, Arizona area. All of the accidents involved small sizes of EMT (1/2 in. and 3/4 in.), improperly installed or damaged to the raceway systems by other trades, in combination with equipment failure. Section 90-1(b) clearly states it is not the intent of the NEC to guard against hazards that occur from improper installations or lack of maintenance.

The submitter also cites a 1986 Factory Mutual report which was prepared for Carlon for the purpose of substantiating several code changes to the 1990 NEC. All of these proposed changes were rejected. The panel statement said that the installations in the Factory Mutual tests did not meet Code requirements. There was only one negative vote, which was cast by Mr. C. Forsberg of Carlon.

The submitter blames the accidents cited on the fact that EMT does not provide an adequate grounding path. However, the examples he uses as substantiation deal with improper design, the use of EMT in the wrong application, or poor workmanship.

Over 50 years of field experience involving millions of feet of EMT have shown that, where installed and maintained properly, EMT is an effective equipment-grounding conductor, in accordance with Section 250-2(d). In fact, Panel 5, which is responsible for Article 250 (Grounding) unanimously rejected similar proposals in this code cycle and in past code cycles.

The accidents cited in the submitter's substantiation do not consider product improvements over the years nor is the age of the installation mentioned. The submitter stated that the UL standard for EMT does not contain grounding tests. However, each raceway

to fitting interface is subjected to the same ground current test as is required for grounding and bonding equipment. The grounding capability of steel EMT is well documented in standard engineering manuals and research reports.

The submitter has not provided any substantiation that the addition of a ground wire would make the installations safer. If he believes that poor workmanship contributes to improper connections, etc., why does he believe that the same would not happen with a supplemental grounding conductor? I have personally witnessed several installations where the supplemental grounding conductor was not properly terminated. It could be argued, in fact, that the addition of a supplemental ground could, in some instances, cause more potential problems that it would solve. Workmanship is an issue that must be dealt with by rigorous inspections, a strong licensing program by all jurisdictions, required education before licensing, and continued education annually to insure that only qualified installers perform and/or supervise the work.

Contrary to the submitter's statements, we have found that electronic equipment does function very well with EMT as a single path. A 1994 research report on grounding by the Georgia Institute of Technology shows that EMT actually has the lowest impedance path of all conduits. Where the metal raceway is used for shielding, a nonconductive fitting should be inserted in one end of the raceway system to prevent ground loops. When a redundant ground wire is run, because of the difference in impedance, it must be bonded to the raceway system at each outlet, junction box, or termination point.

The addition of a supplemental grounding conductor in EMT should remain a design decision. Present code requirements are adequate to provide for safe, reliable installations.

The position of the committee had always been that poor workmanship cannot be a substitute for complying with the code. It is not prohibited to install an internal ground wire and some engineers do require it already and they have that right since they can be held liable for the installations they design. I think it is and should remain a design consideration. Present code requirements are correct and are adequate to provide requirements necessary for safe reliable installations.

(Log #3395)

8- 283 - (348-4(a)): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than 2/3 of the members eligible to vote have voted in the affirmative.

SUBMITTER: David Yee, Scottsdale, AZ

RECOMMENDATION: Add a new paragraph after the original text to read as follows:

(a) Exposed and Concealed. The use of listed electrical metallic tubing shall be permitted for both exposed and concealed work.

<u>A separate equipment grounding conductor, sized as required by Section 250-122, shall be installed in all electrical metallic tubing.</u>

SUBSTANTIATION: A. The title of Section 250-118(4) states "type of equipment grounding conductor".

Conductor is defined in Article 100 as follows:

Bare: A conductor having no covering or electrical insulation whatsoever.

Covered: A conductor encased within material of composition of thickness that is not recognized by this Code as electrical insulation.

Insulated: A conductor encased within material of composition and thickness that is recognized by this Code as electrical insulation.

Since the title references conductors, the code section should only reference conductors. Tubing, conduit, raceways, and other similar material should not be referenced as conductors in this section.

B. Grounding as provided by the EMT system is inadequate in many cases due to the separation, corrosion, loose fittings, thermal expansion, etc. This is due to inadequate code requirements on specific installation requirements causing EMT to move in such a manner that the fittings, couplings, and connectors loosen over time.

There have been many cases of human injuries due to this problem over time and across the country. Refer to my earlier submittal under ROP (1998) 5-272.

Installation(s) exposed on the surface of the roof have come apart during normal use. Also during the reroofing of a roof, roof workmen, during the removal and installation of roofing material, have become severely shocked when the workman pick up the EMT raceway during the reroofing process. Roofers quite often move or step on the electrical conduits to install the new roofing. During this process, conduit fittings are being broken, pulled apart, or conductors damaged. Other nonelectrical trades are also called upon to perform on a roof are often not aware of the importance of grounding continuity. These persons do not take the necessary precautions to avoid damaging conduit or separating fittings. Additionally, conduits exposed to the elements become rusted with a limited amount of ground continuity left and when moved or stepped on, they break quite easily.

Needless additional electrocutions and fires can be eliminated by the following minor change in installation requirements. By having an equipment grounding conductor installed within the raceway, the grounded appliance would have an assured means for ground return, thereby protecting the individual from shock hazard or injury. Since the only way that an appliance can remain energized, is when the conductors contained in the raceway remain continuous.

Interior raceways have the same problem as stated above, however, it has been proven everyday that the raceway system has a high impedance path. This proof is constantly shown by the fact that sensitive electronic equipments do not function correctly. Another line of reasoning involves computer grounding. A more solidly grounded conduit system would be less noisy and would help to encourage safe grounding practices for solid state equipment. Section 250-118(4) implies that this raceway system is adequate for grounding.

Where the EMT conduit is being used as the sole equipment grounding conductor, the ground path is often broken in normal field applications. As a result, equipment or a portion of the raceway may be energized with no equipment grounding to trip the overcurrent device. By installing an equipment grounding conductor within the raceway will help to ensure an effective equipment grounding means (the grounding path remains intact) and will provide additional safety for personnel and property.

Note: Additional information was submitted under ROP (1998) 5-272 and 8-157 including the letters referenced are available from NFPA.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action on proposal 8-282.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 6

NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:

BERMAN: See my Explanation of Negative on Proposal 8-282.

DAUBERGER: See my Explanation of Negative on proposal 2-282.

DOLLINS: Where EMT and any other wiring method is installed and maintained in accordance with the NEC and their listing, the wiring method will perform as intended. The substantiation cites wiring methods that are installed where it will be damaged, exposed to corrosive environment, or that are poorly maintained. These conditions are already addressed by the code. If EMT is not suitable for a given condition of installation or use, an alternative wiring method should be used. It is not necessary to require a separate equipment grounding conductor for all installations of EMT.

JANNOT: See my Explanation of Negative Vote on Proposal 8-282.

LILLY: The substantiation for this proposal is not sufficient to warrant its acceptance. I offer the following responses to the points made in the proposal substantiation.

1. CMP 8 does not have jurisdiction over 250-118.

2. The first paragraph of Part B of the substantiation states "Grounding as provided by the EMT system is inadequate in many cases due to the separation, corrosion, loose fittings, thermal expansion, etc. This is due to inadequate code requirements on specific installation requirements causing EMT to move in such a manner that the fittings, couplings, and connectors loosen over time." There are not "inadequate code requirements." 300-6, 348-4(b) and 348-6 provide for the corrosion protection of EMT. 300-7 provides for expansion fittings for EMT, 348-5(1) prohibits EMT being used where subject to severe physical damage. 348-13 requires EMT to be securely fastened. 384-10 requires couplings and connectors for EMT to be made up tight. 90-1(b) tells us that code compliance and proper maintenance are necessary for "an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use". 348-4 and 348-5 provide for the permitted and not permitted uses of EMT.

3. Installations of EMT on rooftops where workman "pick up the EMT" are not code compliant as the EMT is not securely fastened in accordance with 348-13. Installations on rooftops where the EMT is damaged by being stepped on are not code compliant, as 348-5(1) does not permit the EMT to be installed, "Where, during installation or afterward, it will be subject to severe physical damage."

4. Installations that comply with 300-7, 348-4, 348-5, 348-6, 348-13 and other applicable code requirements should not "come apart during normal use."
5. The installation of an equipment grounding conductor will not facilitate the overcurrent device operation on high impedance faults, such as arcing faults.
6. Grounding of "sensitive electronic equipment" is a design consideration. As such, it is beyond the scope of the NEC as 90-1(c) states "This code is not intended as a design specification nor an instruction manual for untrained persons."

Installations that are installed in accordance with the NEC and properly maintained are safe and the EMT is suitable as an equipment grounding conductor.

See my Explanation of Negative Vote on Proposal 8-282.

LOYD: This proposal should have been rejected. See my comments on ROP 8-282 vote and action.

(Log #3738)

8- 284 - (348-5): Reject

SUBMITTER: Wayne A. Lilly, Bridgewater, VA

RECOMMENDATION: Revise item (1) of Section 348-5 so the section reads as follows:

348-5. Uses Not Permitted. Electrical metallic tubing shall not be used.

(1) Where, during installation or afterward, ~~it~~ ferrous electrical metallic tubing will be subject to severe physical damage. Nonferrous electrical metallic tubing shall not be used where, during installation or afterward, it will be subject to physical damage unless listed for the purpose.

(2) Where protected from corrosion solely by enamel.

(3) In cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 2 in. (50.8 mm) thick or unless the tubing is at least 18 in. (457 mm) under the fill.

(4) In any hazardous (classified) location except as permitted by Sections 502-4, 503-3, and 504-20.

(5) For the support of fixtures or other equipment except conduit bodies no larger than the largest trade size of the tubing. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.

Exception: Aluminum fittings and enclosures shall be permitted to be used with steel electrical metallic tubing.

SUBSTANTIATION: Nonferrous electrical metallic tubing is gaining acceptance throughout the electrical industry. Nonferrous EMT, such as aluminum, is much softer than ferrous EMT and is thus more susceptible to damage. Including a listing provision makes allowance for nonferrous EMT which may be suitable for exposure to physical damage.

PANEL ACTION: Reject.

PANEL STATEMENT: All EMT, ferrous and nonferrous is evaluated to the same product standard in order to qualify for listing and is permitted by the NEC to be installed in locations where not subject to severe physical damage. The determination of areas subject to physical damage is the responsibility of the authority having jurisdiction.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #2073)

8- 285 - (348-5, Exception): Accept in Principle

Note: The Technical Correlating Committee understands that the Panel Action text revises the wording accepted in 384-12(6), Exception of Proposal 8-276.

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Revise the exception to read as follows:

Exception: Aluminum fittings and enclosures shall be permitted to be used with steel electrical metallic tubing where not subject to corrosive influences.

SUBSTANTIATION: Aluminum fitting will corrode in corrosive areas and clarification is needed in the code.

This exception implies that corrosion protection is not required due to the location of the exception.

The aluminum must also protected. Listed copper free aluminum fittings and enclosures will also have severe corrosion when located near the salt oceans of the world.

I have inspected industrial plants around the world and found that within 3 months corrosion to the aluminum enclosures and fittings start to become severe.

The code needs to address this concern.

PANEL ACTION: Accept in Principle.

Revise the proposed text to read:

"Exception: Aluminum fittings and enclosures shall be permitted to be used with steel electrical metallic tubing where not subject to severe corrosive influences. "

PANEL STATEMENT: The environments described in the substantiation are ones that present severe corrosive influences.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #260)

8- 286 - (348-5(6) (New)):

Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Charles M. Trout, Maron Electric Co.

RECOMMENDATION: Add a new part (6) to read:

"for installation on roof-tops".

SUBSTANTIATION: The deterioration of electrical metallic tubing used on roof-tops has been well documented over the years. A user should be able to expect an electrical installation to last the life of the building if properly installed and maintained. Electrical metallic tubing properly installed and properly maintained cannot withstand the deterioration and corrosive rotting when subjected to the adverse weather elements encountered in roof-top installations. The metallic protection for the conductors rusts, erodes and rots away leaving conductors subject to physical damage and with that also loses its performance of ground fault path so essential to safe electrical installations. Attempts have been made through proposals to prohibit the use of electrical metallic tubing as an equipment grounding conductor. But that is not the problem. The basic problem is that electrical metallic tubing is not suitable for use on roof-tops without some additional coating such as a PVC or other noncorrosive material.

PANEL ACTION: Accept.

PANEL STATEMENT:

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 6

NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:

BERMAN: The submitter has indicated that properly installed and maintained EMT cannot withstand deterioration when subjected to adverse weather elements. However, except for the statement that this is well documented over the years, no further evidence of those specific conditions was presented to support the proposal.

It is agreed that any raceway can deteriorate when subjected to severe corrosive influences. This application is already prohibited by 348-4(b). Use of EMT on a rooftop would certainly be considered a wet location, but not necessarily a severe corrosive influence. UL Listing of EMT requires the tubing to be subjected to the same corrosion test conditions as rigid metal conduit.

DAUBERGER: Adding rooftop installations to "Uses Not Permitted" is unwarranted because the submitter failed to provide adequate substantiation.

DOLLINS: The proposed new nonpermitted use, "For installation on rooftops" is too broad. It covers all rooftop installations including the great majority where no problems exist. The present requirement of Section 348-5(1) prohibits EMT from use "Where, during installation or afterward, it will be subject to severe physical damage." The present requirements already prohibit the use of EMT on rooftops and anywhere else "Where, during installation or afterward, it will be subject to severe physical damage."

JANNOT: The submitter did not provide sufficient substantiation for making this drastic restriction.

LILLY: The substantiation states, in part, "The deterioration of electrical metallic tubing used on roof-tops has been well documented over the years." This is insufficient technical substantiation for the proposal as no such documentation was provided.

There is no need to prohibit EMT on rooftops. The substantiation for this proposal cites only corrosion problems, 300-6, 348-4(b), and 348-6 provide requirements for corrosion protection. 348-4(b)

additionally requires the EMT installation to be suitable for the condition. 348-4 and 348-5 provide use requirements. These corrosion requirements, in conjunction with corrosion protection requirements in ANSI and UL standards, provide adequate corrosion protection for rooftop installations. The authority having jurisdiction, installer, designer, and owner must make the determination as to the suitability of the installation based on code requirements. The installer, owner and designer are responsible for design considerations. The owner is responsible for maintenance.

I have performed electrical inspections for 23 years. During those years I have found no rooftop installations of EMT where the "metallic protection" for the conductors rusts, rots and erodes away leaving conductors subject to physical damage." Perhaps this is because of the different weathering conditions or roofing materials used in my area. It might even be because of different maintenance. Whatever the reason, prohibiting the use of EMT on all rooftops is overly restrictive, as there are many installations that do not exhibit the problems cited in the substantiation.

LOYD: This proposal should be rejected, if accepted it will eliminate the use of all EMT on rooftops without providing the substantiation to do so. The submitter states that deterioration of electrical metallic tubing used on rooftops is well documented. Yet, he has supplied no documentation to support this claim. As a former contractor, inspector and electrician, I have not found this to be true. We have used EMT as a poke-through to feed rooftop units for years without problems.

The submitter's rationale for not allowing EMT on rooftops is entirely focused on the supposed corrosive environment in which the EMT would be installed. The submitter states that the deterioration of EMT on rooftops is well documented. The submitter also states that properly installed and maintained EMT cannot withstand the deterioration and corrosive rotting that occurs on rooftops. Depending on the particular area of the country, EMT on rooftops may or may not be subjected to corrosive environments. However, the Code already covers this issue in 300-6:

300-6. Protection Against Corrosion. Metal Raceways, cable trays, cablebus, auxiliary gutters, cable armor, boxes, cable sheathing, cabinets, elbows, couplings, fittings, supports, and support hardware shall be of materials suitable for the environment in which they are to be installed.

Noncompliance with Section 300-6 would be an improper installation. Section 90-1(b) clearly states it is not the intent of the NEC to guard against hazards that occur from improper installations or lack of maintenance.

The submitter finally states that the problem is not the use of EMT as an equipment-grounding conductor, but that EMT is not suitable for rooftop installations without adding a coating such as PVC. This is a design decision. As stated above, the Code already covers that issue in 300-6.

As a committee, we should continue to support allowing designers and the authorities having jurisdiction to make the decision as to when additional corrosion protection in required. There are other areas in which EMT, or any other wiring method, is installed where it may be subject to severe corrosion. That is insufficient reason for totally prohibiting the use of that product in that application. We have rejected setting the precedent of providing laundry lists of possible locations where additional corrosion protection is or may be required.

Each Code proposal is supposed to be voted on based on the substantiation in the proposal. Substantiation is completely lacking in this proposal and the only issue raised is corrosion protection, which is already covered in the Code. This proposal should be rejected.

COMMENT ON AFFIRMATIVE:

GRIFFITH: New part (6) should read "for installation in roof-tops <u>exposed to the outdoors</u>". Industrial plants have many control rooms and other roof-tops that are indoors, inside a larger building not subjected to the same conditions included in the submitter's substantiation.

(Log #261)

8- 287 - (348-5(7) (New)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Add a new part (7) to read:

"For installation of trade sizes 1/2 in., 3/4 in., and 1 in. in accessible hollow spaces above ceilings unless the following conditions are met:

a. The electrical metallic tubing is rigidly supported every 4 1/2 ft and within 12 in. of every connector and coupling, and

b. An equipment grounding conductor, sized in accordance with Section 250-122, is installed in the conduit."

SUBSTANTIATION: The bending, kinking and separation of electrical metallic tubing at fittings where installed in these sizes in hollow spaces above ceilings has been well documented over the years. Properly installed and maintained installations are subjected to excessive vibration due to internal and external sources. Properly installed and maintained installations have been roughly pushed and pulled apart by other persons working above the ceiling. A properly maintained concealed installation is not checked with such regularity that disruption of the integrity of the conduit system would immediately be repaired. Attempts have been made with well documented proposals to require an equipment grounding conductor to be run with electrical metallic tubing installation such as these but these proposals have been rejected. So let's support electrical metallic tubing properly and maintain the electrical grounding continuity we desperately need and indeed are required to maintain in accordance with Section 250-2(d).
PANEL ACTION: Reject.
PANEL STATEMENT: The requirements for supporting and securing EMT are adequately addressed by the existing text of 348-13. The proposal does not provide sufficient technical substantiation to indicate that additional supports are needed. The equipment grounding conductor requirement is covered by the panel action on Proposal 8-282.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #262)

8- 288 - (348-5(8) (New)): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co.
RECOMMENDATION: Add a new part (8) to read:

"for direct burial in the earth unless the following conditions are met:

a. The electrical metallic tubing is encased in 1 in. of concrete, and

b. An equipment grounding conductor, sized in accordance with Section 250-122, is installed in the conduit."

SUBSTANTIATION: A user should be able to expect an electrical installation to last the life of the building if properly installed and maintained. Contrary to the remarks sometimes heard from manufacturers' representatives lobbying for their employers products "poor workmanship" is not the cause of deterioration, rusting, and rotting. "Poor maintenance" is not the cause of deterioration, rusting or rotting. "Poor inspection" is not the cause of deterioration, rusting or rotting. Using a product that will deteriorate, rust or rot in this application is the problem. Corrosion protection applied by the manufacturer does not work as can be seen by well documented proposals. Maintaining an installation of electrical metallic tubing buried in direct contact with the earth is really "difficult". When electrical metallic tubing rusts or rots away, we lose the protection for our conductors leaving them subject to physical damage and with that we also lose our performance of ground fault path so essential to safe electrical installations and justifiably required by Section 250-2(d). The basic problem is that electrical metallic tubing is not suitable for direct burial use. Let's give our installers the proper products with a code to back them up and we can enjoy seeing the purpose of the code upheld.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not provide sufficient technical substantiation and the proposed text conflicts with 348-4(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3079)

8- 289 - (348-7): Accept in Principle in Part

Note: The Technical Correlating Committee understands that the Panel Action text revises the wording accepted in 348-20 of Proposal 8-276.

SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise this section and the FPN to read:

(a) Minimum. <u>EMT</u> ~~tubing~~ smaller than 1/2 <u>(16)</u> ~~in. electrical trade size~~ shall not be used.

Exception: For enclosing the leads of motors as permitted in Section 430-145(b).
(b) Maximum. EMT larger than 4 (103) shall not be used. ~~The maximum size of tubing shall be the 4 in. electrical trade size.~~
FPN: The Trade Size and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-x.
~~FPN: Metric trade numerical designations for EMT electrical metallic tubing are the same as those found in Extra heavy duty Rigid Steel Conduits for Electrical Installations, IEC 81-1989; namely, 1/2 = 16, 3/4 = 21, 1 = 27. 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103.~~
SUBSTANTIATION: To correlate with proposal submitted to CMP 3 to add a table showing English and Metric trade size designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code, which is no longer needed. Metric trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code.
PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the addition of the new FPN to read as follows:
"FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions."
The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of the word "tubing" with the acronym "EMT" and the deletion of "in. electrical trade size" by action on Proposals 8-276 and 8-277.
The panel prefers the language used for "maximum size" per Proposal 8-276.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-276 and 8-277.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #CP805)

8- 289a - (348-8): Accept
Note: The Technical Correlating Committee understands that the accepted text becomes a new paragraph to 348-22 of Proposal 8-276.
SUBMITTER: CMP 8
RECOMMENDATION: Add new second paragraph to 348-8 to read:
"Cables shall be permitted to be installed where such use is permitted by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9."
SUBSTANTIATION: The proposed language clarifies that cables, where permitted elsewhere in the code, are allowed to be used in a raceway. It also provides clear direction on how to determine raceway fill where cables are installed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3080)

8- 290 - (348-9): Accept
Note: The Technical Correlating Committee understands that the accepted text revises the wording accepted in 348-28 of Proposal 8-276.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise to read as follows:
348-9. Reaming and Threading.
(a) All cut ends of EMT ~~electrical metallic tubing~~ shall be reamed or otherwise finished to remove rough edges.
(b) EMT ~~Electrical metallic tubing~~ shall not be threaded. ~~Where integral couplings are utilized, such couplings shall be permitted to be factory threaded.~~
Exception: EMT with factory threaded integral couplings complying with 348-16(c).
SUBSTANTIATION: This language clarifies the only situation where EMT is permitted to be threaded. This integral coupling is no longer being produced, but a patent exists and UL does not want to delete it from the testing standard. See companion proposal for 348-16(c).
PANEL ACTION: Accept.
PANEL STATEMENT: The panel can not verify the second part of the submitter's substantiation. Underwriters Laboratories is not aware of any requests to delete the product from the testing standard.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3808)

8- 291 - (348-9 and Table 350-12): Reject
SUBMITTER: Franklin H. King, Eugene, OR
RECOMMENDATION: Revise text to read as follows:
When tubing cutters are used to cut partially through conduit and broken at the cut a reduction in wire pull number must be decreased.
Exception: No wire reduction needed when depth gage tubing cutters are used.
SUBSTANTIATION: As internal diameters may be reduced in pipe (EMT) using tubing cutters; guess work cutting is too careless type work (110-12). May cause reduction of wire size. 300-17 (ease of installation and withdrawal without conductor damage is required).
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substatiation to limit the methods by which EMT is cut in the field. The requirements are adequately covered in 348-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3077)

8- 292 - (348-11): Accept
Note: The Technical Correlating Committee understands that the accepted text replaces the last sentence and deletes the Exception of 348-24 accepted in Proposal 8-276.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise the last sentence to read as follows and delete the exception:
The radius of the curve of any field bend to the centerline of the conduit ~~the inner edge of any field bend~~ shall not be less than shown in Table 346-10 for one-shot and full shoe benders.
~~Exception: For field bends made with a bending machine designed for the purpose, the minimum radius shall not be less than indicated in Table 346-10, Exception.~~
NOTE: This is a companion proposal to revise Table 346-10.
SUBSTANTIATION: Only one shot and full shoe benders are used for EMT. This revised text clarifies that measurements are to be made to the centerline where these benders are used. The new Table 346-10 proposed in a companion proposal makes the exception unnecessary. Lead sheath conductors are no longer made and the existing Table 346-10 has been deleted and combined with the exception table.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LILLY: I disagree with that part of the substantiation that states "Only one-shot and full shoe benders are used for EMT." EMT is also bent by use of "hickey" style benders. The proposed language "one-shot and full shoe benders" should be deleted, as it is overly restrictive. "Hickey" style benders have been successfully used in the industry for many years. Bends made using "hickey" style benders and complying with the column "Other Bends", in the proposed revised Table 346-10, will not damage the raceway nor will they pose problems with conductor installation.

(Log #4213)

8- 293 - (348-13): Accept in Principle in Part

Note: The Technical Correlating Committee understands that revision to "terminations" modifies 348-30(a) in Proposal 8-276.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

Electrical metallic tubing shall be installed as a complete system as provided in Article 300. ~~Each tubing length~~ It shall be securely fastened in place at least every 10 ft (3.05 m). In addition, ~~each tube~~ it shall be securely fastened within 3 ft (914 mm) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing ~~terminations~~ termination.

SUBSTANTIATION: The revised wording of this section resulting from 1999 NEC changes can be interpreted to require individual lengths of EMT to be independently supported, regardless how short the length. For example, if I have a 2-ft scrap left over and I decide to put my box kick on that and then couple a 10-ft length to it, historically I only needed one clip, and it could go anywhere in the first 3 ft from the box. It might go at 30 in., and bypass the cut length entirely, or not.

The 1999 wording says every tubing length has to be supported "at least" (could be less) every 10 ft, and you could argue that the 2 ft scrap is a "tubing length" requiring support. Furthermore, "each tube" has to be supported within 3 ft of "tubing terminations" so you could say even the 10 ft length needs a clip within 3 ft of its coupling with the 2-ft piece. The proposal that produced this foolishness wasn't well substantiated, and we should go back and unfix what was never broken. This proposal does that.

PANEL ACTION: Accept in Principle in Part.

The panel accepts the change from "terminations" to "termination".

The panel accepts in principle the remainder of the proposal by panel action on Proposal 8-276, Section 348-30.

PANEL STATEMENT: The panel concurs with the submitter that the term "terminations" should be made singular.

See panel action and substantiation on Proposal 8-276.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 2

NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:

BERMAN: I agree with Mr. Lilly that the panel action reintroduces a potential interpretation issue that was partially resolved in the 1999 NEC. While the submitter is correct in pointing out that the present wording could be interpreted to mean that several short lengths in a run would each need to be securely fastened, the proposal could also potentially allow one to again "take credit" for securement on the opposite side of a box. Requiring "each tubing run" to be securely fastened as required would result in consistent application of the intent of this rule.

LILLY: The substantiation for Proposal 8-162 of the 1998 ROP was "Many interpretations have been made pertaining to this situation where installers wish to "take credit" for supports on opposite sides of an outlet box, junction box, device box, etc. The new wording would clarify the intent that supports are needed for each conduit terminating in such boxes, not just on one side of the box." The proposed revision to this section allows it to be interpreted as it was prior to the 1999 NEC. This will cause the code to regress by creating the same problem that was solved in the 1999 NEC.

(Log #4441)

8- 294 - (348-13): Reject

SUBMITTER: Doyle J. Cantrell

RECOMMENDATION: Revise text as follows:

Electrical metallic tubing shall be installed as a complete system as provided in Article 300. Each tubing length shall be securely fastened in place at least every 10 ft (3.05 m). In addition, each tube shall be securely fastened within 3 ft (914 mm) of each coupling, outlet box, junction box, device box, cabinet, conduit body, or other tubing terminations.

SUBSTANTIATION: Mechanical strength of coupling devices is not sufficient for self support in conduit runs.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's substantiation is not correct. Couplings are evaluated and listed for mechanical strength.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #263)

8- 295 - (348-13 Exception No. 3 (New)): Reject

SUBMITTER: Charles M. Trout, Maron Electric Co.

RECOMMENDATION: Add a new Exception No. 3 to read:

"As provided for in 348-5(7)."

SUBSTANTIATION: This change would be necessary if the panel accepts the proposal to add a new part (7) to Section 348-5.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 8-287.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #344)

8- 296 - (348-13 Exception No. 3 (New)): Reject

SUBMITTER: Jeffrey Rettig, Umatilla, OR

RECOMMENDATION: Add an Exception No. 3 to 348-13 stating:

EMT less than 36 in., connected between 2 boxes, each supported per Section 370-23, does not need to be fastened.

SUBSTANTIATION: Problem resolved: Unnecessary supports.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 8-247.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #839)

8- 297 - (348-13 Exception No. 3 (New)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add:

Exception No. 3: Exposed electrical metallic tubing installed on a rooftop where the roof has a slope of less than 4 in. (102 mm) in 12 in. (305 mm) shall be fastened within 3 ft (914 mm) of each side of each coupling.

SUBSTANTIATION: I have observed many separations of EMT from couplings where installed on roofs where it is likely to be tripped over or stepped on by rooftop equipment installers or service personnel. Tubing runs are commonly secured to wooden blocks affixed by adhesive to built-up roof covering. The Los Angeles City Electrical Code once (before adoption of the NEC) required tubing support within 3 ft of both sides of couplings, which mitigates the separation problem, since when stepped on the tubing may be bent but not usually separated. With one support immediately adjacent to a coupling, the tubing may span nearly 10 ft before the next required support. Although this complies with present Code, if stepped on or tripped over the flexibility is more likely to result in separation at the coupling. Since some areas are not concerned with snow removal equipment, restriction due to severe physical damage may be difficult to enforce.

Prevention of separation, with attendant loss of grounding continuity should be the goal rather than requirements for separate grounding conductors.

The proposal is perhaps more warranted for smaller sizes of tubing; the majority of separations seem to occur in the 1/2 and 3/4 in. tubing due to lesser strength and rigidity.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 348-5 does not permit EMT to be used where during installation or afterward, it would be subject to severe physical damage. Installations, such as those referred to in the substantiation and the recommendation would subject EMT to severe physical damage.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

COMMENT ON AFFIRMATIVE:

See Lloyd's negative comment on proposal 8-286 (Log #260).

(Log #275)

8- 298 - (348-16(a)): Accept
Note: The Technical Correlating Committee understands that the Panel Action deletes 348-100(a) of Proposal 8-276.
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION: Delete this sentence in its entirety.
SUBSTANTIATION: This paragraph is redundant with the definition in Section 348-1. This deletion is consistent with the goals and efforts of the Technical Correlating Committee Task Group on the usability of the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #280)

8- 299 - (348-16(a)): Accept in Principle
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION: Delete this sentence in its entirety.
SUBSTANTIATION: This paragraph is redundant with the definition in Section 348-1. This deletion is consistent with the goal and efforts of the Technical Correlating Committee Task Group on the usability of the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-298.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #276)

8- 300 - (348-16(b)): Accept
Note: The Technical Correlating Committee understands that the Panel Action deletes 348-100(b) accepted in Proposal 8-276.
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION: Delete this section in its entirety.
SUBSTANTIATION: This sentence is not necessary because adequate information is provided in the proposed change to Section 348-16(d). The letters EMT on each piece are adequate to distinguish from rigid. See companion Proposal for 348-16(d).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #281)

8- 301 - (348-16(b)): Accept in Principle
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION: Delete this section in its entirety.
SUBSTANTIATION: This sentence is not necessary because adequate information is provided in the proposed change to Section 348-16(d). The letters EMT on each piece are adequate to distinguish from rigid. See companion Proposal for 348-16(d).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-300.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3078)

8- 302 - (348-16(c)): Accept
Note: The Technical Correlating Committee understands that the accepted text revises the accepted text in 348-100(c) of Proposal 8-276.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise Section 348-16(c) to read:
(c) Factory-threaded Integral Couplings. Where EMT with a threaded integral coupling is utilized, threads for both the tubing and coupling shall be factory-made. The coupling and EMT threads shall be designed so as to prevent bending of the tubing at any part of the thread. ~~(c) Connectors. Where the tubing is coupled together by threads, the connector shall be designed so as to prevent bending of the tubing at any part of the thread.~~
SUBSTANTIATION: This language clarifies the only situation where EMT is permitted to be threaded. This integral coupling is no longer being produced, but a patent exists and UL does not want to delete it from the testing standard. See companion proposal for 348-9.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel can not verify the second part of the submitter's substantiation. Underwriters Laboratories is not aware of any requests to delete the product from the testing standard.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #279)

8- 303 - (348-16(d)): Reject
SUBMITTER: Brian E. Johnson, LTV Steel Tubular Products Co.
RECOMMENDATION: Change to read:
"Each length shall be clearly and durably marked every 10 ft (3.05 m) with the letters "EMT" at least 1/8 in. high in accordance with Section 110-21."
SUBSTANTIATION: Creates consistent marking language. The change is in agreement with the UL standard.
PANEL ACTION: Reject.
PANEL STATEMENT: EMT is required to be listed and the product standard specifies that the letters "EMT" be marked on the product.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3081)

8- 304 - (348-17 (New)): Accept
Note: The Technical Correlating Committee understands that the requirement appears in 348-6, and that text in the recommendation replaces the accepted text for 348-6 in Proposal 8-276.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add a new Section 348-3 to read:
Listing Requirements. Electrical Metallic Tubing (EMT), factory elbows and associated fittings shall be listed.
SUBSTANTIATION: An individual section is needed to cover this important requirement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3774)

8- 305 - (348-60 (New)): Accept
SUBMITTER: Richard E. Loyd, R&N Assoc.
RECOMMENDATION: Add a new section "Grounding" as follows:
348-60. Grounding. EMT shall be permitted as an equipment ground conductor.
SUBSTANTIATION: I serve on the Usability Task Group, Subtask Group 1, which has submitted proposals to reformat the existing nine raceway articles using a common template. After these proposals were submitted, I noticed that all of the raceway articles except Article 348 contain a section on grounding. In the substantiation of the rewrite for Article 348, the submitter indicates there is a section on grounding for EMT. However, this section does not appear in the actual proposal. EMT is permitted to be used as an equipment grounding conductor and should so indicate in Article 348, since all of the other raceway articles indicate whether or not the raceway can be used as an equipment grounding conductor. Omitting this information only from the EMT article will confuse the Code user.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: The language of this change contradicts the panel's action on Proposal 8-282.

ARTICLE 349 — FLEXIBLE METALLIC TUBING: TYPE FMT

(Log #1227)

8- 306 - (349): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Article 349 to read as follows:
Article 349—Flexible Metallic Tubing: Type FMT

A. General.

349-1. Scope. This article covers the use, installation, and construction specifications for Flexible Metallic Tubing (FMT) and associated fittings.

349-2. ~~349-1.~~ Definition. Flexible Metallic Tubing (FMT). ~~is a listed~~ A ~~tubing~~ raceway that is circular in cross section, flexible, metallic, and liquidtight without a nonmetallic jacket.

349-3. Other Articles. Installations of ~~flexible metallic tubing~~ FMT shall comply with ~~the provisions of the~~ applicable ~~sections~~ provisions of Article 300 ~~and Section 110-21~~.

349-6. Listing Requirements. FMT and associated fittings shall be listed.

B. ~~Construction and~~ Installation

349-10. ~~349-4.~~ Uses Permitted. ~~Flexible metallic tubing~~ FMT shall be permitted to be used for branch circuits

(1) In dry locations,
(2) Where concealed,
(3) In accessible locations, and
(4) For system voltages of 1000 volts maximum.

349-12. ~~349-5.~~ Uses Not Permitted. ~~Flexible metallic tubing~~ FMT shall not be used

(1) In hoistways;
(2) In storage battery rooms;
(3) In hazardous (classified) locations unless otherwise permitted under other articles in this Code;
(4) Underground for direct earth burial, or embedded in poured concrete or aggregate;
(5) Where subject to physical damage; and
(6) In lengths over 6 ft (1.83 m).

349-20. ~~349-10.~~ Size.
(a) Minimum. ~~Flexible metallic tubing~~ FMT smaller than 1/2-in. ~~electrical~~ trade size shall not be used.

Exception No. 1: ~~Flexible metallic tubing~~ FMT of 3/8-in. trade size shall be permitted to be installed in accordance with Sections 300-22(b) and (c).

Exception No. 2: ~~Flexible metallic tubing~~ FMT 3/8-in. trade size shall be permitted in lengths not in excess of 6 ft (1.83 m) as part of an approved assembly or for lighting fixtures. See Section 410-67(c).

(b) Maximum. The maximum size of ~~Flexible metallic tubing~~ FMT shall be the 3/4-in. trade size.

FPN: Metric trade numerical designations for FMT ~~Flexible metallic tubing~~ are 3/8 = 12, 1/2 = 16, and 3/4 = 21.

349-22. ~~349-12.~~ Number of Conductors.

(a) ~~Flexible metallic tubing~~ FMT — 1/2-in. and 3/4-in. Trade Size.

The number of conductors or cables ~~permitted~~ in 1/2-in. and 3/4-in. trade sizes ~~of Flexible metallic tubing~~ shall not exceed that permitted by the percentage ~~of~~ fill specified in Table 1, Chapter 9.

(b) ~~Flexible metallic tubing~~ FMT — 3/8-in. Trade Size.

The number of conductors ~~permitted~~ in 3/8-in. trade size ~~Flexible metallic tubing~~ shall not exceed that permitted in Table 350-22 ~~350-12~~.

349-24. ~~349-20.~~ Bends.

(a) Infrequent Flexing Use.

Where ~~the flexible metallic tubing~~ FMT ~~shall be~~ may be infrequently flexed in service after installation, the radii of bends measured to the inside of the bend shall not be less than specified in Table 349-24(a) ~~349-20(a)~~.

Table 349-24(a) ~~349-20(a)~~. Minimum Radii for Flexing Use
[*****1999 NEC Table 349-20(a) and note here *****]

(b) Fixed Bends.

Where ~~the flexible metallic tubing~~ FMT is bent for installation purposes and is not flexed or bent as required by use after installation, the radii of bends measured to the inside of the bend shall not be less than specified in Table 349-24(b) ~~349-20(b)~~.

Table 349-24(b) ~~349-20(b)~~. Minimum Radii for Fixed Bends
[******1999 NEC Table 349-20(b) and note here *****]

349-40. ~~349-18.~~ Boxes and Fittings.
~~Flexible metallic tubing shall be used only with listed terminal fittings.~~ Fittings shall effectively close any openings in the connection.

349-56. ~~349-17.~~ Splices and Taps.
Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies.

~~349-16~~ 349-60. Grounding.

See Section 250-118(8) for rules on the use of ~~flexible metallic tubing~~ FMT as an equipment grounding conductor.

C. Construction Specifications.

349-120. Marking. FMT shall be marked according to Section 110-21.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements.
Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.
The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

Explanation of renumbering and editorial changes;

Title; Acronym "FMT" added
349-1. New Scope added to conform with the style manual
349-2.
1. Definition renumbered from Section 349-1 to 349-2
2. "FMT" added
3. Flexible Metallic Tubing capitalized as it is a proper name of a product.
4. Listing requirements relocated to new Section 349-6
5. Changed "metallic" to metal
6. Changed "tubing" to "raceway"

349-3. Add acronym FMT, reworded for clarity, moved 110-21 reference to 349-120.

349-6. New section for listing requirements for FMT and associated fittings.

Part B new title "Installation"; construction requirements relocated to a new part C.

349-10.

1. Delete product name and replace with acronym "FMT"

2. Renumbered 349-4.

349-12.
1. Delete product name and replace with acronym "FMT"
2. Renumbered 349-5.

349-20.
1. Delete product name and replace with acronym "FMT"everywhere the product name was used.
2. The word "electrical" deleted as it added nothing to the clarity of the section.
3. Renumbered 349-10.

349-22.
1. Delete product name and replace with acronym "FMT"
2. Reword section 349-22(a) adding reference to "cables" for clarity.
3. Delete "permitted" as it is unecessary.
4. Update reference.
5. Renumbered 349-12.

349-24.
1. Delete product name and replace with acronym "FMT" .

2. Renumbered 349-20.

349-40.
1. Delete product name and replace with acronym "FMT"
2. Relocated listing requirements for fittings to 349-6.
3. Renumbered 349-18.

349-56. Renumbered 349-17.
349-60.
1. Delete product name and replace with acronym "FMT".
2. Renumbered 349-16.

C. Construction Specifications.

349-120. New section marking requirements relocated from 349-1, Definition.

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	Common Numbering System for the Circular Raceway Articles
	Article 3XX, <title>: <acronym>
	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.
3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.
3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete from the proposal: 349-3, and the second sentence of 349-56.
In proposed section 349-22(a) delete the words "or cables".
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP 8 recommends approval of the scope section by the TCC.

The proposed 349-3, and second sentence of 349-56 are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
There was no technical substantiation provided to add the words "or cables" as part of the rewrite of 349-22(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1287)

8- 307 - (349): Accept
Note: The Technical Correlating Committee notes that the dimension changes are implemented in the revisions on Proposal 8-306.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
349-5 (6) In lengths over 1.8 m (6 ft) ~~(1.83 m)~~.
349-10 (a) Minimum. Flexible metallic tubing smaller than metric designator 16 (1/2) ~~in. electrical trade size~~ shall not be used.
Exception No. 1: Flexible metallic tubing of metric designator 12 (3/8) ~~in. trade size~~ shall be permitted to be installed in accordance with Sections 300-22(b) and (c).
Exception No. 2: Flexible metallic tubing of metric designator 12 (3/8) ~~in. trade size~~ shall be permitted in lengths not in excess of 1.8 m (6 ft) ~~(1.83 m)~~ as part of an approved assembly or for lighting fixtures. See Section 410-67(c).
349-10 (b) Maximum. The maximum size of flexible metallic tubing shall be metric deisgnator 21 ~~the~~ (3/4) ~~in. trade size~~.
FPN: Metric trade numerical designations for flexible metallic tubing are 12 = 3/8 ~~= 12~~, 16 = 1/2 ~~= 16~~, and 21 = 3/4 ~~= 21~~.
349-12 (a) Flexible Metallic Tubing - Metric Designator 16 (1/2) ~~in.~~ and 21 (3/4) ~~in. Trade Size~~.
The number of conductors permitted in trade sizes 16 (1/2) ~~in.~~ and 21 (3/4) ~~in.~~ trade sizes of flexible metallic tubing shall not exceed the percentage of fill specified in Table 1, Chapter 9.
349-12 (b) Flexible Metallic Tubing - Metric Designator 12 (3/8) ~~in. Trade Size~~.
The number of conductors permitted in trade size 12 (3/8) ~~in. trade size~~ flexible metallic tubing shall not exceed that permitted in Table 350-12.
~~Table 349-20 (a)~~
Table 349-20(a). Minimum Radii for Flexing Use

~~Trade Size Minimum Radii~~
~~(in.) (in.)~~
~~3/8 10~~
~~1/2 12 1/2~~
~~3/4 17 1/2~~

~~Note: For SI units, 1 in. = 25.4 mm (radii).~~

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #840)

8- 308 - (349-2): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Definition. Flexible metallic tubing is a listed raceway ~~tubing~~ that is circular in cross section, flexible, metallic, and liquidtight without a metallic jacket.
SUBSTANTIATION: Edit. The designation of this product indicates it is a tubing, and defining a tubing as a tubing is a poor definition. Defining its function as a raceway would correlate with similar definitions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-306.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

Table 349-20(a). Minimum Radii for Flexing Use

		Minimum Radii for Flexing Use	
Trade Size	Metric Designator	In.	mm
3/8	12	10	25.4
1/2	16	12 1/2	317.5
3/4	21	17 1/2	444.5

~~Table 349-20 (b)~~
Table 349-20(b). Minimum Radii for Fixed Bends

		Minimum Radii for Fixed Bends	
Trade Size	Metric Designator	in	mm
3/8	12	3 1/2	88.9
1/2	16	4	101.6
3/4	21	5	127.0

~~Trade Size Minimum Radii~~
~~(in.) (in.)~~
~~3/8 3 1/2~~
~~1/2 4~~
~~3/4 5~~

(Log #1432)

8- 309 - (349-3): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 349-3 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-306.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #841)

8- 310 - (349-4): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence:
"Flexible metallic tubing shall be permitted for branch circuits and tap conductors."
SUBSTANTIATION: Branch circuits may end at an outlet to which FMT may be connected to supply utilization equipment with tap conductors, which may not be considered as branch circuit (conductors).
PANEL ACTION: Reject.
PANEL STATEMENT: Taps to a branch circuit are still considered as branch circuit conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2252)

8- 311 - (349-4(4)): Reject
SUBMITTER: Tim Quigley, Rome Electric Corp.
RECOMMENDATION: Should reference 430-145(b).
SUBSTANTIATION: 430-145(b) states that flexible metallic conduit can be used for any voltage to connect to motors.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation covers the use of FMC which is not covered by Article 349 (FMT).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3082)

8- 312 - (349-10): Accept in Principle in Part
Note: The Technical Correlating Committee understands that the revised text is to be placed in 349-20 of Proposal 8-306.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise this section and the FPN to read:
(a) Minimum. FMT ~~Flexible metallic tubing~~ smaller than 1/2 (16) ~~in. electrical trade size~~ shall not be used.
Exception No. 1: FMT ~~Flexible metallic tubing~~ of 3/8 (12) ~~in. trade size~~ shall be permitted to be installed in accordance with Sections 300-22(b) and (c).
Exception No. 2: FMT ~~Flexible metallic tubing~~ of 3/8 (12) ~~in. trade size~~ shall be permitted in lengths not in excess of 6 ft (1.83 m) as part of an approved assembly or for lighting fixtures. See Section 410-67(c).
(b) Maximum. FMT larger than 3/4 (21) shall not be used. ~~The maximum size of flexible metallic tubing shall be in the 3/4 in. trade size.~~
FPN: The Trade Size and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-x.
~~FPN: Metric trade numerical designations for flexible metal tubing are 3/8 = 12, 1/2 = 16, 3/4 = 21.~~
SUBSTANTIATION: To correlate with proposal submitted to CMP 3 to add a table showing English and Metric trade size designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code, which is no longer needed. Metric trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code. The UL standard does not include trade size 3/8.
PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the addition of the new FPN to read as follows:
"FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions."
The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of the word " Flexible Metallic Tubing" with the acronym "FMT" and the deletion of "in. electrical trade size" by action on Proposals 8-306 and 8-307.
The panel prefers the language used for "maximum size" per Proposal 8-306.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-306 and 8-307.
The product standard (UL 360) used to evaluate FMT does cover 3/8" trade size.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3040)

8- 313 - (349-12): Accept in Principle
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise to read:
(a) Flexible Metallic Tubing— ~~1/2 in. and 3/4 in.~~ Trade Sizes 1/2 (16) and 3/4 (21). The number of conductors permitted in 1/2 (16) ~~in.~~ and 3/4 (21) ~~in. trade sizes of flexible metallic tubing~~ FMC shall not exceed the percentage of fill specified in Table 1, Chapter 9.
(b) Flexible Metallic Tubing— ~~3/8 in.~~ Trade Size 3/8 (12). The number of conductors permitted in ~~3/8 in.~~ trade size 3/8 (12) FMC ~~flexible metallic tubing~~ shall not exceed that permitted in Table 350-12.
SUBSTANTIATION: Trade sizes for conduit and tubing no longer use the "inch" designation. This is a companion proposal to 349-10 submitted by NEMA.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposals 306 and 307.
The panel recognizes that the submitter intended to state "FMT" not "FMC".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
BERMAN: Typographical error - Panel Statement should reference Proposals 8-306 and 8-307.

(Log #3041)

8- 314 - (349-20): Accept in Principle
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Remove the "(in.)" from the Table in 349-20(a) and (b).
SUBSTANTIATION: Trade sizes for conduit and tubing no longer use the "inch" designation. This is a companion proposal to 349-10 submitted by NEMA.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-307.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 350 — FLEXIBLE METAL CONDUIT: TYPE FMC

(Log #1228)

8- 315 - (350): Accept in Principle

NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Article 350 to read as follows:

ARTICLE 350 FLEXIBLE METAL CONDUIT: Type FMC

A. General

350-1. Scope. This article covers the use ~~and~~, installation, ~~of~~ and construction specifications for Flexible Metal Conduit (FMC) and associated fittings.

350-2. Definition. Flexible Metal Conduit (FMC). A ~~is a~~ raceway of circular cross section made of helically wound, formed, interlocked metal strip.

350-3. Other Articles. Installations of FMC ~~flexible metal conduit~~ shall comply with ~~the~~ applicable provisions of Article 300.

350-6. Listing Requirements. FMC and associated fittings shall be listed.

B. Installation

350-10. ~~350-4~~ Uses Permitted. FMC ~~Flexible metal conduit shall be listed and~~ shall be permitted to be used in exposed and concealed locations.

350-12. ~~350-5.~~ Uses Not Permitted. FMC ~~Flexible metal conduit~~ shall not be used in the following:

(1) In wet locations unless the conductors are approved for the specific conditions and the installation is such that liquid is not likely to enter raceways or enclosures to which the conduit is connected.

(2) In hoistways, other than as permitted in Section 620-21(a)(1)

(3) In storage battery rooms

(4) In any hazardous (classified) location other than as permitted in Sections 501-4(b) and 504-20

(5) Where exposed to materials having a deteriorating effect on the installed conductors, such as oil or gasoline

(6) Underground or embedded in poured concrete or aggregate

(7) Where subject to physical damage

350-20. ~~350-10.~~ Size.

(a) Minimum. FMC ~~Flexible metal conduit~~ less than 1/2 in. ~~electrical~~ trade size shall not be used unless permitted in (1) through (5) below for 3/8-in. ~~electrical~~ trade size.

(1) For enclosing the leads of motors as permitted in Section 430-145(b)

(2) In lengths not in excess of 6 ft (1.83 m)

(a) For utilizing equipment, or

(b) As part of a listed assembly, or

(c) For tap connections to lighting fixtures as permitted in Section 410-67(c)

(3) For manufactured wiring systems as permitted in Section 604-6(a)

(4) In hoistways, as permitted in Section 620-21(a)(1)

(5) As part of a listed assembly to connect wired fixture sections as permitted in

Section 410-77(c)

(b) Maximum. FMC ~~Flexible metal conduit~~ larger than 4-in. ~~electrical~~ trade size shall not be used.

FPN: Metric trade numerical designations for FMC ~~flexible metal conduit~~ are 3/8 = 12, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, and 4 = 103.

~~350-12~~. 350-22. Number of Conductors. The number of conductors or cables ~~permitted in a flexible metal conduit~~ shall not exceed that permitted by the percentage ~~of~~ fill specified in Table 1, Chapter 9, or as permitted in Table 350-~~12~~ 22 for 3/8 in. trade size ~~flexible metal conduit~~.

Table 350-22. ~~Table 350-12.~~ Maximum Number of Insulated Conductors in 3/8-in. Flexible Metal Conduit*

***** 1999 NEC Table 350-12 here *****

350-26. ~~350-16.~~ Bends. There shall not be more that the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes. Bends in the conduit shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. The radius of the curve of the inner edge of any field bend shall not be less than shown in Table 346-~~10~~ 24.

350-28. ~~350-22.~~ Trimming. All cut ends ~~of flexible metal conduit~~ shall be trimmed or otherwise finished to remove rough edges, except where fittings that thread into the convolutions are used.

350-30. ~~350-18. Supports.~~ Securing and Supporting. FMC shall be securely fastened in place and supported in accordance with (a) and (b).

(a) Securely Fastened. FMC ~~Flexible metal conduit~~ shall be securely fastened in place by an approved means within 12 in.(305 mm) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 4 1/2 ft (137 mm).

Exception No. 1: Where ~~flexible metal conduit~~ FMC is fished.

Exception No. 2: Lengths not exceeding 3 ft (914 mm) at terminals where flexibility is required.

Exception No. 3: Lengths not exceeding 6 ft (1.83 m) from a fixture terminal connection for tap connections to light fixtures as permitted in Section 410-67(c).

(b) Supports. Horizontal runs of ~~flexible metal conduit~~ FMC supported by openings through framing members at intervals not greater than 4 1/2 ft (1.37 m) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.

350-42. Couplings and Connectors. ~~350-20. Fittings. Fittings used with flexible metal conduit shall be listed.~~ Angle connectors shall not be used for concealed raceway installations.

350-56. ~~350-24.~~ Splices and Taps. Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies.

350-60. ~~350-14.~~ Grounding. FMC ~~Flexible metal conduit~~ shall be permitted as a grounding means as covered in Section 250-118. Where an equipment bonding jumper is required around FMC ~~flexible metal conduit~~, it shall be installed in accordance with Section 250-102.

Where used to connect equipment where flexibility is required, an equipment grounding conductor shall be installed.

SUBSTANTIATION:

The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements.

Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.

The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

Explanation of proposed renumbering and editorial changes;

Title Acronym "FMC" added

350-1 New language "and construction specifications for" added for consistency with other circular raceway articles; Flexible Metal Conduit capitalized as it is a proper name of a product; acronym added.

350-2 Acronym added; Flexible Metal Conduit capitalized as it is a proper name of a product.

350-3 Acronym "FMC" added, delete product name.

350-6 New section to relocate listing requirements for FMC and associated fittings.

Requirements formerly in 350-4 and 350-20

350-10 Formerly 350-4; acronym added; product name deleted; listing requirements

moved to 350-6

350-12 Formerly 350-5; acronym added; product name deleted.

350-20 Formerly 350-10; acronym added; product name deleted; word "electrical" deleted as it added nothing to the clarity of the section.

350-22 Formerly 350-12; editorial revisions for clarity.

350-26 Formerly 350-16; reference to Table 346-10 changed to reflect the new numberin sequence there (Table 346-24).

350-28 Formerly 350-22; product name deleted as it was unnecessary.

350-30 Formerly 350-18; retitled "Securing and Supporting" with respective sections added to separate the former requirements; acronym added; product name deleted.

350-42 Formerly 350-20; Retitled "Couplings and Connectors" to more accurately describe the section; listing requirements moved to 350-6.

350-56 Formerly 350-24

350-60 Formerly 350-14; acronym added; product name deleted.

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	Common Numbering System for the Circular Raceway Articles
	Article 3XX, <title>: <acronym>
	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.
3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.
3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete from the proposal: 350-3, and the second sentence of 350-56.
In proposed 350-22 delete the words "or cables."
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 350-3, and second sentence of 346-56 are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
There was no technical substantiation provided to add the words "or cables" as part of the rewrite of 350-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1288)

8- 316 - (350): Accept
NOTE: The Technical Correlating Committee understands that the revised dimensions will be implemented in the revisions of Proposal 8-315.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
350-10 (a) Minimum. Flexible metal conduit less than metric designator 16 (1/2) ~~in. electrical trade size~~ shall not be used unless permitted in (1) through (5) below for metric designator 12 (3/8) - ~~in. electrical trade~~ size.
350-10 (a) (2) In lengths not in excess of 1.8 m (6 ft) ~~(1.83 m)~~
350-10 (b) Maximum. Flexible metal conduit larger than metric designator 103 (4) ~~in. electrical trade size~~ shall not be used.
FPN: Metric trade numerical designations for flexible metal conduit are 12 = 3/8 ~~= 12~~, 16 = 1/2 ~~= 16~~, 21 = 3/4 ~~= 21~~, 27 = 1 ~~= 27~~, 35 = 1 1/4 ~~= 35~~, 41 = 1 1/2 ~~= 41~~, 53 = 2 ~~= 53~~, 63 = 2 1/2 ~~= 63~~, 78 = 3 ~~= 78~~, 91 = 3 1/2 ~~= 91~~, and 103 = 4 ~~= 103~~.
350-12 The number of conductors permitted in a flexible metal conduit shall not exceed the percentage of fill specified in Table 1, Chapter 9, or as permitted in Table 350-12 for metric designator 12 (3/8) ~~in.~~ flexible metal conduit.
Table 350-12. Maximum Number of Insulated Conductors in Metric designator 12 (3/8) ~~in.~~ Flexible Metal Conduit*
350-18 Flexible metal conduit shall be securely fastened in place by an approved means within 300 mm (12 in.) ~~(305 mm)~~ of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft) ~~(1.37 m).~~
Exception No. 1: Where flexible metal conduit is fished.
Exception No. 2: Lengths not exceeding 900 mm (3 ft) ~~(914 mm)~~ at terminals where flexibility is required.

Exception No. 3: Lengths not exceeding 1.8 m (6 ft) ~~(1.83 m)~~ from a fixture terminal connection for tap connections to light fixtures as permitted in Section 410-67(c).

Horizontal runs of flexible metal conduit supported by openings through framing members at intervals not greater than 1.4 m (4 1/2 ft) ~~(1.37 m)~~ and securely fastened within 300 mm (12 in.) ~~(305 mm)~~ of termination points shall be permitted.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #1433)

8- 317 - (350-3): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 350-3 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-315.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #842)

8- 318 - (350-5(8) (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
(8) For conductors operating at over 600 volts, nominal, except as permitted by Section 430-123 for motors, and Article 600 for electric signs and outline lighting.
SUBSTANTIATION: The UL "white book" indicates listed conduit is limited to 600 volts or less circuits except as otherwise permitted for motors and signs. Code users may infer from those uses permitted in the Code and this section that there is no general voltage restriction. The proposal would reinforce Sections 110-3 and 300-2 which are general in nature and may be overlooked. This section is a logical location to clearly indicate an important not permitted use. This is done in Section 351-23(b) for LTFNMC.
PANEL ACTION: Reject.
PANEL STATEMENT: This additional language is not necessary as Sections 110-3(b) and 300-2 already cover the requirement to use a product in accordance with its listing and respective voltage limitation. Sections 430-123 and 600-7 specifically permit the use of FMC for over 600 volt applications.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #843)

8- 319 - (350-9): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
"Grounding. Flexible metal conduit shall be permitted as a grounding means as covered in Section 250-118. Where an equipment bonding jumper is ~~required~~ provided around flexible metal conduit..." (remainder unchanged)
SUBSTANTIATION: The word "required" is associated with Code rules; the provisions of Section 250-102 should apply where a bonding jumper is installed by choice.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-336. The panel believes that the submitter intended to reference Section 350-14 in his proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3083)

8- 320 - (350-10): Accept in Principle in Part
NOTE: The Technical Correlating Committee understands that the action text revises the FPN following 350-20(b) in Proposal 8-315.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise this section and the FPN to read:
(a) Minimum. FMC ~~Flexible metal conduit less~~ smaller than 1/2 (16) ~~in. electrical trade size~~ shall not be used unless permitted in (1) through (5) below for 3/8 (12). ~~in. electrical trade size.~~
(1) For enclosing the leads of motors as permitted in Section 430-145(b)
(2) In lengths not in excess of 6 ft (1.83 m)
a. For utilizing equipment, or
b. As part of a listed assembly, or
c. For tap connections to lighting fixtures as permitted in Section 410-67(c)
(3) For manufactured wiring systems as permitted in Section 604-6(a)
(4) In hoistways, as permitted in Section 620-21(a)(1)
(5) As part of a listed assembly to connect wired fixture sections as permitted in Section 410-77(c)
(b) Maximum. FMC ~~Flexible metal conduit~~ larger than 4 (103) ~~in. electrical trade size~~ shall not be used. ~~The maximum size of liquidtight flexible metal conduit shall be the 4 in. trade size.~~
FPN: The Trade Size and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-x.
~~FPN: Metric trade numerical designations for flexible metal tubing are 3/8 = 12, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103.~~
SUBSTANTIATION: To correlate with proposal submitted to CMP 3 to add a table showing English and Metric trade size designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code, which is no longer needed. Metric trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for 2002 Code.
PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the addition of the new FPN to read as follows:
"FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions".
The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of the word " Flexible Metal Conduit" with the acronym "FMC" and the deletion of "in. electrical trade size" by action on Proposals 8-315 and 8-316.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-315 and 8-316.
The panel points out that the second sentence of 5(b) is not part of the existing text and that the reference to flexible metallic tubing in the deleted FPN should be flexible metal conduit.
The product standard (UL 360) used to evaluate FMT does cover 3/8" trade size.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
BERMAN: The last sentence of the Panel Statement was incorrectly carried over from the Panel Statement on Proposal 8-312 and does not apply to this proposal.

(Log #1709)

8- 321 - (350-10(a)(2)c): Reject
SUBMITTER: Ray C. Mullin, Ray C. Mullin Books
RECOMMENDATION: Revise text as follows:
(c) For tap connections to lighting fixtures as permitted in Section 410-67(c). Where fished in the spaces above ceilings and in walls, the maximum total length shall not exceed 25 ft, and an equipment grounding conductor shall be installed.
SUBSTANTIATION: The present NEC permits 3/8 in. flex in lengths not over 6 ft to connect lighting fixtures.

When installing recessed lighting fixtures (cans) above ceilings in remodel work, electricians "fish" the flex in ceilings and down to the switches using 3/8 in. flex. They pull in the circuit conductors and generally include an equipment grounding conductor. When more than one lighting fixture is installed, they run the 3/8 in. flex to the first fixture, then "daisy chain" to the remaining fixtures.

In some areas, they use armored cable (BX) and in other areas they use nonmetallic-sheathed cable (NMC). But in the Chicagoland area and other parts of the country, electricians prefer to install 3/8 in. flex. This is their choice. They wish to have the advantage of being able to add or remove conductors in the future if needed. Their codes do not permit the use of armored cable or nonmetallic-sheathed cable.

It is impossible to install 1/2 in. flexible metal conduit because it is not flexible enough to bend the 1/2 in. flex into the knockouts on the lighting fixtures junction box. 3/8 in. flex offers the needed flexibility.

This proposal will make legal what is already being done in the field on remodel work. This proposal merely extends the present 6 ft maximum length for concealed remodel work where the flex is fished in above ceilings and in walls. This proposal is not intended to make 3/8 in. flex a wiring method, but instead, merely backing off of the present 6 ft maximum length for this specific application.
PANEL ACTION: Reject.
PANEL STATEMENT: Flexible metal conduit is produced in standard sizes of 1/2" through 4". The 3/8" size is produced for special applications and is not intended as a general use wiring method.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #844)

8- 322 - (Table 350-12): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Table 350-12 Maximum Number of Insulated Conductors in 3/8-in. Flexible Metal Conduit.*
SUBSTANTIATION: The reasoning behind this table is somewhat obscure. In general a single conductor in a raceway is not permitted by Section 300-3(b). Section 250-118 permits the conduit as a grounding means under certain conditions. Three No. 12 THHN circuit conductors are permitted with an additional No. 12 "covered" conductor for grounding, but if the grounding conductor is not required four circuit conductors are not permitted. Derating requirements are still applicable.

The present asterisk note literally only permits the grounding conductor if it is the same size as the circuit conductors, presumably not permitting a smaller size conductor, such as where a 15 ampere overcurrent device protects No. 10 conductors. It also literally does not provide for an insulated grounding conductor or bonding jumper.

Individually "covered" conductors per Article 100 are not indicated in Code tables re: area, material covering, temperature rating, etc. and do not appear to be a listed product. This creates a problem with other Code Sections such as 110-2, 110-3, 110-11, etc.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed table does not enhance clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #26)

8- 323 - (350-14): Accept in Principle
NOTE: The Technical Correlating Committee understands that the revised text replaces the text accepted in 350-60 of Proposal 8-315.
NOTE: The following proposal consists of Comment 8-330 on Proposal 8-187 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-187 was:
Revise paragraph 3 to read as follows:
"Where used to connect equipment where flexibility is required, or where vibration is likely to be present, an equipment grounding conductor shall be installed."
SUBMITTER: Morton L. Mullins, Chemical Manufacturers Assn.
RECOMMENDATION: The proposal needs to be clarified as to how the required equipment grounding conductor may be installed. If Article 315 is approved, add a new sentence to 315-60(a) that states:
The equipment grounding conductor may be installed inside or outside the flexible metal conduit. If 315 is not approved, add the new sentence to paragraph 3 of 350-14 after the word "installed".
SUBSTANTIATION: The addition of the requirement for an equipment grounding conductor where vibration is likely was done without clarifying that the conductor may be inside or outside the flexible metal conduit. The addition of the new sentence removes this confusion.
PANEL ACTION: Accept in Principle.
Revise the text of this section as follows:
"350-14. Grounding and Bonding.
Where used to connect equipment where flexibility is required, an equipment grounding conductor shall be installed.
Where required or installed, equipment grounding conductors shall be installed in accordance with 250-134(b).
Where required or installed, equipment bonding jumpers shall be installed in accordance with 250-102."
PANEL STATEMENT: The amended text adequately covers equipment grounding and bonding requirements. The panel does not agree that bonding jumpers shall always be contained inside the raceway. Section 250-102(e) permits the installation of the bonding jumper on the inside or outside of the raceway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: Either an equipment grounding conductor or an equipment bonding jumper is acceptable to address the concern, provided a bonding jumper is installed in accordance with 250-102(e). The first sentence of Section 350-14 should, therefore, read "Where used to connect equipment where flexibility is required, an equipment grounding conductor or an equipment bonding jumper shall be installed". The remainder of the panel's revised text is correct as shown.

Table 350-12. Maximum Number of Insulated Conductors in 3/8-in. Flexible Metal Conduit*

Size (AWG)	Fittings Inside Conduit	Fittings Outside Conduit	Fittings Inside Conduit	Fittings Outside Conduit	Fittings Inside Conduit	Fittings Outside Conduit	Fittings Inside Conduit	Fittings Outside Conduit
18	~~2~~ 3	~~3~~ 4	~~3~~ 4	~~5~~ 6	~~5~~ 6	~~8~~ 9	~~5~~ 6	~~8~~ 9
16	~~1~~ 2	~~2~~ 3	~~3~~ 4	~~4~~ 5	~~4~~ 5	~~6~~ 7	~~4~~ 5	~~6~~ 7
14	~~1~~ 2	~~2~~ 3	~~3~~ 4	~~3~~ 4	~~3~~ 4	4 5	~~3~~ 4	4 5
12	—	—	~~1~~ 2	~~2~~ 3	~~2~~ 3	~~3~~ 4	~~2~~ 3	~~3~~ 4
10	—	—	~~1~~ 2	~~1~~ 2	~~1~~ 2	~~1~~ 2	~~1~~ 2	~~2~~ 3

~~* In addition, one covered or bare~~ An equipment grounding conductor or equipment bonding jumper that is bare or has the same insulation type and is not larger than the circuit conductors shall be permitted and shall be counted in applying the table.

LOYD: The proposal should have been rejected. I believe CMP 8 exceeded their scope in rewording this section of the code. A Technical Correlating Committee Task Group prior to this meeting addressed this issue. It was determined that CMP 8 could address 250-118 issues. However, it is the responsibility of CMP 5 to address the methods for grounding installations. No substantiation has been provided for adding this redundant text to Article 350. I also believe it adds confusion rather than clarity.

(Log #1927)

8- 324 - (350-14): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
RECOMMENDATION: Revise the second paragraph to read:
Where used to connect equipment where flexibility is required or where likely to be subjected to vibration, an equipment grounding conductor shall be installed.
SUBSTANTIATION: This first appeared in the 1987 NEC as Section 350-5, Exception No. 2. It was added in response to reports of loose flex fittings or loose locknuts. Vibration is more often the cause of these failures than is the need for flexibility.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the term "vibration" is too subjective and the panel maintains its position that it is a design issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3084)

8- 325 - (350-16): Accept in Principle
NOTE: The Technical Correlating Committee understands that the panel action replaces the last sentence of 350-26 in Proposal 8-315. It was the action of the Technical Correlating Committee that this Proposal be reconsidered and that the panel utilize the common numbering system for the text in 350-26. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise the last sentence to read:
The radius of the curve ~~of the inner edge~~ to the centerline of any field bend shall not be less than shown in Table 346-10 using the column "Other Benders."
SUBSTANTIATION: This change is necessary to correlate with the proposal to revise Table 346-10. This text clarifies that measurements are to be made to the centerline and provides radii consistent with other conduits.
PANEL ACTION: Accept in Principle.
In the proposed text change "Other Benders" to "Other Bends".
PANEL STATEMENT: The word "Benders" is replaced with the word "Bends" in the third column so the column is applicable to bends made by other than one shot and full shoe benders. Bends made in ENT, RNC, FMC, and LFNC are examples of bends that would be made by means other than one shot and full shoe benders.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1461)

8- 326 - (350-20): Reject
SUBMITTER: Joseph E. McCann, City of Coral Springs, FL
RECOMMENDATION: Add new text to read as follows:
All fitting used with flexible metal conduit shall be made up tight.
SUBSTANTIATION: Since most circuits run within flexible metal conduit have equipment grounds with them, many installers don't see a reason for a good mechanical connection. But what happens when an equipment ground is not required, then there is no continuity.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are addressed by the requirements of 250-120(a) which covers the installation of equipment grounding conductors. This section of the code is applicable as FMC is an equipment grounding conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 351 — LIQUIDTIGHT FLEXIBLE METAL CONDUIT: TYPE LFMC

(Log #1229)

8- 327 - (351): Accept in Principle
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee notes that an Article number will be assigned at the end of the revision cycle.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Separate existing Article 351 into two distinct articles; Liquidtight Flexible Metal Conduit and Liquidtight Flexible Nonmetallic Conduit. This proposal contains the proposed text for Liquidtight Flexible Metal Conduit. See companion proposal for Liquidtight Flexible Nonmetallic Conduit, Article 3YY.
Article 3XX Liquidtight Flexible Metal Conduit ~~and Liquidtight Flexible Nonmetallic Conduit~~: Type LFMC
A. General ~~Liquidtight Flexible Metal Conduit~~
3XX-1. Scope. This article covers the use, installation, and construction specifications for Liquidtight Flexible Metal Conduit ~~and liquidtight flexible nonmetallic conduit.~~ (LFMC) and associated fittings.
3XX-2. Definition. Liquidtight Flexible Metal Conduit (LFMC). A ~~is a listed~~ raceway of circular cross section having an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core with associated couplings, connectors, and fittings and approved for the installation of electric conductors.
3XX-3. Other Articles. Installations of LFMC ~~liquidtight flexible metal conduit~~ shall comply with ~~the~~ applicable provisions of Article 300 and with ~~the~~ specific sections of Articles 350, 501, 502, 503, and 553 referenced below.
FPN: For marking requirements, see Section 110-21.
3XX-6. Listing Requirements. LFMC and associated fittings shall be listed.

~~B. Installation~~
~~351-4 Use.~~
3XX-10. Uses Permitted.
~~(a) Permitted. Listed Liquidtight flexible metal conduit~~ LFMC shall be permitted to be used in exposed or concealed locations as follows:
1. Where conditions of installation, operation, or maintenance require flexibility or protection from liquids, vapors, or solids
2. As permitted by Sections 501-4(b), 502-4, 503-3, and 504-20 and in other hazardous (classified) locations where specifically approved, and by Section 553-7(b)
3. For direct burial where listed and marked for the purpose.

3XX-12. Uses Not Permitted.
~~(b) Not Permitted. Liquidtight flexible metal conduit~~ LFMC shall not be used as follows:
1. Where subject to physical damage
2. Where any combination of ambient and conductor temperature will produce an operating temperature in excess of that for which the material is approved.

3XX-20. ~~351-5.~~ Size.
(a) Minimum. LFMC ~~Liquidtight flexible metal conduit~~ smaller than 1/2-in. ~~electrical~~ trade size shall not be used.
Exception: LFMC ~~Liquidtight flexible metal conduit~~ of 3/8-in. size shall be permitted as covered in Section 350-20(a) ~~350-10(a).~~
(b) Maximum. The maximum size of LFMC ~~Liquidtight flexible metal conduit~~ shall be the 4-in. trade size.
FPN: Metric trade numerical designations for LFMC ~~liquidtight flexible metal conduit~~ are 3/8 = 12, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, and 4 = 103.
3XX-22. ~~351-6.~~ Number of Conductors.
(a) 1/2-in. through 4-in. Trade Sizes. ~~Single Conduit.~~ The number of conductors or cables ~~permitted in a single conduit, 1/2 in. through 4-in. trade sizes,~~ shall not exceed that permitted by the percentage ~~of~~ fill specified in Table 1, Chapter 9.
(b) ~~Liquidtight Flexible Metal Conduit —~~ 3/8-in. Trade Size. The number of conductors ~~permitted in 3/8 in. liquidtight flexible metal conduit~~ shall not exceed that permitted in Table 350-22 ~~350-12~~.
3XX-26 ~~351-10~~. Bends -- Number in One Run. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes.
3XX-30. ~~351-8. Supports~~ Securing and Supporting. LFMC shall be securely fastened in place and supported in accordance with (a) and (b).

(a) Securely Fastened. ~~Liquidtight flexible metal conduit~~ LFMC shall be securely fastened in place by an approved means within 12 in. (305 mm) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 4 1/2 ft (1.37 m).
Exception No. 1: Where ~~Liquidtight flexible metal conduit~~ LFMC is fished.
Exception No. 2: Lengths not exceeding 3 ft (914 mm) at terminals where flexibility is necessary.
Exception No. 3: Lengths not exceeding 6 ft (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures as permitted in Section 410-67(c).
(b) Supports. Horizontal runs of ~~liquidtight flexible metal conduit~~ LFMC supported by openings through framing members at intervals not greater than 4 1/2 ft (1.37 m) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.
3XX-42. Couplings and Connectors. ~~351-7. Fittings. Liquidtight flexible metal conduit LFMC shall be used only with listed terminal fittings.~~ Angle connectors shall not be used for concealed raceway installations.
3XX-56. ~~351-11~~. Splices and Taps. Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies.
3XX-60. ~~351-9~~. Grounding. ~~Liquidtight flexible metal conduit~~ LFMC shall be permitted as a grounding means as covered in Section 250-118. Where an equipment bonding jumper is required around ~~liquidtight flexible metal conduit~~ LFMC, it shall be installed in accordance with Section 250-102.
Where used to connect equipment where flexibility is required, an equipment grounding conductor shall be installed.
FPN: See Sections 501-16(b), 502-16(b), and 503-16(b) for types of equipment grounding conductors.
SUBSTANTIATION:
The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements. Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.
The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements presented in the nine current circular raceway articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.
A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.
For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.
The following text is provided to further substantiate all changes and to cross reference between the 1999 NEC® Article 351, Part A, and the proposed revision to this article for the 2002 cycle.
Split the existing Article 351 into two separate articles to accommodate both metallic and nonmetallic conduit. By using the Section Number 3XX as this particular article number, the numbering system conforms to the common section numbering format that this usability subtask group is proposing. This Subtask Group recognizes that only the Technical Correlating Committee has the authority to assign article numbers.

Explanation of proposed renumbering and editorial changes;
Title Acronym "LFMC" added
A. General

- 3XX-1 Scope revised to conform with the style manual.
- 3XX-2 (1) Acronym "LFMC" Added for clarity.
  (2) Listing requirements relocated to new Section 3XX-6.
- 3XX-3 Product name deleted and replaced with acronym "LFMC".
- 3XX-6 New section to relocate listing requirements for LFMC and associated fittings. Listing requirements for the conduit came from 351-2 (1999 NEC) and for the fittings from 351-7 (1999 NEC).

B. Installation.

- 3XX-10 (1) Title 351-4 Use was deleted.
  (2) Uses Permitted renumbered from Section 351-4(a) to 3XX-10.
  (3) Product name deleted and replaced with acronym "LFMC".
- 3XX-12 (1) Uses Not Permitted renumbered from Section 351-4(b) to 3XX-12.
  (2) Product name deleted and replaced with acronym "LFMC".
- 3XX-2 (1) Size renumbered from Section 351-5 to 3XX-20.
  (2) Product name deleted and replaced with acronym "LFMC" (four places).
  (3) Corrected section reference.

(4) The word "electrical" deleted as it added nothing to the clarity of the section.

- 3XX-22 (1) Number of Conductors renumbered from 351-6 to 3XX-22.
  (2) Text of section was revised for clarity and consistency with other articles.
  (3) Corrected section reference.
- 3XX-26 Bends--Number in One Run renumbered from 351-10 to 3XX-26.
- 3XX-30 (1) Securing and Supporting renumbered from 351-8 to 3XX-30.
  (2) Product name deleted and replaced with acronym "LFMC" (3 Places).
  (3) Separated the Section into two parts for clarity.
- 3XX-42 (1) Moved listing requirements to Section 3XX-6.
  (2) Angle connector requirement relocated from 351-7 to new Section 3XX-42 Couplings and Connectors.
- 3XX-56 Splices and Taps renumbered from 351-11 to 3XX-56.
- 3XX-60 (1) Grounding renumbered from 351-9 to 3XX-60.
  (2) Product name delet ed and replaced with acronym "LFMC" (2 places).

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	Common Numbering System for the Circular Raceway Articles
	Article 3XX, <title>: <acronym>
	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.

3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.
3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete from the proposal: the second sentence of 3XX-56.
In proposed 3XX-22 delete the words "or cables."
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed second sentence of 3XX-56 is deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
There was no technical substantiation provided to add the words "or cables" as part of the rewrite of 3XX-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1230)

8- 328 - (351): Accept in Principle
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee notes that an Article number will be assigned at the end of the revision cycle.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Separate existing Article 351 into two distinct articles; Liquidtight Flexible Metal Conduit and Liquidtight Flexible Nonmetallic Conduit. This proposal contains the proposed text for Liquidtihgt Flexible Nonmetallic Conduit. See companion proposal for Liquidtight Flexible Metallic Conduit, Article 351A.

Article 3YY Liquidtight Flexible Nonmetallic Conduit: Type LFNC

~~I General.~~
3YY-1. Scope. This article covers the use, installation, and construction specifications for liquidtight flexible nonmetallic conduit (LFNC) and associated fittings.
3YY.2 Definition. Liquidtight Flexible Nonmetallic Conduit (LFNC). A raceway of circular cross section of various types as follows:
(1) A smooth seamless inner core and cover bonded together and having one or more reinforcement layers between the core and covers, designated as Type LFNC-A
(2) A smooth inner surface with integral reinforcement within the conduit wall, designated as Type LFNC-B
(3) A corrugated internal and external surface without integral reinforcement within the conduit wall, designated as LFNC-C.
LFNC is flame resistant and with fittings, and is approved for the installation of electrical conductors.
FPN: FNMC is an alternate designation for LFNC. (ROP 8-342)
3YY.6 Listing Requirements. LFNC and associated fittings shall be listed.
II Installation.
3YY-10. Uses Permitted. LFNC shall be permitted to be used in exposed or concealed locations for the following purposes:
FPN: Extreme cold may cause some types of nonmetallic conduits to become brittle and therefore more susceptible to damage from physical contact.
(1) Where flexibility is required for installation, operation, or maintenance.
(2) Where protection of the contained conductors is required from vapors, liquids or solids.
(3) For outdoor locations where listed and marked as suitable for the purpose.
(ROP 8-343)
(4) For direct burial where listed and marked for the purpose.
(5) Type LFNC -B shall be permitted to be installed in lengths longer than 1.8 m (6 ft) where secured in accordance with 351B.30. (ROP 8-329, 8-345)
(6) Type LFNC_B as a listed manufactured prewired assembly, metric designator 16 (1/2) through 27 (1).
3YY.12 Uses Not Permitted. LFNC shall not be used as follows:
(1) Where subject to physical damage
(2) Where any combination of ambient and conductor temperatures is in excess of that for which the LFNC is approved
(3) In lengths longer than 1.8 m (6 ft), except as permitted by 351B.10(5) or where a longer length is approved as essential for a required degree of flexibility (ROP 8-329)
(4) Where voltage of the contained conductors is in excess of 600 volts, nominal
3YY.20 Size.
(a) Minimum. LFNC smaller than metric designator 16 (1/2) shall not be used unless permitted in (1) through (3) metric designator 12 (3/8). (ROP 8-329)
(1) For enclosing the leads of motors as permitted in Section 430-145(b)
(2) In lengths not exceeding 6 ft (1.83 m) as part of a listed assembly for tap connections to lighting fixtures as required in Section 410-67(c), or for utilization equipment
(3) For electric sign conductors in accordance with Section 600-32(a)
(b) Maximum. LFNC larger than metric designator 103 (4) shall not be used.
FPN: See 300.1(C) for the metric designators and trade sizes. These are for identification purposes only and do not relate to actual dimensions. (ROP 8-354)
3YY.22 Number of Conductors. The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.
3YY.26 Bends. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points, e.g., conduit bodies and boxes. Bends shall be made so that the conduit will not be damaged and that the internal diameter of the conduit shall not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve to the centerline of such bends shall not be less than shown in Table 346.10 using the column 'Other Bends'. (ROP 8-359)
3YY.30 Securing and Supporting. LFNC-B shall be securely fastened and supported in accordance with one of the following:
(1) The conduit shall be securely fastened at intervals not exceeding 900 mm (3 ft) and within 300 mm (12 in.) on each side of every outlet box, junction box, cabinet, or fitting. (ROP 8-329)

(b) Securing or supporting of the conduit shall not be required where it is fished, installed in lengths not exceeding 3 ft. (914 mm) at terminals where flexibility is required, or where installed in lengths not exceeding 6 ft. (1.83 m) from a fixture terminal connection for tap conductors to lighting fixtures permitted in Section 410-67(c).

(c) Horizontal runs of ~~liquidtight flexible nonmetallic conduit~~ LFNC supported by openings through framing members at intervals not exceeding 3 ft. (914 mm) and securely fastened within 12 in. (305 mm) of termination points shall be permitted.

3YY-42. Couplings and Connectors. ~~351 26. Fittings. Liquidtight flexible nonmetallic conduit shall be used only with listed terminal fittings.~~ Angle connectors shall not be used for concealed raceway installations.

3YY-56. ~~351 29.~~ Splices and Taps. Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies.

3YY-60. ~~351-28. Equipment~~ Grounding. Where an equipment grounding conductor is required for the circuits installed in LFNC ~~liquidtight flexible nonmetallic conduit~~, it shall be permitted to be installed on the inside or outside of the LFNC ~~conduit~~. Where installed on the outside, the length of the equipment grounding conductor shall not exceed 6 ft (1.83 m) and shall be routed with the raceway or enclosure. Fittings and boxes shall be bonded or grounded in accordance with Article 250.

SUBSTANTIATION:

The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways of circular cross-section. For the 1999 NEC, a previous Sub-Task Group recommended that all of the circular raceway articles be combined into a single article (Article 344), to present a more uniform approach to the conduit and tubing requirements and to consolidate common requirements. Review of public comments led the Panel to conclude that the goal of more user friendly code language had not been realized by the proposed Article 344. Furthermore, the Panel requested that a committee be appointed to consider the issue of user friendly code as it relates to the circular raceway articles.

The Sub-Task Group was asked to address such possibilities as revising the rejected 1999 proposal in light of the public comments, developing one or more articles to address the requirements presented in the nine current circular raceways articles, or revising the current nine circular raceway articles using a similar style manual format. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the circular raceways. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. A table that provides the uniform format for each circular raceway has been provided with this proposal.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for conduit and tubing not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

The following text is provided to further substantiate all changes and to cross-reference between the 1999 NEC Article 351 Part B and the proposed revision to this Article for the 2002 cycle.

The acronym "LFNC" has been added to improve clarity and usability of this raceway in this Article. Substantiation explaining all changes in reference to new Section numbers.

Split the existing Article 351 into two parts to accommodate both metallic and nonmetallic liquidtight conduit. By using Article 3YY as the Article number for Liquidtight Flexible Nonmetallic Conduit, the numbering system conforms to the common Section numbering format that this Usability Sub-Task Group is proposing. This Sub-task Group recognizes that only the Technical Correlating Committee has the authority to assign article numbers.

Title: Add the Acronym "LFNC".

A. General

3YY-1. Scope. The previous Scope 351-1, covered both metallic and nonmetallic conduit. The proposed scope identifies only the nonmetallic version and is consistant with the style manual.

Article 3YY Substantiation (cont.)

3YY-2. Definition. The definition has been relocated from 351-22. The listing requirements have been relocated to the new Section 3YY-6. Acronym used throughout this and other articles of this Code is introduced.

3YY-3. Other Articles. This section was added to be consistent with the format of other raceway articles.

3YY-6. Listing Requirements. This is a new section relocating listing requirements from Sections 351-22 and 351-26.

B. Installation

3YY-10. Uses Permittted. Title of Section 351-23, Use, has been deleted. Uses permitted has been relocated from Section 351-23(a). Replace "liquidtight flexible nonmetallic conduit" with "LFNC", two locations. Update section references.

3YY-12. Uses Not Permitted. Has been relocated from 350-23(b). Add the word "Uses" for consistency with other raceway articles. Replace "liquidtight flexible nonmetallic conduit" with "LFNC". Update section references.

3YY-20. Size. These requirements were relocated from Section 351-24. Reword the text to be stated in "minimum" and "maximum" to be consistent with other raceway articles. Replace "liquidtight flexible nonmetallic conduit" with "LFNC".

3YY-22. Number of Conductors. Relocated from Section 351-25. Added the words "or cables" and reworded existing text for consistency with other raceway articles.

3YY-26. Bends. Relocated from Section 351-30.

3YY-30. Securing and Supporting. Relocated from Section 351-27. Replaced "liquidtight flexible nonmetallic conduit" with "LFNC" in two locations. Update section references.

3YY-42. Couplings and Connectors. Text relocated from Section 351-26. Listing requirements were relocated to Section 3YY-6.

3YY-56. Splices and Taps. Relocated from Section 351-29.

3YY-60. Grounding. Relocated from Section 351-28. Delete the word "Equipment" from the section title to be consistent with other raceway articles. Replace "liquidtight flexible nonmetallic conduit" with "LFNC".

The following Section numbers have been assigned unilaterally throughout all 10 raceway articles.	Common Numbering System for the Circular Raceway Articles
	Article 3XX, <title>: <acronym>
	Part A. General
3XX - 1	Scope.
3XX - 2	Definitions.
3XX - 3	Other Articles.
3XX - 6	Listing Requirements.
	Part B. Installation
3XX - 10	Uses Permitted.
3XX - 12	Uses Not Permitted.
3XX - 14	Dissimilar Metals.
3XX - 16	Temperature Limits.
3XX - 20	Size.
3XX - 22	Number of Conductors.
3XX - 24	Bends – How Made.
3XX - 26	Bends – Number in One Run.
3XX - 28	Reaming & Threading.
3XX - 28	Trimming.
3XX - 30	Securing and Supporting.

3XX - 40	Boxes and Fittings.
3XX - 42	Coupling and Connectors
3XX - 44	Expansion Fittings
3XX - 46	Bushings.
3XX - 48	Joints.
3XX - 50	Conductor Terms
3XX - 56	Splices and Taps.
3XX - 60	Grounding.
	Part C. Construction Specifications.
3XX - 100	Construction.
3XX - 110	Corrosion Protection.
3XX - 120	Marking.
3XX - 130	Standard Lengths.

PANEL ACTION: Accept in Principle.
Delete from the proposal: 3YY-3 and the second sentence of 3YY-56.
In proposed 3YY-22 delete the words "or cables."
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 3-YY and the second sentence of 3YY-56 are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
There was no technical substantiation provided to add the words "or cables" as part of the rewrite of 3YY-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
BERMAN: Typographical error - The first sentence of the second paragraph of the Panel Statement should have referenced "3YY-3", and not '3-YY".

(Log #1289)

8- 329 - (351): Accept
NOTE: The Technical Correlating Committee notes that the revised dimensions will be implemented in the two new articles (3XX and 3YY) created by Proposals 8-327 and 8-328.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
351-5 (a) Minimum. Liquidtight flexible metal conduit smaller than metric designator 16 (1/2) ~~in. electrical trade size~~ shall not be used.

Exception: Liquidtight flexible metal conduit of metric designator 12 (3/8) ~~in. size~~ shall be permitted as covered in Section 350-10(a).
(b) Maximum. The maximum size of liquidtight flexible metal conduit shall be metric designator 103 ~~the~~ (4) ~~in. trade size~~.
FPN: Metric trade numerical designations for liquidtight flexible metal conduit are 12 = 3/8 ~~= 12~~, 16 = 1/2 ~~= 16~~, 21 = 3/4 ~~= 21~~, 27 = 1 ~~= 27~~, 35 = 1 1/4 ~~= 35~~, 41 = 1 1/2 ~~= 41~~, 53 = 2 ~~= 53~~, 63 = 2 1/2 ~~= 63~~, 78 = 3 ~~= 78~~, 91 = 3 1/2 ~~= 91~~, and 103 = 4 ~~= 103~~.
351-6 (a) Single Conduit. The number of conductors permitted in a single conduit, metric deisginator 16 (1/2) ~~in.~~ through 103 (4) ~~in. trade sizes~~, shall not exceed the percentage of fill specified in Table 1, Chapter 9.
351-6 (b) Liquidtight Flexible Metal Conduit - Metric deisgnator 12 (3/8) ~~in. Size~~. The number of conductors permitted in metric designator 12 (3/8) ~~in.~~ liquidtight flexible metal conduit shall not exceed that permitted in Table 350-12.
351-8 Liquidtight flexible metal conduit shall be securely fastened in place by an approved means within 300 mm (12 in.) ~~(305 mm)~~ of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4 1/2 ft) ~~(1.37 m)~~.
Exception No. 1: Where liquidtight flexible metal conduit is fished.
Exception No. 2: Lengths not exceeding 900 mm (3 ft) ~~(914 mm)~~ at terminals where flexibility is necessary.
Exception No. 3: Lengths not exceeding 1.8 m (6 ft) ~~(1.83 m)~~ from a fixture terminal connection for tap conductors to lighting fixtures as permitted in Section 410-67(c).
Horizontal runs of liquidtight flexible metal conduit supported by openings through framing members at intervals not greater than 1.4 m (4 1/2 ft) ~~(1.37 m)~~ and securely fastened within 300 mm (12 in.) ~~(305 mm)~~ of termination points shall be permitted.
351-23 (a) (5) Liquidtight flexible nonmetallic conduit as defined in Section 351-22(2) shall be permitted to be installed in lengths longer than 1.8 m (6 ft) ~~(1.83 m)~~ where secured in accordance with Section 351-27.
351-23 (a) (6) As a listed manufactured prewired assembly, metric designator 16 (1/2) ~~in.~~ through 27 (1) ~~in.~~ conduit, as defined in Section 351-22(2).
351-23 (b) (3) In lengths longer than 1.8 m (6 ft) ~~(1.83 m)~~, except as permitted by Section 351-23(a)(5) or where a longer length is approved as essential for a required degree of flexibility
351-24 The electrical trade sizes of liquidtight flexible nonmetallic conduit shall be in accordance with (a) or (b):
a. Metric deisignator 16 (1/2) ~~in.~~ to 103 (4) ~~in.~~ inclusive
b. Metric designator 12 (3/8) ~~in.~~ as permitted below
351-24 (b) (2) In lengths not exceeding 1.8 m (6 ft) ~~(1.83 m)~~ as part of a listed assembly for tap connections to lighting fixtures as required in Section 410-67(c), or for utilization equipment
FPN: Metric trade numerical designations for liquidtight flexible nonmetallic conduit are 12 = 3/8 ~~= 12~~, 16 = 1/2 ~~= 16~~, 21 = 3/4 ~~= 21~~, 27 = 1 ~~= 27~~, 35 = 1 1/4 ~~= 35~~, 41 = 1 1/2 ~~= 41~~, 53 = 2 ~~= 53~~, 63 = 2 1/2 = ~~63~~, 78 = 3 ~~= 78~~, 91 =3 1/2 ~~= 91~~, and 103 = 4 ~~= 103~~.
351-27
(a) The conduit shall be securely fastened at intervals not exceeding 900 mm (3 ft) ~~(914 mm)~~ and within 300 mm (12 in.) ~~(305 mm)~~ on each side of every outlet box, junction box, cabinet, or fitting.
(b) Securing and supporting of the conduit shall not be required where it is fished, installed in lengths not exceeding 900 mm (3 ft) ~~(914 mm)~~ at terminals where flexibility is required, or where installed in lengths not exceeding 1.8 m (6 ft) ~~(1.83 m)~~ from a fixture terminal connection for tap conductors to lighting fixtures as permitted in Section 410-67(c).
(c) Horizontal runs of liquidtight flexible nonmetallic conduit supported by openings through framing members at intervals not exceeding 900 mm (3 ft) ~~(914 mm)~~ and securely fastened within 300 mm (12 in.) (305 mm) of termination points shall be permitted.
351-28 Where an equipment grounding conductor is required for the circuits installed in liquidtight flexible nonmetallic conduit, it shall be permitted to be installed on the inside or outside of the conduit. Where installed on the outside, the length of the equipment grounding conductor shall not exceed 1.8 m (6 ft) ~~(1.83 m)~~ and shall be routed with the raceway or enclosure. Fittings and boxes shall be bonded or grounded in accordance with Article 250.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.
In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.
In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #2199)

8- 330 - (351-2): Accept
NOTE: The Technical Correlating Committee understands that 3XX-2 in Proposal 8-327 is the text intended to be accepted by the Panel with the words "and approved" deleted.
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Liquidtight flexible metal conduit is a listed raceway of circular cross section..., connectors and fittings ~~and approved~~ for the installation of electric conductors.
SUBSTANTIATION: A definition in the NEC cannot presuppose acceptance by the authority having jurisdiction (approved). The listing already qualifies intermediate metal conduit for use in accordance with Article 351of the NEC. See the UL General Information for Electrical Equipment 1999. The NEC Style Manual 2.2.2 states, "Definitions shall not contain requirements or recommendations." Requiring intermediate metal conduit to be approved to comply with the definition is a requirement. This definition should be written similar to other related definitions, for example, see 331-1 first paragraph.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel believes that the submitter intended to reference LFMC instead of IMC in his substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1434)

8- 331 - (351-3): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 351-3 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
Section 351-4(a)(2) appropriately references the applicable sections in 501, 502, 503, 504, and 553.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #845)

8- 332 - (351-4(b)(3) (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add:
(3) For conductors operating at over 600-volts, nominal, except as permitted by Section 430-123 for motors and Article 600 for electric signs and outline lighting.
SUBSTANTIATION: The UL "white book" indicates listed conduit is limited to 600 volts or less circuits except as permitted for motors and signs. Code users may infer from those Code-permitted uses and this section that there is no general voltage limitation. The proposal would reinforce Sections 110-3 and 300-2 which are general in nature and may be overlooked. This section is a logical location to indicate a not permitted use.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-318.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3086)

8- 333 - (351-5): Accept in Principle in Part
NOTE: The Technical Correlating Committee understands that revisions noted in the Panel Action will occur in 3XX-20 and 3YY-20
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise this section and the FPN to read:
(a) Minimum. LFMC ~~Liquidtight flexible metal conduit~~ smaller than 1/2 (16) shall not be used. ~~in. electrical trade size.~~
~~Exception:~~ LFMC ~~Liquidtight flexible metal conduit~~ of 3/8 (12) ~~in. size~~ shall be permitted as covered in Section 350-10(a).
(b) Maximum. LFMC larger than 4 (103) shall not be used. ~~The maximum size of liquidtight flexible metal conduit shall be the 4 in. trade size.~~
FPN: The Trade Sizes and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-x.
~~FPN: Metric trade numerical designations for flexible metal tubing are 3/8 = 12, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, 4 = 103.~~
SUBSTANTIATION: To correlate with proposal submitted to CMP 3 to add a table showing English and Metric trade size designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code, which is no longer needed. Metric trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code.
PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the addition of the new FPN to read as follows:
"FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions".
The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of the words "Liquidtight Flexible Metal Conduit" with the acronym "LFMC" and the deletion of "in. electrical trade size" by action on Proposals 8-327 and 8-329.
The panel prefers the language used for "maximum size" per Proposal 8-327.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-327 and 8-329.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3389)

8- 334 - (351-6(b)): Accept in Principle
NOTE: The Technical Correlating Committee understands that action text revises 3XX-22(b) of Proposal 8-327.
SUBMITTER: Will Dockham, Gilmanton Iron Works, NH
RECOMMENDATION: Delete Section 351-6(b):
~~(b) Liquidtight Flexible Metal Conduit — 3/8 in. Size. The number of conductors permitted in 3/8 in. liquidtight flexible metal conduit shall not exceed that permitted in Table 350-12.~~
SUBSTANTIATION: Confusion is caused when applying Table 350-12, to 3/8 in. liquidtight flexible metal conduit because it is unclear as to which column - "Fitting Inside Conduit" or "Fitting Outside Conduit", should be used. Liquidtight flexible metal conduit fittings typically have a component that installs inside the liquidtight flexible metal conduit, however, I doubt that it is intended that the "Fitting Inside Conduit" column is the appropriate column to use. Also, 3/8 in. liquidtight flexible nonmetallic conduit, Type-B, has the same internal diameter per Chapter r9, Table 4, as 3/8 in. liquidtight flexible metal conduit, therefore the sizing criteria for both raceways should be the same.
NOTE: Also see companion proposal to add a column for 3/8 in. liquidtight flexible metal conduit to Appendix C, Tables C6 and C6(A).
PANEL ACTION: Accept in Principle.
In 351-6(b) amend the text to read:
"(b) Liquidtight Flexible Metal Conduit — 3/8-in. Size. The number of conductors permitted in 3/8-in. liquidtight flexible metal conduit shall not exceed that permitted in Table 350-12, Fittings Outside Conduit columns."
PANEL STATEMENT: The panel's action has clarified the appropriate column to use for these fittings. The panel is aware that fittings currently used have a ferrule that inserts into the conduit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1462)

8- 335 - (351-7): Reject
SUBMITTER: Joseph E. McCann, City of Coral Springs, FL
RECOMMENDATION: Add new sentence stating:
"All fitting used with liquid tight flexible metal conduit shall be made up tight."
SUBSTANTIATION: Since most circuits run within liquid tight flexible metal conduit have equipment grounds with them, many installers don't see a reason for a good mechanical connection. But, what happens when an equipment ground is not required and there is no continuity. Also, with this system the raceways should be water tight.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are addressed by the requirements of 250-120(a) which covers the installation of equipment grounding conductors. This section of the code is applicable as LFMC is an equipment grounding conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #27)

8- 336 - (351-9): Accept in Principle
NOTE: The Technical Correlating Committee understands that the action text replaces 3XX-60 in Proposal 8-327 with the text from the Panel action.
NOTE: The following proposal consists of Comment 8-345 on Proposal 8-199 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 8-199 was:
Revise paragraph 3 to read as follows:
"Where used to connect equipment where flexibility is required, or where vibration is likely to be present, an equipment grounding conductor shall be installed."
SUBMITTER: Morton L. Mullins, Chemical Manufacturers Assn.
RECOMMENDATION: The proposal needs to be clarified as to how the required equipment grounding conductor may be installed. If Article 315 is approved, add a new sentence to 315-60(a) that states:
The equipment grounding conductor may be installed inside or outside the flexible metal conduit. If 315 is not approved, add the new sentence to paragraph 3 of 351-9.
SUBSTANTIATION: The addition of the requirement for an equipment grounding conductor where vibration is likely was done without clarifying that the conductor may be inside or outside the flexible metal conduit. The addition of the new sentence removes this confusion.
PANEL ACTION: Accept in Principle.
Revise the text of this section as follows and retain the existing fine print note:
"351-9. Grounding and Bonding.
Where used to connect equipment where flexibility is required, an equipment grounding conductor shall be installed.
Where required or installed, equipment grounding conductors shall be installed in accordance with 250-134(b).
Where required or installed, equipment bonding jumpers shall be installed in accordance with 250-102."
PANEL STATEMENT: The amended text adequately covers equipment grounding and bonding requirements. The panel does not agree that bonding jumpers shall always be contained inside the raceway. Section 250-102(e) permits the installation of the bonding jumper on the inside or outside of the raceway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: Either an equipment grounding conductor or an <u>equipment bonding jumper</u> is acceptable to address the concern, provided a bonding jumper is installed in accordance with 250-102(e). The first sentence of Section 351-9 should, therefore, read "Where used to connect equipment where flexibility is required, an equipment grounding conductor <u>or an equipment bonding jumper</u> shall be installed". The remainder of the panel's revised text is correct as shown.
LOYD: The proposal should have been rejected. I believe CMP-8 exceeded their scope in rewording this section of the code. A Techanicl Correlating Committee Task Group prior to this meeting addressed this issue. It was determined that CMP-8 could address 250-118 issues. However, it is the responsibility of CMP-5 to address the methods for grounding installations. No substantiation has been provided for adding this redundant text to Article 351. I also believe it adds confusion rather than clarity.

(Log #846)

8- 337 - (351-9): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Grounding. Liquidtight flexible metal conduit shall be permitted as a grounding means as covered in Section 250-118. Where an equipment bonding jumper is ~~required~~ <u>provided</u> around liquidtight flexible metal conduit, it shall be installed in accordance with Section 250-102. (remainder unchanged)
SUBSTANTIATION: The word "required" is associated with Code rules; the provisions of Section 250-102 should apply where a bonding jumper is installed by choice.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-336.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LOYD: See my Explanation of Negative on Proposal 8-336 (Log #27).

(Log #1928)

8- 338 - (351-9): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
RECOMMENDATION: Revise the second paragraph to read:
Where used to connect equipment where flexibility is required <u>or where likely to be subjected to vibration,</u> an equipment grounding conductor shall be installed.
SUBSTANTIATION: This first appeared in the 1987 NEC as Section 351-9 Exception No. 2. It was added in response to reports of loose flex connectors or loose locknuts. Vibration is more often the cause of these failures than is the need for flexibility.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the term "vibration" is too subjective and the panel maintains its position that it is a design issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2202)

8- 339 - (351-12 (New)): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-327. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Add a new Section 351-12 to read as follows:
351-12. Bends. Bends in conduit shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. The radius of the curve of the inner edge of any bend shall not be less than shown in Table 346-10.
SUBSTANTIATION: Article 351 Part A Liquidtight Flexible Metal Conduit does not address how bends are to be made nor the radii of the bends. This new rule should be added to address these issues. Section 350-16 addresses these issues for flexible metal conduit and it is similar in nature to liquidtight. I have used this rule as a basis for the wording of the newly proposed section. All other articles that pertain to conduit or tubing have rules about bends.

PANEL ACTION: Accept in Principle.
Amend the proposed text to read:
"351-12. Bends. Bends in conduit shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. The radius of the curve of the inner edge to the centerline of any bend shall not be less than shown in Table 346-10 using the column "other bends". "
PANEL STATEMENT: The amended text will harmonize with Proposal 8-325 for 350-16.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3087)

8- 340 - (351-12 (New)): Accept
NOTE: The Technical Correlating Committee understands that the recommendation is to be added as a new Section 3XX-120 in a new Part III of Article 3XX.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: 351 A. Liquidtight Flexible Metal Conduit--Create a new section to read:
351-12, Marking. LFMC shall be marked according to Section 110-21. The trade size and other information required by the listing shall also be marked on the conduit. Conduit suitable for direct burial shall be so marked.
SUBSTANTIATION: This is a companion proposal to 351 B. Liquidtight Flexible Nonmetallic Conduit. Section 351 A does not currently include marking requirements other than a Fine Print Note in 351-3, Other Articles. Most other raceway articles contain a section on marking or include information on marking in the Construction Specifications.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2226)

8- 341 - (351-22): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[NOTE: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
DOLLINS: See Ganatra's Explanation of Negative Vote on Proposal 6-3.

(Log #2969)

8- 342 - (351-22): Accept in Principle
NOTE: The Technical Correlating Committee understands the proposed FPN is to appear following 3YY-2(3) of Proposal 8-328.
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
"Liquidtight flexible nonmetallic conduit is a listed raceway of circular cross section of various types as follows:
(1) A smooth seamless inner core and cover bonded together and having one or more reinforcement layers between the core and cover, designated as Type LFNC-A or FNMC-A
(2) A smooth inner surface with integral reinforcement within the conduit wall, designated as Type LFNC-B or FNMC-B
(3) A corrugated internal and external surface without integral reinforcement within the conduit wall, designated as Type LFNC-C or FNMC-C."
SUBSTANTIATION: Currently, per UL 1660 all conduit is marked "FNMC" and per UL 514B, Section 77 and the 1999 UL Electrical Equipment Directory (DWTT) all liquidtight nonmetallic fittings are marked as "FNMC". FNMC is a currently recognized acronym by the inspectors.
PANEL ACTION: Accept in Principle.
Retain the existing wording of this section and after paragraph (3) add a new fine print note to read:
"FNMC is an alternate designation for LFNC."
PANEL STATEMENT: The panel does not concur that new text is necessary in paragraphs (1-3), but has added a new Fine Print Note to address the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1695)

8- 343 - (351-23(a)(3), FPN): Accept
NOTE: The Technical Correlating Committee understands the panel action deletes the FPN in 3YY-10(3) accepted in Proposal 8-328.
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Delete the fine print note regarding marking requirements. See companion proposal for Section 351-34. Marking.
SUBSTANTIATION: This marking requirement is misplaced and should be located in a section consistent with other raceway articles. See companion proposal for new Section 351-34.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1863)

8- 344 - (351-23(a)(3), FPN): Accept
NOTE: The Technical Correlating Committee understands that the panel action deletes the FPN in 3YY-10(3) accepted in Proposal 8-328.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 351-23(a)(3) FPN in its entirety.
SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3 and 4 apply generally.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1696)

8- 345 - (351-23(a)(5)): Accept
NOTE: The Technical Correlating Committee understands that the accepted text revises the text accepted in 3YY-10(5) Proposal 8-328.
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Replace "Liquidtight flexible nonmetallic conduit as defined in Section 351-22(2)" with "Type LFNC-B".
SUBSTANTIATION: Replace unnecessary wording with the designation of the product permitted for this application. This will eliminate the need to refer back to Section 351-22(2) to determine the applicable designated type.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2970)

8- 346 - (351-23(a)(5)): Accept in Principle
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
(5) Liquidtight ~~flexible nonmetallic conduit~~ Flexible Nonmetallic Conduit, Type B (LFNC-B) ~~as defined in Section 351-22(2)~~ shall be permitted to be installed in lengths longer than 6 ft (1.83 m) where secured in accordance with Section 351-27.
SUBSTANTIATION: This proposal revises the text for clarification. The reference back to 351-22(2) was removed so that it is clear that only LFNC-B is allowed to be used in lengths longer than 6 ft.
Liquidtight Flexible Nonmetallic Conduit was capitalized because it is a proper name.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-345.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
BERMAN: Typographical error - Panel Statement should reference Proposal "8-345", and not "8-245".

(Log #1697)

8- 347 - (351-23(a)(6)): Accept
NOTE: The Technical Correlating Committee understands that the accepted text revises 3YY-10(6) accepted in Proposal 8-328.
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Replace "as a listed manufactured prewired assembly, 1/2 in. through 1 in. conduit as defined in Section 351-22(2)" with "Type LFNC-B shall be permitted to be installed as a listed manufactured prewired assembly, in 1/2 in. through 1 in. sizes."
SUBSTANTIATION: Replace unnecessary wording with the designation of the product permitted for the application. This will eliminate the need to refer back to Section 351-22(2) to determine the applicable designated type.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2971)

8- 348 - (351-23(a)(6)): Accept in Principle
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
(6) As a listed manufactured prewired assembly, 1/2-in. through 1-in. Liquidtight Flexible Nonmetallic Conduit, Type B (LFNC-B) ~~conduit, as defined in Section 351-22(2)~~.
SUBSTANTIATION: This proposal revises the text for clarification. The reference back to 351-22(2) was removed so that it is clear that only LFNC-B is allowed to be a prewired assembly.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-347.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3085)

8- 349 - (351-23(a)(6)): Accept in Principle
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Change the text as follows:
(6) Type LFNC-B, as defined in Section 351-22(2), 1/2 (16) through 1 (27), ~~As~~ as a listed manufactured prewired assembly. ~~, 1/2 in. through 1 in. conduit, as defined in Section 351-22(2).~~
SUBSTANTIATION: The text, as currently written, is not correct. The prewired assembly is not defined in Section 351-22(2). The type of conduit permitted as a prewired assembly is what is defined in 351-22(2). Metric trade size designators have also been added.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposals 8-347 and 8-329.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3620)

8- 350 - (351-23(b)): Accept
NOTE: The Technical Correlating Committee understands that the Panel Action deletes the 3YY-12(4) Exception accepted in Proposal 8-328.
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Delete the Exception: This Section will now read as follows:
(b) Not Permitted. Liquidtight flexible nonmetallic conduit shall not be used in the following:
1. Where subject to physical damage.
2. Where any combination of ambient and conductor temperatures is in excess of that for which the liquidtight flexible nonmetallic conduit is approved.
3. In lengths longer than 6 ft (1.83 m), except as permitted by Section 351-23(a)(5) or where a longer length is approved as essential for a required degree of flexibility.
4. Where voltage of the contained conductors is in excess of 600 volts, nominal.
~~Exception: As permitted in Section 600-32(a) electric signs over 600 volts.~~
SUBSTANTIATION: This Section 600-32(a) refers to neon secondary circuit conductors only and not electric signs. The reference to electric signs would appear to address the primary circuit used to energize a manufactured product which can be or is listed and labeled.
We are not aware of any signs that require more than 600 volts to energize.
Therefore, the exception should be deleted to clarify any misinterpretation between secondary high voltage conductors and primary service voltage needs.
This Section also conflicts with Section 300-37 for wiring requirements for over 600 volts. Also conflicts with Section 90-3 which states that Chapters 1 through 4 apply generally to all these Sections and any exceptions should occur in Article 600 only.
Also Section 351-23(b)(4) now states that 600 volts is not permitted and that brings Section 300-37 back into agreement with Section 90-3.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1758)

8- 351 - (351-23(b), Exception): Accept in Principle
SUBMITTER: Herbert Moulton, Masters Technology Inc.
RECOMMENDATION: Delete the exception.
This section will now read as follows:
(b) Not Permitted. Liquidtight flexible nonmetallic conduit shall not be used in the following:
1. Where subject to physical damage.
2. Where any combination of ambient and conductor temperatures is in excess of that for which the liquidtight flexible nonmetallic conduit is approved.
3. In lengths longer than 6 ft (1.83 m), except as permitted by Section 351-23(a)(5) or where a longer length is approved as essential for a required degree of flexibility.
4. Where voltage of the contained conductors is in excess of 600 volts, nominal.
~~Exception: As permitted in Section 600-32(a) for electric signs over 600 volts.~~
SUBSTANTIATION: This Section 600-32(a) refers to neon secondary circuit conductors only and not electric signs. The reference to electric signs would appear to address the primary circuit used to energize a manufactured product which can be or is listed and labeled.
We are not aware of any signs that require more than 600 volts to energize. Therefore, the exception should be deleted to clarify any misinterpretation between secondary high voltage conductors and primary service voltage needs.
This section also conflicts with Section 300-37 for wiring requirements for over 600 volts. Also, conflicts with Section 90-3 which states that Chapters 1 through 4 apply generally to all these sections and any exceptions should occur in Article 600 only.
Also, Section 351-23(b)(4) now states that 600 volts is not

permitted and that brings Section 300-37 back into agreement with Section 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-350.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3250)

8- 352 - (351-23(b)(3)): Reject
SUBMITTER: Craig M. Wellman, Newark, DE
RECOMMENDATION: Revise paragraph as follows:
In lengths longer than 6 ft (1.83 m), except as permitted by Section 351-23(a)(5) or where installed in cable tray or where a longer length is approved as essential for a required degree of flexibility.
SUBSTANTIATION: The change in this section in the 1999 Code added unnecessary restrictions on installations of cables for power limited applications in liquidtight flexible nonmetallic conduit in cable tray. Physical separation of the power limited signal cable from other cables in a tray is a common requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: LFNC Type B is permitted to be installed in lengths longer than 6 feet per 351-23(a)(5) and can be installed in a cable tray. The panel is unaware of any evaluation for Type A and Type C for lengths greater than 6 feet.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2163)

8- 353 - (351-24): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(a) 1/2 to 2 4 in. inclusive.
FPN: ..., 1 1/2 = 41, 2 = 53, ~~2 1/2 = 63, 3 78, 3 1/2 = 91, and 4 = 103~~
SUBSTANTIATION: Underwriters Laboratories, Inc. lists flexible nonmetallic conduit, liquid-tight (DXOQ) only up to 2 inch inclusive. (See UL General Information for Electrical Equipment 1999.) Manufacturers only make it up to 2 inch inclusive. (See the cut sheet which I have provided. Since the Code recognizes only listed flexible nonmetallic conduit in Section 351-23(a), the sizes in the code should match the listing.
NOTE: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: While it is true that current listings are only available up to 2 inch trade size, there is permission in the product standard (UL 1660) to manufacture the product in sizes up to 4 inches.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LOYD: The submitter is correct. The 1999 UL General Information for Electrical Equipment, page 17 clearly states that LFNC is only listed 3/8 through 2 in. The panel's substantiation is not correct, as we do not reference the UL 1660 standard as a requirement; we only require the product to be listed. Therefore, we retain the responsibility to evaluate new products and sizes. The NEC size restrictions should be limited to the products submitted for acceptance.

(Log #3042)

8- 354 - (351-24): Accept in Principle in Part
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise this section and the FPN to read:
Size: The electrical trade sizes of LFNC ~~liquidtight flexible nonmetallic conduit~~ shall be in accordance with (a) or (b):
(a) Minimum. LFNC smaller than 1/2 (16) shall not be used unless permitted in (1) through (3) below for 3/8 (12). ~~1/2 in. to 4 in. inclusive.~~
(1) For enclosing the leads of motors as permitted in Section 430-145(b)
(2) In lengths not in excess of 6 ft (1.83 m) as part of a listed assembly for tap connections to lighting fixtures as required in Section 410-67(c), or for utilization equipment
(3) For electric sign conductors in accordance with Section 600-32(a)
(b) Maximum. LFNC larger than 4 (103) shall not be used. ~~3/8 in. as permitted below~~
FPN: The Trade Sizes and Metric Designators are for identification purposes only and do not relate to actual dimensions. See 300-1(c).
~~FPN: Metric trade numerical designations for liquidtight flexible nonmetallic conduit are 3/8 = 12, 1/2 = 16, 3/4 = 21, 1 = 27, 1 1/4 = 35, 1 1/2 = 41, 2 = 53, 2 1/2 = 63, 3 = 78, 3 1/2 = 91, and 4 = 103.~~
SUBSTANTIATION: To correlate with proposal submitted by NEMA to CMP 3 to add a table showing current trade sizes and metric designators. The table provides universal information throughout the Code. This cuts out a lot of excess language in the Code which is no longer needed. Metric designators for trade sizes have been established for two Code cycles and cover raceways and system components. Also, picks up use of acronym as proposed for the 2002 Code.
PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the addition of the new FPN to read as follows:
FPN: See 300-1(c) for the Metric Designators and Trade Sizes. These are for identification purposes only and do not relate to actual dimensions.
The panel accepts the deletion of the old FPN. The panel accepts in principle the replacement of the words "Liquidtight Flexible Nonmetallic Conduit" with the acronym "LFNC" by action on Proposals 8-328 and 8-329.
The panel prefers the language used for "minimum and maximum size" per Proposal 8-328.
PANEL STATEMENT: The acceptance of the changes to the Fine Print Notes are contingent upon an acceptance of Proposal 3-6 by CMP-3. If CMP-3 does not accept Proposal 3-6, the panel directs staff to revert to the existing FPN. The proposed Fine Print Note was revised to comply with Section 4.1.2 of the NEC Style Manual. See panel action on Proposals 8-328 and 8-329.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1700)

8- 355 - (351-27): Accept
NOTE: The Technical Correlating Committee understands that the accepted text revises the text accepted in 3YY-30 of Proposal 8-328.
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Replace "Liquidtight flexible nonmetallic conduit, as defined in Section 351-22(2)..." with "Type LFNC-B shall be securely fastened and supported in accordance with one of the following:".
SUBSTANTIATION: Replace unnecessary wording with the designation of the product permitted for the application. This will eliminate the need to refer back to Section 351-22(2) to determine the applicable designated type.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #847)

8- 356 - (351-28): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-328. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Equipment Grounding and Bonding. Where an equipment grounding conductor is ~~required~~ installed for the circuit(s) installed in liquidtight flexible nonmetallic conduit it shall be ~~permitted to be installed on the inside or outside of the conduit~~ in accordance with Section 250-134(b). An equipment bonding jumper, where installed, shall be in accordance with Section 250-102(e). ~~Where installed on the outside, the length of the equipment grounding~~

~~conductor shall not exceed 6 ft (1.83 m) and shall be routed with the raceway or enclosure.~~ Where used to connect equipment where flexibility is required, an equipment bonding jumper, where employed, shall be installed within the raceway. Fittings, boxes, and other enclosures shall be bonded or grounded in accordance with Article 250.
SUBSTANTIATION: This section blurs the distinction between equipment grounding conductors and equipment bonding jumpers. Section 250-134(b) indicates an equipment grounding conductor shall be inside the raceway. The requirements of this section should apply whether such conductors are installed by choice or "required" by Code. The proposal references equipment bonding jumpers; Sections 350-14 and 351-9 require a grounding/bonding conductor inside the raceway where flexibility is required; this should also apply to this raceway.
PANEL ACTION: Accept in Principle.
Revise the text of this section as follows:
351-9. Grounding and Bonding.
Where used to connect equipment where flexibility is required, an equipment grounding conductor shall be installed.
Where required or installed, equipment grounding conductors shall be installed in accordance with 250-134(b).
Where required or installed, equipment bonding jumpers shall be installed in accordance with 250-102.
PANEL STATEMENT: The amended text adequately covers equipment grounding and bonding requirements. The panel does not agree that bonding jumpers shall always be contained inside the raceway. Section 250-102(e) permits the installation of the bonding jumper on the inside or outside of the raceway. See panel action on Proposal 8-357 relative to deleting the reference to Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
GRIFFITH: Either an equipment grounding conductor or an equipment bonding jumper is acceptable to address the concern, provided a bonding jumper is installed in accordance with 250-102(e). The first sentence of Section 350-28 should, therefore, read "Where used to connect equipment where flexibility is required, an equipment grounding conductor or an equipment bonding jumper shall be installed". The remainder of the panel's revised text is correct as shown.
LOYD: No substantiation has been provided for adding this redundant text to Article 351. I also believe it adds confusion rather than clarity.
The Task Group agreed with the proponent of this proposal. LFNC is an approved flexible wiring method for use with both metallic and nonmetallic wiring methods. Where it is used with metallic raceways, it must be bonded around in accordance with 250-102(e).
COMMENT ON AFFIRMATIVE:
BERMAN: In the Panel Action, the section number (351-9) and first sentence were incorrectly carried over from the Panel Action on Proposal 8-336.
The Panel Action should read as follows:
Panel Action: Accept in Principle
Revise the text of this section as follows:
351-28 Grounding and Bonding. Where required or installed, equipment grounding conductors shall be installed in accordance with 250-134(b).
Where required or installed, equipment bonding jumpers shall be installed in accordance with 250-102.

(Log #1701)

8- 357 - (351-28): Accept
NOTE: The Technical Correlating Committee understands that the action deletes the last sentence of 3YY-60 in Proposal 8-328.
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Delete the last sentence that currently reads "fittings and boxes shall be bonded or grounded in accordance with Article 250."
SUBSTANTIATION: This article covers liquidtight flexible nonmetallic conduit and doesn't need to identify the needs of fittings and boxes. It's understood by everyone that Article 250 covers the grounding and bonding needs of all installations.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1702)

8- 358 - (351-29): Accept in Principle
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Delete the second sentence "see Article 370 for rules on the installation and use of boxes and conduit bodies."
SUBSTANTIATION: The first sentence of the clause refers the reader to Section 300-15 which is appropriate. Section 300-15 refers to Article 370. Also, this article covers conduit, not boxes and conduit bodies, and doesn't need to identify their needs.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-328.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1698)

8- 359 - (351-31 (New)): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 8-328. This action will be considered by the Panel as a Public Comment.
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Add the following wording:
Bends - How Made. Bends ends of LFNC shall be made so that the conduit will not be damaged and that the internal diameter of the conduit shall not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment, and the radius of the curve of the inner edge of such bends shall not be less than shown in Table 346-10.
SUBSTANTIATION: This article lacked requirements for bending LFNC, which is needed for protection of the conduit against damage and protection of the conductors, when pulled. Also, this article should be consistent with the requirements of articles covering similar raceways (e.g. Article 331).
PANEL ACTION: Accept in Principle.
Amend proposed language to read:
"Bends - How Made. Bends ends of LFNC shall be made so that the conduit will not be damaged and that the internal diameter of the conduit shall not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve of the inner edge to the centerline of such bends shall not be less than shown in Table 346-10 using the column 'Other Bends'."
PANEL STATEMENT: This language harmonizes with Proposal 8-325 for 350-16.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2203)

8- 360 - (351-31 (New)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Add a new Section 351-31 to read as follows:
351-31. Bends. Bends in conduit shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. The radius of the curve of the inner edge of any bend shall not be less than shown in Table 346-10.
SUBSTANTIATION: Article 351 Part B Liquidtight Flexible Metal Conduit does not address how bends are to be made nor the radii of the bends. This new rule should be added to address these issues. Section 350-16 addresses these issues for flexible metal conduit and it is similar in nature to liquidtight. I have used this rule as a basis for the wording of the newly proposed section. All other articles that pertain to conduit or tubing have rules about bends.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-359.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3088)

8- 361 - (351-31 (New)): Accept in Principle
NOTE: The Technical Correlating Committee understands that the panel action text is to be added as a new 3YY-120 in a new Part III, Construction Requirements of Proposal 8-328.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: 351 B. Liquidtight Flexible Nonmetallic Conduit--Add a new Section 351-31 to read as follows:
351-31. Marking. The product name or appropriate acronym followed by Type A, B, or C shall also be marked on the conduit along with other markings required by the listing. The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by printing on the jacket or by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with Section 310-11.
SUBSTANTIATION: No requirements for marking LFNC currently exist in this article, other than a Fine Print Note under 351-23(a)(3) outdoor locations. When prewired ENT was added to Article 331, marking requirements were also added and were apparently overlooked when prewired LFNC was added to Article 351. Similar information on marking is included in Article 343. It is appropriate to require the type to be marked as the requirements differ by type. This is done by UL, but with globalization, it should be clear in the Code.
PANEL ACTION: Accept in Principle.
Amend the proposed language to read:
"351-32. Marking. LFNC shall be marked at least every 600mm (2 ft) in accordance with 110-21. The marking shall include a type designation as required in 351-22 and the trade size. Conduit that is intended for outdoor use or direct burial shall be marked.
The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with Section 310-11." PANEL STATEMENT: Provisions for outdoor use marking were added to the proposal, as this information is necessary for proper field installation. Not all listing information is necessary to be included in the marking.
For clarity, the requirements for prewired assemblies are displayed as a separate paragraph.
Staff is advised that the action taken on this proposal has added 3YY-120 in Proposal 8-328.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1699)

8- 362 - (351-32 (New)): Accept
NOTE: The Technical Correlating Committee understands that the recommended text is added as 3YY-28 in Proposal 8-328.
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Add the following wording:
Trimming. All cut ends of conduit shall be trimmed inside and outside to remove rough edges.
SUBSTANTIATION: This article lacked requirements for trimming cut ends of LFNC. Cut ends should be trimmed to prevent chafing of pulled conductors. Also, this article should be consistent with the requirements of articles covering similar raceways (e.g. Article 331).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1703)

8- 363 - (351-33 (New)): Accept in Part
NOTE: The Technical Correlating Committee understands that the added text becomes 3YY-100 in Proposal 8-328.
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Add the following wording:
Construction. LFNC shall be made of material that does not exceed the ignitability, flammability, smoke generation, and toxicity characteristics of rigid (nonplasticized) polyvinyl chloride. LFNC-B as a prewired manufactured assembly, shall be provided in continuous lengths capable of being shipped in a coil, reel, or carton without damage.
SUBSTANTIATION: This article lacked construction requirements necessary for the safe manufacture and transport of LFNC. Also, this article should be consistent with the requirements of articles covering similar raceways (e.g., Article 331).
PANEL ACTION: Accept in Part.
Delete the proposed first sentence.
PANEL STATEMENT: The proposed first sentence does not adequately describe the material used in this product. Listing requirements adequately evaluate the material characteristics.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LOYD: This proposal should have been accepted as submitted, or the correct construction characteristics should have been added. Type B LFNC is an approved general wiring method. If this product does contribute more dangerous levels of ignitability, flammability, smoke generation, and toxicity properties than do other nonmetallic wiring methods (as was stated by one of the panel members during the panel discussion), then it is very important that we inform the designers and users before they choose this wiring method.

(Log #1704)

8- 364 - (351-34 (New)): Accept in Principle
SUBMITTER: George R. Dauberger, Thomas & Betts Corp.
RECOMMENDATION: Add the following wording:
Marking. Each length of LFNC shall be clearly and durably marked at least every 2 ft (600 mm) as required in the first sentence of Section 110-21. The type of material shall also be included in the marking and this marking shall be permanent. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.
FPN: Examples of these optional markings include, but are not limited to, "ls" for limited-smoke and markings such as "outdoors."
SUBSTANTIATION: The marking requirements need to agree with the marking requirements from the product standard. The marking information should be located where it will be easily identified and consistent with other raceway articles. See companion proposal for Section 351b-10(3) fpn.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-361.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 352 — SURFACE METAL RACEWAYS AND SURFACE NONMETALLIC RACEWAYS

(Log #1290)

8- 365 - (352): Accept
NOTE: The Technical Correlating Committee notes that the revisions to the dimensions contained in the recommendation will be implemented in the revised text of 8-366, 8-370 and 8-376 as appropriate.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
352-1 (b) (2) Where the voltage is 300 volts or more between conductors, unless the metal has a thickness of not less than 1.02 mm (0.040 in.) ~~(1.016 mm)~~ nominal
352-4 (1) The cross-sectional area of the raceway exceeds 2500 mm2 (4 in.2) ~~2 (2580 mm2)~~
352-45 (1) The cross-sectional area of the raceway exceeds 2500 mm2 (4 in.2) ~~2 (2580 mm2)~~

Table 352-45. Channel Size and Inside Diameter Area

Channel Size		Area		40 % Area *		25 % Area **	
mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
41 x 21	1 5/8 x 13/16	572	0.887	229	0.355	143	0.222
41 x 25	1 5/8 x 1	743	1.151	297	0.460	186	0.288
41 x 35	1 5/8 x 1 3/8	1076	1.677	433	0.671	270	0.419
41 x 41	1 5/8 x 1 5/8	1308	2.028	523	0.811	327	0.507
41 x 62	1 5/8 x 2 7/16	2045	3.169	817	1.267	511	0.792
41 x 83	1 5/8 x 3 1/4	2780	4.308	1112	1.723	695	1.077
38 x 19	1 1/2 x 3 1/4	548	0.849	219	0.340	137	0.212
38 x 38	1 1/2 x 1 1/2	1179	1.828	472	0.731	295	0.457
38 x 48	1 1/2 x 1 7/8	1485	2.301	594	0.920	371	0.575
38 x 76	1 1/2 x 3	2487	3.854	995	1.542	622	0.964

***Raceways with external joiners shall use a 40 percent wire fill calculation to determine the number of conductors permitted.**
****Raceways with internal joiners shall use a 25 percent wire fill calculation to determine the number of conductors permitted.**

352-47 (a) A surface mount strut-type channel raceway shall be secured to the mounting surface with retention straps external to the channel at intervals not exceeding 3 m (10 ft) ~~(3.05 m)~~ and within 900 m (3 ft) ~~(914 mm)~~ of each outlet box, cabinet, junction box, or other channel raceway termination.

352-47 (b) Suspension Mount. Strut-type channel raceways shall be permitted to be suspension mounted in air with approved appropriate methods designed for the purpose at intervals not to exceed 3 m (10 ft) ~~(3.05 m)~~.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 2

NOT RETURNED: 1 Corry

EXPLANATION OF NEGATIVE:

LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.

LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #1302)

8- 366 - (352 Part A): Accept in Principle

NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Rewrite of Article 352 Part A.

This is a companion proposal to 352 Part B and 352 Part C

ARTICLE 3TT – Surface Metal Raceways ~~and Surface Nonmetallic Raceways~~

~~A. Surface Metal Raceways~~

A. General

3TT-1. Scope. This article covers the use, installation, and construction specifications for surface metal raceways and associated fittings.

3TT-2. Definition.

Surface Metal Raceway. A metallic raceway that is intended to be mounted to the surface of a structure, with associated couplings, connectors, boxes and fittings for the installation of electrical conductors.

3TT-3 ~~352-2.~~Other Articles

Surface metal raceways shall comply with the applicable provisions of Article 300.

~~352-5. Extension Through Walls and Floors~~

~~Surface metal raceways shall be permitted to pass transversely through dry walls, dry partitions, and dry floors if the length passing through is unbroken. Access to the conductors shall be maintained on both sides of the wall, partition, or floor.~~

~~352-6. Combination Raceways~~

~~Where combination surface metal raceways are used both for signaling and for lighting and power circuits, the different systems shall be run in separate compartments identified by sharply contrasting colors of the interior finish, and the same relative position of compartments shall be maintained throughout the premises.~~

B. Installations

3TT-10 ~~352-1.~~ Uses Permitted

~~(a) Permitted.~~ The use of surface metal raceways shall be permitted in the following:

1. In dry locations

2. In Class I, Division 2 hazardous (classified) locations as permitted in Section 501-4(b), Exception

3. Under raised floors, as permitted in Section 645-5(d)(2)

4. Extension Through Walls and Floors - surface metal raceway shall be permitted to pass transversely through dry walls, dry partitions, and dry floors if the length passing through is unbroken. Access to the conductors shall be maintained on both sides of the wall, partition, or floor.

3TT-12 Uses Not Permitted

~~(b) Not Permitted. The use of~~ Surface metal raceways shall not be used ~~permitted~~ in the following:

1. Where subject to severe physical damage, unless otherwise approved

2. Where the voltage is 300 volts or more between conductors, unless the metal has a thickness of not less than 0.040 in. (1.016 mm) nominal

3. Where subject to corrosive vapors

4. In hoistways

5. Where concealed, except as permitted in Section 3TT-10(3) ~~352-1(a)(3)~~

3TT-21 ~~352-3.~~ Size of Conductors

No conductor larger than that for which the raceway is designed shall be installed in surface metal raceway.

3TT-22 ~~352-4~~. Number of Conductors ~~in Raceways~~

The number of conductors installed in surface metal raceway ~~any raceway~~ shall not be greater than the number for which the raceway is designed.

The derating factors of Section 310-15(b)(2)(a) shall not apply to conductors installed in surface metal raceways where all of the following conditions are met:

1. The cross-sectional area of the raceway exceeds 4 in.2 (2580 mm2)

2. The current-carrying conductors do not exceed 30 in number

3. The sum of the cross-sectional areas of all contained conductors does not exceed 20 percent of the interior cross-sectional area of the surface metal raceway

3TT-56 ~~352-7~~. Splices and Taps

Splices and taps shall be permitted in surface metal raceways having a removable cover that is accessible after installation. The conductors, including splices and taps, shall not fill the raceway to more than 75 percent of its area at that point. Splices and taps in surface metal raceways without removable covers shall be made only in junction boxes. All splices and taps shall be made by approved methods.

Taps of Type FC cable installed in surface metal raceway shall be made in accordance with Section 363-10.

3TT-60 ~~352-9~~. Grounding

Surface metal raceway enclosures providing a transition from other wiring methods shall have a means for connecting an equipment grounding conductor.

3TT-70 Combination Raceways. When combination surface metal raceways are used both for signaling and for lighting and power circuits, the different systems shall be run in separate compartments identified by sharply contrasting colors of the interior finish, and the same relative position of compartments shall be maintained throughout the premises.

C. Construction Specifications

3TT-100 Construction. ~~352 8. General~~

Surface metal raceways shall be of such construction as will distinguish them from other raceways. Surface metal raceways and their elbows, couplings, and similar fittings shall be designed so that the sections can be electrically and mechanically coupled together and installed without subjecting the wires to abrasion.

Where covers and accessories of nonmetallic materials are used on surface metal raceways, they shall be identified for such use.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways other than those in circular cross section.

Currently Article 352 is made up of three parts. The purpose of this proposal was to separate each Part into three separate Articles. These three new articles follow the format developed by Sub-Task Group 1. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the raceways articles. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

For the purpose of this proposal an article numbering scheme of "3TT" was used. It was not the intent of the submitter that this numbering scheme be adopted. Instead, a "NEW" article number would be assigned by the Technical Correlating Committee.

Explanation of renumbering and editorial changes;

Title	Delete Surface Nonmetallic Raceways
3TT-1	New Scope added to conform with the style manual.
3TT-2	New Definition added to conform with the style manual
3TT-3	(1) Other Articles renumbered from Section 352-3 to 3TT-3.
352-5	Moved to Uses Permitted 3TT-10(4).
352-6	Moved to Construction 3TT-100.
3TT-10	(1) Uses "Permitted" renumbered from Section 352-1 to 3TT-10.
	(2) Added "Extension Trough Walls and Floors" 352-5.
	(3) Moved "uses not permitted" to section 3TT-12
3TT-12	(1) New section for "Uses Not Permitted".
	(2) Correct section references.
3TT-21	(1) Size renumbered from Section 352-3 to 3TT-21.
3TT-22	(1) Number of Conductors renumbered from 352-4 to 3TT-22.
	(2) Removed the reference to raceway for clarity.
3TT-56	(1) Splices and Taps renumbered from 352-7 to 3TT-56.
3TT-60	(1) Grounding renumbered from 352-9 to 3TT-60.
352-A-70	Moved 352-6 to this section called combination raceways.
3TT-100	(1) Construction renumbered and renamed from 352-8 General to 3TT-100 Construction.

PANEL ACTION: Accept in Principle.

Delete from the proposal 3TT-3.

PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.

The proposed 3TT-3 is deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #2075)

8- 367 - (352-1): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add a Scope section to Article 340 to read as follows:

352-1. Scope. The provisions of this article covers the use, installation, and construction specifications requirements of surface metal raceways and surface nonmetallic raceways.

Renumber remaining sections.

SUBSTANTIATION: Each Article should have a scope section.

The NEC style manual on style also shows a scope article.

To keep the Articles consistent all Articles should be similar.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 8-366.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #848)

8- 368 - (352-1(b)(5)): Accept

NOTE: The Technical Correlating Committee understands that the revision will occur in 3TT-12(5) and that the reference will now be 3TT-10(4) based in Proposal 8-366.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise:

(5) Where concealed, except as permitted in Section 352-~~1(a)(3)~~5.

SUBSTANTIATION: Edit. The reference to Section 352-1(a)(3) is technically incorrect as the area under the raised floor is required to be accessible by Section 645-5(d)(1) and does not meet the definition of concealed. Section 352-5 is more appropriate since portions passing through walls, etc. are likely to be "concealed".

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #1435)

8- 369 - (352-2): Accept in Principle

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Delete 352-2 in its entirety.

SUBSTANTIATION: 1999 National Electrical Code Style Manual:

Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."

Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 8-366.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #CP806)

8- 369a - (3TT-6): Accept

SUBMITTER: CMP 8

RECOMMENDATION: Add new section 3TT-6 to read:

"3TT-6 Listing Requirements. Surface metal raceway and associated fittings shall be listed."

SUBSTANTIATION: The panel intends that this product be evaluated and listed in accordance with the appropriate product standard.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #1303)

8- 370 - (352 Part B): Accept in Principle

NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Rewrite of Article 352 Part B

This is a compainion proposal to 352 Part A and 352 Part C

Article 3UU - Surface Nonmetallic Raceways

~~B. Surface Nonmetallic Raceways~~

A. General

3UU-1. Scope. This article covers the use, installation, and construction specifications for surface nonmetallic raceways and associated fittings.

3UU-2 Definition. ~~352-21. Description~~

Surface Nonmetallic Raceway. A nonmetallic raceway that is intended to be mounted to the surface of a structure, with associated couplings, connectors, boxes and fittings for the installation of electrical conductors.

3UU-3 ~~352-23.~~ Other Articles

Surface nonmetallic raceways shall comply with the applicable provisions of Article 300. ~~Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the raceway.~~

B. Installations

3UU-10 ~~352-22.~~ Uses Permitted

~~(a) Permitted.~~ (1) The use of surface nonmetallic raceways shall be permitted in dry locations.

(2) Extension Through Walls and Floors - surface nonmetallic raceway shall be permitted to pass transversely through dry walls, dry partitions, and dry floors if the length passing through is unbroken. Access to the conductors shall be maintained on both sides of the wall, partition, or floor.

3UU-12 Uses Not permitted

~~(b) Not Permitted.~~ Surface nonmetallic raceways shall not be used as in the following ~~follows:~~

1. Where concealed
2. Where subject to severe physical damage
3. Where the voltage is 300 volts or more between conductors, unless listed for higher voltage
4. In hoistways
5. In any hazardous (classified) location except Class I, Division 2 locations as permitted in Section 501-4(b), Exception
6. Where subject to ambient temperatures exceeding those for which the nonmetallic raceway is listed
7. For conductors whose insulation temperature limitations would exceed those for which the nonmetallic raceway is listed

3UU-21 ~~352-24.~~ Size of Conductors

No conductor larger than that for which the raceway is designed shall be installed in surface nonmetallic raceway.

3UU-22 ~~352-25.~~ Number of Conductors ~~in Raceways~~

The number of conductors installed in surface nonmetallic raceway ~~any raceway~~ shall not be greater than the number for which the raceway is designed.

~~352-28. Extension Through Walls and Floors~~

~~Surface nonmetallic raceways shall be permitted to pass transversely through dry walls, dry partitions, and dry floors if the length passing through is unbroken. Access to the conductors shall be maintained on both sides of the wall, partition, or floor.~~

3UU-56 ~~352-29.~~ Splices and Taps

Splices and taps shall be permitted in surface nonmetallic raceways having a removable cover that is accessible after installation. The conductors, including splices and taps, shall not fill the raceway to more than 75 percent of its area at that point. Splices and taps in surface nonmetallic raceways without removable covers shall be made only in junction boxes. All splices and taps shall be made by approved methods.

3UU-60 Grounding

Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the raceway.

3UU-70 (Relocated from 3UU-100 Construction to Part B. Installations) Combination Raceways. When combination surface nonmetallic raceways are used both for signaling and for lighting and power circuits, the different systems shall be run in separate compartments identified by sharply contrasting colors of the interior finish, and the same relative position of compartments shall be maintained throughout the premises.

C. Construction Specifications

3UU-100 Construction. ~~352-27. General~~

Surface nonmetallic raceways shall be of such construction as will distinguish them from other raceways. Surface nonmetallic raceways and their elbows, couplings, and similar fittings shall be designed so that the sections can be mechanically coupled together and installed without subjecting the wires to abrasion.

Surface nonmetallic raceways and fittings are made of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. It shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low-temperature effects.

3UU-120 Marking.

Surface nonmetallic raceway that have limited smoke-producing characteristics shall be permitted to be identified with the suffix LS.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways other than those in circular cross section.

Currently Article 352 is made up of three parts. The purpose of this proposal was to separate each Part into three separate Articles. These three new articles follow the format developed by Sub-Task Group 1. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the raceways articles. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

For the purpose of this proposal an article numbering scheme of "3UU" was used. It was not the intent of the submitter that this numbering scheme be adopted. Instead, a "NEW" article number would be assigned by the Technical Correlating Committee.

Explanation of renumbering and editorial changes;

Title New Title added.

3UU-1 New Scope added to conform with the style manual.

3UU-2 (1) Definition renumbered and renamed from 352-21 Description to 3UU-2 Definition.
(2) Deleted Part B from 352.
(3) Moved limited smoke producing marking requirement to 3UU-120

3UU-3 (1) Other Articles renumbered from Section 352-23 to 3UU-3.
(2) Moved Grounding Requirements to 3UU-60

3UU-10 (1) Uses "Permitted" renumbered from Section 352-22 to 3UU-10.
(2) Added "Extension Trough Walls and Floors" 352-28.
(3) Moved "uses not permitted" to section 3UU-12

3UU-12 (1) New section for "Uses Not Permitted".
(2) Correct text for clarity.

3UU-21 (1) Size renumbered from Section 352-24 to 3UU-21.

3UU-22 (1) Number of Conductors renumbered from 352-25 to 3UU-22.
(2) Removed the reference to raceway for clarity.

352-28 Moved Extension Through Walls and Floors to uses Permitted 3UU-10(2).

3UU-56 (1) Splices and Taps renumbered from 352-29 to 3UU-56.

3UU-60 (1) New Section
(2) Added grounding requirement from 3UU-3(352-23, 99 NEC).

3UU-70 Moved Combination Raceways from 352-26 to this section.

3UU-100 (1) Construction renumbered and renamed from 352-27 General to 3UU-100 Construction.

3UU-120 (1) New Section for Marking
(2) Added Marking requirements for "limited smoke producing" product from 3UU-2 Definition (352-21 Description, 99 NEC).

PANEL ACTION: Accept in Principle.
Delete from the proposal 3UU-3.
Amend proposed 3UU-120 to read:
"3UU-120 Marking.
Surface nonmetallic raceway that have limited smoke-producing characteristics shall be permitted to be so identified ~~with the suffix LS."~~

PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 3UU-3 is deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
The proposed 3UU-120 is amended to be consistent with the marking requirements of other articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2227)

8- 371 - (352-21): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[NOTE: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
DOLLINS: See Ganatra's Explanation of Negative Vote on Proposal 6-3.

(Log #2826)

8- 372 - (352-21): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise 352-21 to read:

352-21. Description. Part B of this article shall apply to a type of surface nonmetallic raceway and fittings of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. It shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low-temperature effects. ~~Surface nonmetallic raceways that have limited smoke producing characteristics shall be permitted to be identified with the suffix LS.~~ Marking for limited smoke shall be permitted on the surface nonmetallic raceways that have limited smoke-producing characteristics.

SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).

Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.

Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.

Although the section does not deal with wire and cable products, this proposal is made for this section to address the change in the abbreviation for limited smoke marking.

The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-370. This action meets the submitter's concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #849)

8- 373 - (352-22(b)(1)): Accept
NOTE: The Technical Correlating Committee understands that the recommended text revises the text in 3UU-12(1) in Proposal 8-370.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:

(1) Where concealed, except as permitted in Section 352-28.

SUBSTANTIATION: Edit. For correlation with Section 352-28.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2508)

8- 374 - (352-26): Accept
NOTE: The Technical Correlating Committee understands the panel action removes the indicated text from the accepted text of 3UU-70 in Proposal 8-370.
SUBMITTER: Lorena Orbanic, Carlon, Lamson & Sessions
RECOMMENDATION: Revise as follows:

352-26. Combination Raceways. Where combination surface nonmetallic raceways are used both for signaling and for lighting and power circuits, the different systems shall be run in separate compartments, identified by printed legend or by sharply contrasting colors of the interior finish~~, and the same relative position of compartments shall be maintained throughout the premise.~~

SUBSTANTIATION: Manufacturers have accessories which would allow the different circuitry to crossover into other compartments while still maintaining the separation of signaling, lighting, and power circuits. In addition, some manufacturers have multi-compartment raceways systems which link together with single compartment raceway systems allowing the different systems to vary their positions. Thus, it is no longer necessary to maintain the same relative position of compartments throughout the premises.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LOYD: The submitter has provided no technical substantiation to support this change. The manufacturers will now be permitted to redesign their products and the marking requirements left in this section will now have to be done by the installer as field markings rather than distinctive marking by the manufacturer.

Evidence must be provided to assure the committee that safety can be maintained if this change is accepted.

(Log #2521)

8- 375 - (352-26): Reject
SUBMITTER: Lorena Orbanic, Carlon, Lamson & Sessions
RECOMMENDATION: Revise as follows:

325-26. Combination Raceways. Where combination surface nonmetallic raceways are used both for signaling and for lighting and power circuits, the different systems shall be run in separate compartments, ~~identified by printed legend or by sharply contrasting colors of the interior finish,~~ and the same relative position of compartments shall be maintained throughout the premises.

SUBSTANTIATION: First of all, most wiring is labeled already so that you can identify your lighting, signaling, and power circuits. Secondly, preplanning is involved when you design your layout for surface raceway so that you know which surface raceway and fittings to purchase. Thus, during that preplanning, one must have already chosen in which compartments they will place the different types of circuitry. The additional labeling is unnecessary.

In addition, the statement can be misconstrued in two ways: One way is that the electrician/contractor must paint the interior of the surface raceway (not likely) or label the raceways. The second way is that the manufacturer must provide raceways with the compartments having painted interiors or labels saying which is for power, signaling, or lighting. Most manufacturers do not paint the interior compartments nor do they label the compartments which would take away the end user's choice to choose in which compartment they want to place power, signaling, or lighting circuits.

PANEL ACTION: Reject.
PANEL STATEMENT: Compartment identification is important to maintain system separation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
KENDALL: This is a requirement of the installer. Identification of the channel can easily be determined by visual inspection of the conductor, coaxial cable, or communication cable currently installed without additional markings. Marking has nothing to do with separation as indicated in the panel statement.

(Log #1306)

8- 376 - (352 Part C): Accept in Principle
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Rewrite of Article 352 Part C
This is a companion proposal to 352 Part A and 352 Part B
Article 3VV - Strut-Type Channel Raceway
C. Strut-Type Channel Raceway
A. General
3VV-1 Scope. This article covers the use, installation, and construction specifications of strut type channel raceway.
3VV-2 Definition ~~352-40. Description~~
Strut-Type Channel Raceway. A metallic raceway that is intended to be mounted to the surface of or suspended from a structure, with associated accessories for the installation of electrical conductors.
3VV-3 352-43. Other Articles
Installation of strut-type channel raceways ~~strut-type channel raceways~~ shall comply with the applicable provisions of Articles 250 and 300.
3VV-6 Listing Requirements. Strut-type channel raceways, closure strips and accessories shall be listed and identified for such use.
B. Installations
3VV-10 ~~352-41. Uses Permitted~~
The ~~installation~~ use of ~~listed strut-type channel raceways~~ strut-type channel raceways shall be permitted in the following:
1. Where exposed
2. In dry locations
3. In locations subject to corrosive vapors where protected by finishes judged suitable for the condition
4. Where the voltage is 600 volts or less
5. As power poles
6. In Class I, Division 2 hazardous (classified) locations as permitted in Section 501-4(b), Exception
7. Extensions Through Walls and Floors - It shall be permitted to extend unbroken lengths of strut-type channel raceway through walls, partitions, and floors where closure strips are removable from either side and the portion within the wall, partition, or floor remains covered.
8. Ferrous channel raceways and fittings protected from corrosion solely by enamel shall be permitted only indoors.
3VV-12 ~~352-42.~~ Uses Not Permitted
1. Where concealed.
2. Ferrous channel raceways and fittings protected from corrosion solely by enamel shall not be permitted where subject to severe corrosive influences.
3VV-21 ~~352-44~~. Size of Conductors
No conductor larger than that for which the raceway is listed shall be installed in strut-type channel raceways ~~strut-type channel raceways~~.
3VV-22 ~~352-45~~. Number of Conductors ~~in Raceways~~
The number of conductors permitted in strut-type channel raceways ~~strut-type channel raceway~~ shall not exceed the percentage fill using Table 3VV-22 ~~352-45~~ and applicable outside diameter (O.D.) dimensions of specific types and sizes of wire given in the Tables in Chapter 9.
The derating factors of Section 310-15(b)(2)(a) shall not apply to conductors installed in strut-type channel raceways where all of the following conditions are met:
1. The cross-sectional area of the raceway exceeds 4 in.2 (2580 mm2)
2. The current-carrying conductors do not exceed 30 in number
3. The sum of the cross-sectional areas of all contained conductors does not exceed 20 percent of the interior cross-sectional area of the strut-type channel raceways ~~strut-type channel raceway~~
where:
N = number of wires
CA = channel area in square inches
WA = wire area
~~352-46. Extensions Through Walls and Floors~~
~~It shall be permitted to extend unbroken lengths of strut-type channel raceway through walls, partitions, and floors where closure strips are removable from either side and the portion within the wall, partition, or floor remains covered.~~
3VV-30 ~~352-47~~. Securing and Supporting of ~~Strut-Type Channel Raceways~~
(a) A surface mount strut-type channel raceways ~~strut-type channel raceway~~ shall be secured to the mounting surface with retention straps external to the channel at intervals not exceeding 10 ft (3.05 m) and within 3 ft (914 mm) of each outlet box, cabinet, junction box, or other channel raceway termination.
(b) Suspension Mount. strut-type channel raceways ~~Strut-type channel raceways~~ shall be permitted to be suspension mounted in air with approved appropriate methods designed for the purpose at intervals not to exceed 10 ft (3.05 m).
3VV-56 ~~352-48~~. Splices and Taps
Splices and taps shall be permitted in raceways that are accessible after installation by having a removable cover. The conductors, including splices and taps, shall not fill the raceway to more than 75 percent of its area at that point. All splices and taps shall be made by approved methods.
352-60 ~~352-50~~. Grounding
Installation of strut-type channel raceways shall comply with the applicable provisions of Article 250. Strut-type channel raceways ~~Strut-type channel raceway~~ enclosures providing a transition to or from other wiring methods shall have a means for connecting an equipment grounding conductor. Strut-type channel raceways shall be permitted as an equipment grounding conductor in accordance with Section 250-118(14). Where a snap-fit metal cover for strut-type channel raceways ~~strut-type channel raceway~~ is used to achieve electrical continuity in accordance with the listing, this cover shall not be permitted as the means for providing electrical continuity for a receptacle mounted in the cover.
C. Construction Specifications
3VV-100 Construction. ~~352-49. General~~
Strut-type channel raceways and their accessories shall be of a construction that distinguishes them from other raceways. Raceways

Table 3VV-22 ~~352-45.~~ Channel Size and Inside Diameter Area

	Area	40% Area*		25% Area**		
Size Channel	in.^{2}	mm^2	in.^{2}	mm^2	in.^{2}	mm^2
15/8 x 13/16	0.887	572	0.355	229	0.222	143
15/8 x 1	1.151	743	0.460	297	0.288	186
15/8 x 13/8	1.677	1076	0.671	433	0.419	270
15/8 x 15/8	2.028	1308	0.811	523	0.507	327
15/8 x 27/16	3.169	2045	1.267	817	0.792	511
15/8 x 3 1/4	4.308	2780	1.723	1112	1.077	695
1 1/2 x 3/4	0.849	548	0.340	219	0.212	137
1 1/2 x 1 1/2	1.828	1179	0.731	472	0.457	295
1 1/2 x 1 7/8	2.301	1485	0.920	594	0.575	371
1 1/2 x 3	3.854	2487	1.542	995	0.964	622

***Raceways with external joiners shall use a 40 percent wire fill calculation to determine the number of conductors permitted.**
****Raceways with internal joiners shall use a 25 percent wire fill calculation to determine the number of conductors permitted.**

and their elbows, couplings, and other fittings shall be designed so that the sections can be electrically and mechanically coupled together and installed without subjecting the wires to abrasion. They shall comply with the following:
(a) Material. Raceways and accessories shall be formed of steel, stainless steel, or aluminum.
(b) Corrosion protection. Steel raceways and accessories shall be protected against corrosion by galvanizing, enamel, or a PVC coating.
(c) Covers. Covers of strut-type channel raceways shall be either metallic or nonmetallic.
3VV-120 ~~352-51.~~ Marking
Each length of strut-type channel raceways shall be clearly and durably identified as required in the first sentence of Section 110-21.
SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways other than those in circular cross section.

Currently Article 352 is made up of three parts. The purpose of this proposal was to separate each Part into three separate Articles. These three new articles follow the format developed by Sub-Task Group 1. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the raceways articles. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

For the purpose of this proposal an article numbering scheme of "3VV" was used. It was not the intent of the submitter that this numbering scheme be adopted. Instead, a "NEW" article number would be assigned by the Technical Correlating Committee.

Explanation of renumbering and editorial changes;

- Title New Title added.
- 3VV-1 New Scope added to conform with the style manual.
- 3VV-2 (1) New definition added.
  (2) Deleted Part C from 352.
- 3VV-3 (1) Other Articles renumbered from Section 352-43 to 3VV-3.
  (2) Capitalize product name.
  (3) Moved Grounding Requirements to 3VV-60
- 3VV-6 Based on the reading of 352-41 and 352-49, the requirements have been combined into a single section requiring that strut-type channel raceway and its accessories be listed.
- 3VV-10 (1) Uses "Permitted" renumbered from Section 352-41 to 3VV-10.
  (2) Revised 352-42(b) to read as a use permitted and added to this section.
  (3) Added "Extension Trough Walls and Floors" 352-46.
- 3VV-12 (1) Uses "Uses Not Permitted" renumbered from Section 352-42 to 3VV-12.
  (2) Revised 352-42(b) to split out the use permitted from use not permitted.
  (4) Moved listing requirement to 3VV-6
- 3VV-21 (1) Size renumbered from Section 352-44 to 3VV-21.
  (2) Capitalize product name.
- 3VV-22 (1) Number of Conductors renumbered from 352-45 to 3VV-22.
  (2) Capitalize product name. (Two Places)
  (3) Removed the reference to raceway for clarity.
  (4) Corrected Table reference
  (5) Table for the Number of Conductors renumbered from 352-45 to 3VV-22.
- 352-46 Moved Extension Through Walls and Floors to uses Permitted 3VV-10(7).
- 3VV-30
  (1) Securing and Supporting renumbered and renamed from 352-47 Support of Strut Type Channel raceway to 3VV-30 Securing and Supporting.
  (2) Capitalize product name. (Two Places)
- 3VV-56
  (1) Splices and Taps renumbered from 352-48 to 3VV-56.
- 3VV-60 (1) Grounding renumbered from 352-50 to 3VV-60.
  (2) Added grounding requirement from 3VV-3(352-43, 99 NEC).
  (3) Capitalize product name. (Three Places)
- 3VV-100 (1) Construction renumbered and renamed from 352-49 General to 3VV-100 Construction.
  (2) Requirements from the decription in 352-40 have been moved to create an (a), (b) and (c) under construction since those items are related to specific construction of the raceway.
- 3VV-120 (1) Marking renumbered from 352-51 to 3VV-120.
  (2) Added "of Strut-Type Channel Raceways" for clarity.

PANEL ACTION: Accept in Principle.
Delete from the proposal 3VV-3.
In proposed 3VV-10(7) amend to read:
"7. As extensions of unbroken lengths through walls, partitions, and floors where closure strips are removable from either side and the portion within the wall, partition, or floor remains covered."
In 3VV-30(a) add title to read: Surface Mount.
In proposed 3VV-60 delete the first sentence.
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 3VV-3 and the first sentence of 3VV-60 are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
Proposed 3VV-10(7) has been amended to enhance clarity.
The title has been added to 3VV-30(a) to comply with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
JANNOT: The panel action should have included:
In proposed 3VV-22 add the formula: "Formula for wire fill:
$N = \frac{CA}{WA}$" as it appears in 352-45 in the existing NEC.
The panel statement for this action is that it is editorial and was inadvertently omitted.

(Log #1529)

8- 377 - (352-40): Reject
SUBMITTER: Tricia Sofia, MFMA
RECOMMENDATION: In the second sentence change the word "enamel" to "organic coated."
SUBSTANTIATION: The word "enamel" is used in a generic sense and is no longer applicable. The words organic coated are specific and more easily understood.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed new language does not enhance understanding of the product description.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 3
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
BERMAN: The submitter's proposal correctly reflects the industry terminology for the material coating and should be accepted.
DAUBERGER: Although enamel is still being used as a coating by some manufacturers, many have changed to other coatings such as nonmetallic coatings and powder coatings. The term "organic coated" accurately describes the various coatings currently being used on strut-type channel raceways.
LOYD: The proposal should be accepted. The term "Organic" is the correct term and is appropriate. "Enamel" is also an undefined term, but is generally identified as a washable paint.

(Log #2596)

8- 378 - (352-47(b)): Accept
NOTE: The Technical Correlating Committee understands that the recommended wording revises the wording of 3VV-30(b) in Proposal 8-376.
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise Section 352-47(b) to read as follows:
(b) Suspension Mount. Strut-type channel raceways shall be permitted to be suspension mounted in air with approved appropriate methods designed for the purpose at intervals not to exceed 10 ft (3.05 m) and within 3 ft (914 mm) of channel raceway terminations and ends.

SUBSTANTIATION: The present wording allows up to a 20 ft length to be suspended on a single mount located so that no more than 10 ft of channel raceway is on each side of the mount. This does not provide the secure support necessary to prevent damage to the installation from movement as the channel strut rotates around the single mount.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3452)

8- 379 - (352-47(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise Section 352-47(b) to read as follows:
(b) Suspension Mount. Strut-type channel raceways shall be permitted to be suspension mounted in air with approved appropriate methods designed for the purpose at intervals not to exceed 10 ft (3.05 m) and within 3 ft (914 mm) of channel raceway terminations and ends.
SUBSTANTIATION: The present wording allows up to a 20 ft length to be suspended on a single mount located so that no more than 10 ft of channel raceway is on each side of the mount. This does not provide the secure support necessary to prevent damage to the installation from movement as the channel strut rotates around the single mount.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-378.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3739)

8- 380 - (352-47(b)): Accept in Principle
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Revise Section 352-47(b) to read as follows:
(b) Suspension Mount. Strut-type channel raceways shall be permitted to be suspension mounted in air with approved appropriate methods designed for the purpose at intervals not to exceed 10 ft (3.05 m) and within 3 ft (914 mm) of channel raceway terminations and ends.
SUBSTANTIATION: The present wording allows up to a 20 ft length to be suspended on a single mount located so that no more than 10 ft of channel raceway is on each side of the mount. This does not provide the secure support necessary to prevent damage to the installation from movement as the channel strut rotates around the single mount. Including a provision for support within 3 ft of terminations and ends provides a secure support.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 8-378.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #CP807)

8- 380a - (3UU-6): Accept
SUBMITTER: CMP 8
RECOMMENDATION: Add new section 3UU-6 to read:
"3UU-6 Listing Requirements. Surface nonmetallic raceway and associated fittings shall be listed."
SUBSTANTIATION: The panel intends that this product be evaluated and listed in accordance with the appropriate product standard.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
KENDALL: It needs to be clear to NFPA staff and the Technical Correlating Committee that this new section belongs with Surface Nonmetallic Raceway per Proposal 8-370. I believe this proposal number should have been numbered 8-370a to stay in sequence.

ARTICLE 353 — MULTIOUTLET ASSEMBLY

(Log #1436)

8- 381 - (353-1): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 353-1 in its entirety including the fine print note.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2076)

8- 382 - (353-1): Accept in Principle
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a Scope section to Article 353 to read as follows:
353-1. Scope. The provisions of this article covers the use and installation requirements of multioutlet assembly.
Renumber remaining sections.
SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.
PANEL ACTION: Accept in Principle.
Amend the proposed text to read:
"353.1 Scope. This article covers the use and installation requirements for multioutlet assemblies."
PANEL STATEMENT: The amended text is consistent with the proposed revisions made by CMP-8 to other articles. The panel recommends that the TCC accept the proposed scope statement. It is not necessary to renumber the Article based on the panel's action on Proposal 8-381.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1291)

8- 383 - (353-2(b)(3)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
353-2 (b) (3) Where the voltage is 300 volts or more between conductors unless the assembly is of metal having a thickness of not less than 1.02 mm (0.040 in.) ~~(1.02 mm)~~
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

ARTICLE 354 — UNDERFLOOR RACEWAYS

(Log #1292)

8- 384 - (354(a), (b) and (d)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
354-3 (a) Raceways Not Over 100 mm (4 in.) ~~(102 mm)~~ Wide. Half-round and flat-top raceways not over 100 mm (4 in.) ~~(102 mm)~~ in width shall have not less than 20 mm (3/4 in.) ~~(19 mm)~~ of concrete or wood above the raceway.
Exception: As permitted in (c) and (d) for flat-top raceways.
354-3 (b) Raceways Over 100 mm (4 in.) ~~(102 mm)~~ Wide but Not Over 200 mm (8 in.) ~~(203 mm)~~ Wide. Flat-top raceways over 100 mm (4 in.) ~~(102 mm)~~ but not over 200 mm (8 in.) ~~(203 mm)~~ wide with a minimum of 25 mm (1 in.) ~~(25.4 mm)~~ spacing between raceways shall be covered with concrete to a depth of not less than 25 mm (1 in.) ~~(25.4 mm)~~. Raceways spaced less than 25 mm (1 in.) ~~(25.4 mm)~~ apart shall be covered with concrete to a depth of 38 mm (1 1/2 in.) ~~(38 mm)~~.
354-3 (d) Other Raceways Flush with Concrete. In office occupancies, approved metal flat-top raceways, if not over 100 mm (4 in.) ~~(102 mm)~~ in width, shall be permitted to be laid flush with the concrete floor surface, provided they are covered with substantial linoleum that is not less than 1.6 mm (1/16 in.) ~~(1.59 mm)~~ in thickness or with equivalent floor covering. Where more than one and not more than three single raceways are each installed flush with the concrete, they shall be contiguous with each other and joined to form a rigid assembly.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #1437)

8- 385 - (354-1): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 354-1 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2077)

8- 386 - (354-1): Accept in Principle
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a Scope section to Article 354 to read as follows:
354-1. Scope. The provisions of this article covers the use and installation requirements of underfloor raceways.
Renumber remaining sections.
SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.
PANEL ACTION: Accept in Principle.
Amend the proposed text to read:
"354-1. Scope. This article covers the use and installation requirements for underfloor raceways".
PANEL STATEMENT: The amended text is consistent with the proposed revisions made by CMP-8 to other articles. The panel recommends that the TCC accept the proposed scope statement. It is not necessary to renumber the article based on the panel's action on Proposal 8-385.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #850)

8- 387 - (354-7): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
~~Discontinued~~ Removed Outlets. When an outlet is ~~abandoned, discontinued, or~~ removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. (remainder unchanged)
SUBSTANTIATION: Edit. What does abandoned or discontinued mean? Does a period of nonuse, an off position of a switch or circuit breaker constitute abandonment or discontinuance? Those conditions don't create any hazard, as the installation hasn't changed. The only justification for this (largely unenforceable) rule is when the outlet is removed. Vagueness causes variation of interpretation.
PANEL ACTION: Reject.
PANEL STATEMENT: The terms abandoned and discontinued have been used throughout the underfloor raceway articles and clearly implies that the outlet is no longer being used to supply utilization equipment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2572)

8- 388 - (354-15): Accept in Principle
SUBMITTER: J. Philip Simmons, Nat'l Armored Cable Manufacturers Assn.
RECOMMENDATION: Revise existing section as follows:
Connections between raceways and distribution centers and wall outlets shall be made by means of flexible metal conduit where not installed in concrete, or by rigid metal conduit, intermediate metal conduit, electrical metallic tubing, or Type MC cable, with ~~or~~ approved fittings. Where a metallic underfloor raceway system provides for the termination of an equipment grounding conductor, rigid nonmetallic conduit, electrical nonmetallic tubing, or liquidtight flexible nonmetallic conduit where not installed in concrete, shall be permitted.
SUBSTANTIATION: Listed Type MC cable is manufactured with an overall corrosion resistant, moisture impervious nonmetallic jacket. This product is suitable for installations in concrete. See Sections 334-4 and 334-22 for information on supplemental protection of Type MC cable.
PANEL ACTION: Accept in Principle.
Delete existing text and revise 354-15 to read as follows:
354-15. Connections to Cabinets and Wall Outlets. Connections from underfloor raceways to distribution centers and wall outlets shall be made by approved fittings or by any of the wiring methods in Chapter 3, where installed in accordance with the provisions of the respective articles.
PANEL STATEMENT:
This section is rewritten for clarity and to allow any of the wiring methods in Chapter 3 to be used if they are suitable for the purpose. This action meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 356 — CELLULAR METAL FLOOR RACEWAYS

(Log #2078)

8- 389 - (356-1): Accept in Principle
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a Scope section to Article 356 to read as follows:
356-1. Scope. The provisions of this article covers the use, installation, and construction specifications requirements of cellular metal floor raceways.
Renumber remaining sections.
SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.
PANEL ACTION: Accept in Principle.
Amend the proposed text to read:
356-1. Scope. This article covers the use and installation requirements for cellular metal floor raceways.
Renumber existing sections accordingly.
PANEL STATEMENT: The amended text is consistent with the proposed revisions made by CMP 8 to other articles. The panel recommends that the TCC accept the proposed scope statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2196)

8- 390 - (356-1-Cellular Metal Floor Raceway): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
For the purposes of this article, a cellular metal floor raceway is ~~shall be defined as~~ the hollow spaces of cellular metal floors, together with suitable fittings, that may be approved as enclosures for electric conductors. A cell is ~~shall be defined as~~ a single, enclosed tubular space in a cellular metal floor member, the axis of the cell being parallel to the axis of the metal floor member. A header is ~~shall be defined as~~ a transverse raceway for electric conductors, providing access to predetermined cells of a cellular metal floor, thereby permitting the installation of electric conductors from a distribution center to the cells.
SUBSTANTIATION: This is a definition. It should be stated in a declarative sentence and should not use mandatory rule language, such as "shall be." Definitions shall not contain requirements. See the NEC Style Manual 2.2.2 and 3.1.
(I have submitted four other proposals on this same concept.)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1438)

8- 391 - (356-3): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 356-3 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1071)

8- 392 - (356-4): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 1/0" to "1/0 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #851)

8- 393 - (356-7): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
~~Discontinued~~ Removed Outlets. When an outlet is ~~abandoned, discontinued, or~~ removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. (remainder unchanged)
SUBSTANTIATION: Edit. What does abandoned or discontinued mean? Does a period of nonuse, an off position of a switch or circuit breaker constitute abandonment or discontinuance? Those conditions don't create any hazard, as the installation hasn't changed. The only justification for this (largely unenforceable) rule is when the outlet is removed. Vagueness causes variation of interpretation.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-387.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 358 — CELLULAR CONCRETE FLOOR RACEWAYS

(Log #2195)

8- 394 - (358-2-Cell): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
A cell is ~~shall be defined as~~ a single, enclosed tubular space in a floor made of precast cellular concrete slabs, the direction of the cell being parallel to the direction of the floor member. A header is ~~shall be defined as~~ transverse metal raceway for electric conductors, providing access to predetermined cells of a precast cellular concrete floor, thereby permitting the installation of electric conductors from a distribution center to the floor cells.
SUBSTANTIATION: This is a definition. It should be stated in a declarative sentence and should not use mandatory rule language, such as "shall be." Definitions shall not contain requirements. See the NEC Style Manual 2.2.2 and 3.1.
(I have submitted four other proposals on this same concept.)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1072)

8- 395 - (358-10): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 1/0" to "1/0 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #852)

8- 396 - (358-13): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
~~Discontinued~~ Removed Outlets. When an outlet is ~~abandoned, discontinued, or~~ removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. (remainder unchanged)
SUBSTANTIATION: Edit. What does abandoned or discontinued mean? Does a period of nonuse, an off position of a switch or circuit breaker constitute abandonment or discontinuance? Those conditions don't create any hazard, as the installation hasn't changed. The only justification for this (largely unenforceable) rule is when the outlet is removed. Vagueness causes variation of interpretation.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-387.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 362 — METAL WIREWAYS AND NONMETALLIC WIREWAYS

(Log #1293)

8- 397 - (362): Accept
NOTE: The Technical Correlating Committee notes that the revised dimensions in this Proposal will be implemented in the revised Articles 3AA and 3BB of Proposals 8-398 and 8-414.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
362-6 Where insulated conductors are deflected within a wireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the wireway, or where the direction of the wireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6 shall apply. Where insulated conductors No. 4 or larger enter a wireway through a raceway or cable, the distance between those raceway and cable entries shall not be less than six times the trade diameter of the larger raceway or cable connector.
Where insulated conductors No. 4 or larger enter a wireway through a raceway or cable, the distance between raceway and cable entries enclosing the same conductor shall not be less than six times the trade diameter of the larger raceway or cable connector.
362-8 Wireways shall be supported in accordance with the following.
(a) Horizontal Support. Wireways shall be supported where run horizontally at each end and at intervals not to exceed 1.5 m (5 ft) ~~(1.52 m)~~ or for individual lengths longer than 1.5 m (5 ft) ~~(1.52 m)~~ at each end or joint, unless listed for other support intervals. The distance between supports shall not exceed 3 m (10 ft) ~~(3.05 m)~~.
(b) Vertical Support. Vertical runs of wireways shall be securely supported at intervals not exceeding 4.5 m (15 ft) ~~(4.57 m)~~ and shall not have more than one joint between supports. Adjoining wireway sections shall be securely fastened together to provide a rigid joint.
362-22 Nonmetallic wireway shall be supported in accordance with (a) and (b).
(a) Horizontal Support. Nonmetallic wireways shall be supported where run horizontally at intervals not to exceed 900 mm (3 ft) ~~(914 mm)~~, and at each end or joint, unless listed for other support intervals. In no case shall the distance between supports exceed 3 m (10 ft) ~~(3.05 m)~~.
(b) Vertical Support. Vertical runs of nonmetallic wireway shall be securely supported at intervals not exceeding 1.2 m (4 ft) ~~(1.22 m)~~, unless listed for other support intervals, and shall not have more than one joint between supports. Adjoining nonmetallic wireway sections shall be securely fastened together to provide a rigid joint.
362-23 Expansion fittings for nonmetallic wireway shall be provided to compensate for thermal expansion and contraction where the length change is expected to be 6 mm (0.25 in.) ~~(6.36 mm)~~ or greater in a straight run.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #1304)

8- 398 - (362 Part A): Accept in Principle
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Rewrite of Article 362 Part A
This is a companion proposal to 362 Part B
ARTICLE 3AA – Metal Wireways and Nonmetallic Wireways
~~A. Metal Wireways~~
A. General
3AA-1. Scope. This article covers the use, installation, and construction specifications for metal wireways and associated fittings.
3AA-2 ~~362-1.~~ Definition
Metal wireways are sheet metal troughs with hinged or removable covers for housing and protecting electric wires and cable and in which conductors are laid in place after the wireway has been installed as a complete system.
3AA-3 ~~362-3.~~ Other Articles
Installations of Metal W~~w~~ireways shall comply with the applicable provisions of Article 300.
B. Installations
3AA-10 ~~362-2.~~ Uses Permitted
~~(a) Permitted.~~ The use of Metal W~~w~~ireways shall be permitted as in the follow~~s~~ing:
1. For exposed work
2. In concealed spaces only in accordance with Section 640-24
3. In hazardous (classified) locations as permitted by Section 501-4(b) for Class I, Division 2, locations; Section 502-4(b) for Class II, Division 2, locations; and Section 504-20 for intrinsically safe wiring Where installed in wet locations, wireways shall be listed for the purpose.
4. Extension Through Walls - Wireways shall be permitted to pass transversely through walls if the length passing through the wall is unbroken. Access to the conductors shall be maintained on both sides of the wall.
3AA-12 Uses Not Permitted.
~~(b) Not Permitted.~~ The use of Metal W~~w~~ireways shall not be used in the following: ~~permitted where subject to severe physical damage or corrosive vapor.~~
1. Where subject to severe physical damage
2. Where subject to corrosive vapors
3AA-21 ~~362-4.~~ Size of Conductors
No conductor larger than that for which the wireway is designed shall be installed in any wireway.
3AA-22 ~~362-5.~~ Number of Conductors
Metal wireways shall not contain more than 30 current-carrying conductors at any cross section. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors.
The sum of cross-sectional areas of all contained conductors at any cross section of the wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.
The derating factors specified in Section 310-15(b)(2)(a) shall not be applicable to the 30 current-carrying conductors at 20 percent fill specified above.

Exception No. 1: Where the derating factors specified in Section 310-15(b)(2)(a) are applied, the number of current-carrying conductors shall not be limited, but the sum of the cross-sectional areas of all contained conductors at any cross section of the wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.

Exception No. 2: As provided in Section 520-6, the 30-conductor limitation shall not apply to theaters and similar locations.

Exception No. 3: As provided in Section 620-32, the 20 percent fill limitation shall not apply to elevators and dumbwaiters.

3AA-23 ~~362-6.~~ Deflected Insulated Conductors

Where insulated conductors are deflected within a wireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the wireway, or where the direction of the wireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6 shall apply. Where insulated conductors No. 4 or larger enter a wireway through a raceway or cable, the distance between those raceway and cable entries shall not be less than six times the trade diameter of the larger raceway or cable connector. Where insulated conductors No. 4 or larger enter a wireway through a raceway or cable, the distance between raceway and cable entries enclosing the same conductor shall not be less than six times the trade diameter of the larger raceway or cable connector.

3AA-30 Securing and Supporting ~~362-8. Supports~~

Metal wireways shall be supported in accordance with the following.

(a) Horizontal Support. Wireways shall be supported where run horizontally at each end and at intervals not to exceed 5 ft (1.52 m) or for individual lengths longer than 5 ft (1.52 m) at each end or joint, unless listed for other support intervals. The distance between supports shall not exceed 10 ft (3.05 m).

(b) Vertical Support. Vertical runs of wireways shall be securely supported at intervals not exceeding 15 ft (4.57 m) and shall not have more than one joint between supports. Adjoining wireway sections shall be securely fastened together to provide a rigid joint.

3AA-56 ~~362-7.~~ Splices and Taps

Splices and taps shall be permitted within a wireway provided they are accessible. The conductors, including splices and taps, shall not fill the wireway to more than 75 percent of its area at that point.

3AA-58 ~~362-10.~~ Dead Ends

Dead ends of metal wireways shall be closed.

3AA-60 ~~362-13.~~ Grounding

Grounding shall be in accordance with the provisions of Article 250.

~~362-9. Extension Through Walls~~

~~Wireways shall be permitted to pass transversely through walls if the length passing through the wall is unbroken. Access to the conductors shall be maintained on both sides of the wall.~~

3AA-70 ~~362-11.~~ Extensions from Metal Wireways

Extensions from wireways shall be made with cord pendants installed in accordance with Section 400-10 or any wiring method in Chapter 3 that includes a means for equipment grounding. Where a separate equipment grounding conductor is employed, connection of the equipment grounding conductors in the wiring method to the wireway shall comply with Sections 250-8 and 250-12. Where rigid nonmetallic conduit, electrical nonmetallic tubing, or liquidtight flexible nonmetallic conduit is used, connection of the equipment grounding conductor in the nonmetallic raceway to a metal wireway shall comply with Sections 250-8 and 250-12.

C. Construction Specifications

3AA-120 ~~362-12.~~ Marking

Metal wireways shall be marked so that their manufacturer's name or trademark will be visible after installation.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways other than those in circular cross section.

Currently Article 362 is made up of two parts. The purpose of this proposal was to separate each Part into two separate Articles. These two new articles follow the format developed by Sub-Task Group 1. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the raceways articles. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

For the purpose of this proposal an article numbering scheme of "3AA" was used. It was not the intent of the submitter that this numbering scheme be adopted. Instead, a "NEW" article number would be assigned by the Technical Correlating Committee.

Explanation of renumbering and editorial changes;

Title	Title Revised to remove Nonmetallic Wireways.
3AA-1	New Scope added to conform with the style manual.
3AA-2	(1) Definition renumbered from 362-1 to 3AA-2. (2) Deleted Part A from 362. (3) Added "Metal" to product name
3AA-3	(1) Other Articles renumbered from Section 362-3 to 3AA-3. (2) Added "Metal" and capitalize Wireway because it is a proper name.
3AA-10	(1) Uses "Permitted" renumbered from Section 362-2 to 3AA-10. (2) Added "Metal" and capitalize Wireway because it is a proper name. (3) Added "Extension Trough Walls and Floors" 362-9. (4) Moved "uses not permitted" to section 3AA-12.
3AA-12	(1) New section for "Uses Not Permitted". (2) Added "Metal" and capitalize Wireway because it is a proper name. (3) Listed uses not permitted
3AA-21	(1) Size renumbered from Section 362-4 to 3AA-21.
3AA-22	(1) Number of Conductors renumbered from 362-5 to 3AA-22. (2) Added "Metal" to product name.
3AA-23	(1) Deflected Insulated Conductors renumbered from 362-6 to 3AA-23.
3AA-30	(1) Securing and Supporting renumbered and renamed from 362-8 Supporting to 3AA-30 Securing and Supporting. (2) Added "Metal" to product name.
3AA-56	(1) Splices and Taps renumbered from 362-7 to 3AA-56.
3AA-58	(1) Dead Ends renumbered from Section 362-10 to 3AA-58. (2) Added "Metal" and capitalize Wireway because it is a proper name.
3AA-60	(1) Grounding renumbered from section 362-13 to 3 AA-60
362-9	Moved Extension Through Walls and Floors to Uses Permitted 3AA-10(4).
3AA-70	(1) Extension from Metal Wireways renumbered from 362-11 to 3AA-70. (2) Added "Metal" to product name.
3AA-120	(1) Marking renumbered from 362-12 to 3AA-120. (2) Added "Metal" to product name.

PANEL ACTION: Accept in Principle.

Delete "and Nonmetallic Wireways" from the title.

Delete from the proposal 3AA-3.

In proposed 3AA-10(4) amend language to read:

4. "As extensions to pass transversely through walls..."

Delete 3AA-60

PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.

The proposed 3AA-3 and 3AA-60 are deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.

Proposed 3AA-10(4) has been amended to enhance clarity.

The title has changed due to reformatting of nonmetallic wireways into a separate article.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 1 Corry

(Log #2079)

8- 399 - (362-1): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add a Scope section to Article 362 to read as follows:

362-1. Scope. The provisions of this article covers the use and installation requirements of metal wireways and nonmetallic wireways.

Renumber remaining sections.

SUBSTANTIATION: Each Article should have a scope section.

The NEC style manual on style also shows a scope article.

To keep the Articles consistent all Articles should be similar.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposals 8-398 and 8-414.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2184)

8- 400 - (362-2(a)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(1) For exposed work.
~~(2) In concealed spaces in accordance with Section 640-24.~~
(2) ~~(3)~~ In hazardous...
SUBSTANTIATION: In the 1996 NEC 640-4 Exception c., wireways were permitted in concealed places. In the 1999 NEC in accordance with 640-24, "The use of ...wireways,...shall comply with applicable articles with respect to permitted locations...". There are no exceptions; therefore, wireways shall only be used for exposed work and this erroneous reference to 640-24 should be deleted.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-401.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #853)

8- 401 - (362-2(a)(2)b): Accept in Principle
NOTE: The Technical Correlating Committee understands that the panel action does the following: The panel action for (a)(2) revises the text accepted in 3AA-10(2) of Proposal 8-398 and the text for (b) replaces the 3AA-12(2) with the text, "Where subject to severe corrosive environments".
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(a)(2) In concealed spaces ~~only in accordance with~~ except as permitted in Section ~~640-24~~ 362-9.
(b) Not Permitted. The use of wireways shall not be permitted where subject to severe physical damage or corrosive vapor or liquid.
SUBSTANTIATION: Edit. Section 640-24 is irrelevent. The 1996 Section 640-4 Exception (c) which permitted concealment is not in the 1999 NEC. Section 362-9 should be noted for correlation and avoidance of conflict.
Since corrosive vapor is noted, it seems reasonable to include corrosive liquid.
PANEL ACTION: Accept in Principle.
Revise proposed (a)(2):
(a)(2) In concealed spaces ~~except~~ as permitted in 362-9.
Revise proposed text of (b) to read:
(b) Not Permitted. The use of wireways shall not be permitted where subject to severe physical damage or severe corrosive environments.
PANEL STATEMENT: The proposed language of (a)(2) was modified to clarify the only locations where wireway is permitted to be concealed. The revision of Paragraph (b) clarifies that wireway is not permitted to be used where installed in any severely corrosive environment. Some types of metal wireways can be used in locations not deemed to be severely corrosive.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
BERMAN: All types of wireways are suitable for use in environments that are not deemed to be severely corrosive. Therefore, the last sentence of the Panel Statement should not have been included.

(Log #1439)

8- 402 - (362-3): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 362-3 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 8-398.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2317)

8- 403 - (362-5): Reject
SUBMITTER: Michael L. True, Abbott True Electric, Inc.
RECOMMENDATION: Revise the third paragraph to read as follows:
"The derating factors specified in Section 310-15(b)(2)(a) shall not be applicable to ~~the 30~~ current-carrying conductors at 20 percent fill specified above."
SUBSTANTIATION: Wireway fill shall be based on percentage of fill only. Table 310-15(b)(2)(a) is based on 40 percent conduit fill where the current-carrying conductors are "bundled". This should not apply to a wireway. The wireway allows the current-carrying conductors to be spread out over a larger area than a conduit, this allowing heat to dissipate. Table 310-15(b)(2)(a) should not apply to a gutter that is 20 percent filled. The derating chart should apply to wireways that are over 20 percent filled.
PANEL ACTION: Reject.
PANEL STATEMENT: There was no technical substantiation provided to expand the allowable fill.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2318)

8- 404 - (362-5): Reject
SUBMITTER: Michael L. True, Abbott True Electric, Inc.
RECOMMENDATION: Revise text to read as follows:
"Number of Conductors. ~~Wireways shall not contain more than 30 current-carrying conductors at any cross-section.~~ Conductors for signaling or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors."
SUBSTANTIATION: Wireway fill should be based on percentage of fill only. This will allow larger wireways with more unbundled current-carrying conductors thus allowing heat to dissipate.
PANEL ACTION: Reject.
PANEL STATEMENT: There was no technical substantiation provided to expand the allowable fill.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4214)

8- 405 - (362-5): Accept
NOTE: The Technical Correlating Committee understands that the accepted text revises the text accepted in 3AA-22 of Proposal 8-398.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Number of Conductors. The sum of the cross-sectional areas of all contained conductors at any cross-section of a wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway. The derating factors in Section 310-15(b)(2)(a) shall be applied only where the number of current-carrying conductors, including neutral conductors classified as current-carrying under the provisions of Section 310-15(b)(4), exceeds 30. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors. ~~Wireways shall not contain more than 30 current-carrying conductors at any cross-section. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors.~~

~~The sum of cross-sectional areas of all contained conductors at any cross section of the wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.~~

~~The derating factors specified in Section 310-15(b)(2)(a) shall not be applicable to the 30 current-carrying conductors at 20 percent fill specified above.~~

~~Exception No. 1: Where the derating factors specified in Section 310-15(b)(2)(a) are applied, the number of current carrying conductors shall not be limited, but the sum of the cross-sectional areas of all contained conductors at any cross section of the wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.~~

~~Exception No. 2: As provided in Section 520-6, the 30 conductor limitation shall not apply to theaters and similar locations.~~

~~Exception No. 3: As provided in Section 620-32, the 20 percent fill limitation shall not apply to elevators and dumbwaiters.~~

SUBSTANTIATION: This is an editorial simplification of a rule that has become more complex than it needs to be. The only real limit on fill is the 20 percent limitation. The opening statement about 30 conductors doesn't address fill, it addresses mutual conductor heating. The result is one paragraph to get us into trouble and a full-blown exception to get us back out by saying the putative opening limit ("not contain more than 30") isn't a real limit if you want to pay the derating penalty. It's much better to use one sentence to set out the physical limitation (20 percent), and then one sentence to say when you pay the derating penalty. I threw in the appropriate reference on when neutrals are current-carrying for clarity. Then I included the control circuit sentence, and that's it. A simple paragraph with three declarative sentences, written positively. The references to elevator and theater gutters now violates the Style Manual because Section 90-3 adequately addresses it, so I threw them out as well.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3637)

8- 406 - (362-5 Exception No. 1 and Table 362-5): Reject
SUBMITTER: Will Dockham, Gilmanton Iron Works, NH
RECOMMENDATION: Revise the text of Section 362-5 Exception No. 1, and add a new Table 362-5 as follows:

Exception No. 1: Where the derating factors specified in ~~Section 310-15(b)(2)(a)~~ Table 362-5, are applied, the number of current-carrying conductors shall not be limited, but the sum of the cross-sectional areas of all contained conductors at any cross section of the wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.

Table 362-5. Adjustment Factors for More than 30 Current-Carrying Conductors in a Wireway

Number of Current Carrying Conductors	Percent of Values in Tables 310-16 and 310-18 as Adjusted for Ambient Temperature if Necessary
31 – 37	80
38 – 42	70
43 – 50	60
51 – 60	50
61 – 75	40
over 75	35

SUBSTANTIATION: There is a great deal of confusion when trying to determine the ampacity of conductors in a wireway that has more than 30 current-carrying conductors. A dilemma occurs when you attempt to derate per Section 310-15(b)(2)(a). It would imply that the ampacity of up to 30 current-carrying conductors would be at 100 percent of Tables 310-16 or 310-18, however, the ampacity of 31 current-carrying conductors would be at 40 percent of Tables 310-16 or 310-18. Obviously this makes no sense so an ampacity adjustment table needs to be created specifically for Section 362-5.

Please note the values in the purposed Table 362-5, are just a ratio of 30 divided by the applicable percent value. I realize that a more scientific method would be desirable and hope that this panel has the resources to fine tune the values in the table and not just reject this proposal for lack of substantive scientific data.
PANEL ACTION: Reject.
PANEL STATEMENT: The ampacity adjustment factors apply to all current carrying conductors and the submitter has not provided sufficient technical substantiation to apply the ampacity adjustment factors to only those current carrying conductors that exceed 30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #623)

8- 407 - (362-6): Accept in Principle
SUBMITTER: Ralph Geater, Osceola, WI
RECOMMENDATION: Revise 362-6 to read as follows:

Paragraph 1 — "...cable entries shall not be less than ~~six~~ eight times" ...

Paragraph 2 — "...raceway and cable entries ~~enclosing~~ the same conductor shall not be less than ~~six~~ eight times..."
SUBSTANTIATION: 370-28(a)

362-6 above changes need to be made to conform to 370-28(a)(1) Straight Pulls.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concern is achieved by the panel's action on Proposal 8-410.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1073)

8- 408 - (362-6): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 4" to "4 AWG" in two places.
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2597)

8- 409 - (362-6): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise Section 362-6 so the section reads as follows:

362-6. ~~Deflected~~ Insulated Conductors. Insulated conductors installed in a metallic wireway shall comply with (a) and (b).

(a) Deflected Insulated Conductors. Where insulated conductors are deflected within a metallic wireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the metallic wireway, or where the direction of the metallic wireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6(a) shall apply.

(b) Where insulated conductors No. 4 or larger are pulled through a wireway, the distance between raceway and cable entries enclosing the same conductor shall not be less than that required in Section 370-28(a)(1) for straight pulls and Section 370-28(a)(2) for angle pulls.
SUBSTANTIATION: The addition of (b) to 373-6 is a specific reference. A reference to the entire 373-6 is confusing because we don't know whether to use 373-6(a) or 373-6(b). Also, where possible, we are to provide a specific reference.

Metallic wireways, by definition, are for use with conductors which "are laid in place after the wireway has been installed as a complete system". The requirements for deflection of conductors in 362-6 are intended to be utilized with conductors which are "laid in place". In today's installations wireways are also being used as pull boxes. Where wireways are being used as pull boxes the dimensional requirements for pull boxes should apply.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concern is addressed by the panel's action on Proposal 8-410.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3731)

8- 410 - (362-6): Accept
NOTE: The Technical Correlating Committee understands that the accepted text revises the text accepted in 3AA-23 of Proposal 8-398.
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Revise Section 362-6 so the section reads as follows:
362-6. ~~Deflected~~ Insulated Conductors. Insulated conductors installed in a metallic wireway shall comply with (a) and (b).
(a) Deflected Insulated Conductors. Where insulated conductors are deflected within a metallic wireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the metallic wireway, or where the direction of the metallic wireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6(a) shall apply.
(b) Metallic Wireways Used as Pullboxes. Where insulated conductors No. 4 or larger are pulled through a wireway, the distance between raceway and cable entries enclosing the same conductor shall not be less than that required in Section 370-28(a)(1) for straight pulls and Section 370-28(a)(2) for angle pulls.
SUBSTANTIATION: The addition of (a) to 373-6 is a specific reference. A reference to the entire 373-6 is confusing because we don't know whether to use 373-6(a) or 373-7(b). Also, where possible, we are to provide a specific reference.
Metallic wireways, by definition, are for use with conductors which "are laid in place after the wireway has been installed as a complete system." The requirements for deflection of conductors in 362-6 are intended to be utilized with conductors which are "laid in place." In today's installations wireways are also being used as pull boxes. Where wireways are being used as pull boxes the dimensional requirements for pull boxes should apply.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4479)

8- 411 - (362-6): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise Section 362-6 so the section reads as follows:
362-6. Deflected Insulated Conductors. Insulated conductors installed in a metallic wireway shall comply with (a) and (b).
(a) ~~Deflected~~ Insulated Conductors. Where insulated conductors are deflected within a metallic wireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the metallic wireway, or where the direction of the metallic wireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6(a) shall apply.
(b) Where insulated conductors No. 4 or larger are pulled through a wireway, the distance between raceway and cable entries enclosing the same conductor shall not be less than that required in Section 370-28(a)(1) for straight pulls and Section 370-28(a)(2) for angle pulls.
SUBSTANTIATION: The addition of (a) to 373-6 is a specific reference. A reference to the entire 373-6 is confusing because we don't know whether to use 373-6(a) or 373-6(b). Also, where possible, we are to provide a specific reference.
Metallic wireways, by definition, are for use with conductors which " are laid in place after the wireway has been installed as a complete system". The requirements for deflection of conductors in 362-6 are intended to be utilized with conductors which are "laid in place". In today's installations wireways are also being used as pull boxes. Where wireways are being used as pull boxes the dimensional requirements for pull boxes should apply.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concern is addressed by the panel's action on Proposal 8-410.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #624)

8- 412 - (362-6(a) (New)): Reject
SUBMITTER: Ralph Geater, Osceola, WI
RECOMMENDATION: Add a new 362-2(a) to read as follows:
To determine the minimum length of the trough it shall not be less than six times the trade diameter of the largest raceway or cable connection plus the trade size of other raceways.
SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: There was no substantiation. Section 4-3.3(d) of the Regulations Governing Committee Projects requires proposals to include a statement of problem and substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #854)

8- 413 - (362-11): Accept
NOTE: The Technical Correlating Committee understands that the Panel Action deletes the last sentence accepted in 3AA-70 of Proposal 8-398.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete last sentence:
~~"Where rigid nonmetallic conduit, electrical nonmetallic tubing, or liquidtight flexible nonmetallic conduit is used, connection of the equipment grounding conductor in the nonmetallic raceway to a metal wireway shall comply with Sections 250-8 and 250-12."~~
SUBSTANTIATION: Edit. This is a redundant sentence, covered in the preceding sentence which applies to a separate equipment grounding conductor in any raceway or cable, metallic or nonmetallic.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1305)

8- 414 - (362 Part B): Accept in Principle
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Rewrite of Article 362 Part B
This is a companion proposal to 362 Part A
ARTICLE 3BB - Nonmetallic Wireways
~~B. Nonmetallic Wireways~~
A. General
3BB-1. Scope. This article covers the use, installation, and construction specifications for nonmetallic wireways and associated fittings.
3BB-2 ~~362-14.~~ Definition
Nonmetallic Wwireways are flame retardant, nonmetallic troughs with removable covers for housing and protecting electric wires and cables in which conductors are laid in place after the wireway has been installed as a complete system.
3BB-3 ~~362-17.~~ Other Articles
Installations of nonmetallic wireways shall comply with the applicable provisions of Article 300. ~~Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the nonmetallic wireway.~~
~~Exception: Where the grounded conductor is used to ground equipment as permitted in Section 250-142.~~
3BB-6 Listing Requirements. Nonmetallic Raceways shall be listed.
B. Installations
3BB-10 ~~362-15.~~ Uses Permitted
The use of ~~listed~~ nonmetallic wireways shall be permitted ~~as~~ in the following:
1. Only for exposed work, except as permitted in accordance with Section 640-24
2. Where subject to corrosive vapors
3. In wet locations where listed for the purpose
FPN: Extreme cold may cause nonmetallic wireways to become brittle and, therefore, more susceptible to damage from physical contact.

4. Extension Through Walls - nonmetallic wireways shall be permitted to pass transversely through walls if the length passing through the wall is unbroken. Access to the conductors shall be maintained on both sides of the wall.

3BB-12 ~~362-16.~~ Uses Not Permitted

Nonmetallic wireways shall not be used ~~as~~ in the following:

1. Where subject to physical damage
2. In any hazardous (classified) location, except as permitted in Section 504-20
3. Where exposed to sunlight unless listed and marked as suitable for the purpose
4. Where subject to ambient temperatures other than those for which nonmetallic wireway is listed
5. For conductors whose insulation temperature limitations would exceed those for which the nonmetallic wireway is listed

3BB-21 ~~362-18.~~ Size of Conductors

No conductor larger than that for which the N~~n~~onmetallic W~~w~~ireway is designed shall be installed in any N~~n~~onmetallic W~~w~~ireway.

3BB-22 ~~362-19.~~ Number of Conductors

The sum of cross-sectional areas of all contained conductors at any cross section of the N~~n~~onmetallic W~~w~~ireway shall not exceed 20 percent of the interior cross-sectional area of the N~~n~~onmetallic W~~w~~ireway. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors. The derating factors specified in Section 310-15(b)(2)(a) shall be applicable to the current-carrying conductors up to and including the 20 percent fill specified above.

3BB-23 ~~362-20~~. Deflected Insulated Conductors

Where insulated conductors are deflected within a N~~n~~onmetallic W~~w~~ireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the N~~n~~onmetallic W~~w~~ireway, or where the direction of the N~~n~~onmetallic W~~w~~ireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6 shall apply.

3BB-30 Securing and Supporting ~~362-22. Supports~~

Nonmetallic W~~w~~ireway shall be supported in accordance with (a) and (b).

(a) Horizontal Support. Nonmetallic W~~w~~ireways shall be supported where run horizontally at intervals not to exceed 3 ft (914 mm), and at each end or joint, unless listed for other support intervals. In no case shall the distance between supports exceed 10 ft (3.05 m).

(b) Vertical Support. Vertical runs of N~~n~~onmetallic W~~w~~ireway shall be securely supported at intervals not exceeding 4 ft (1.22 m), unless listed for other support intervals, and shall not have more than one joint between supports. Adjoining N~~n~~onmetallic W~~w~~ireway sections shall be securely fastened together to provide a rigid joint.

3BB-44 ~~362-23~~. Expansion Fittings

Expansion fittings for N~~n~~onmetallic W~~w~~ireway shall be provided to compensate for thermal expansion and contraction where the length change is expected to be 0.25 in. (6.36 mm) or greater in a straight run.

FPN: See Table 347-9(A) for expansion characteristics of PVC Rigid Nonmetallic Conduit ~~rigid nonmetallic conduit~~. The expansion characteristics of PVC N~~n~~onmetallic W~~w~~ireway are identical.

3BB-56 ~~362-21~~. Splices and Taps

Splices and taps shall be permitted within a N~~n~~onmetallic W~~w~~ireway provided they are accessible. The conductors, including splices and taps, shall not fill the Nonmetallic Wwireway to more than 75 percent of its area at that point.

~~362-24. Extension Through Walls~~

~~Nonmetallic wireways shall be permitted to pass transversely through walls if the length passing through the wall is unbroken. Access to the conductors shall be maintained on both sides of the wall.~~

3BB-58 ~~362-25~~. Dead Ends

Dead ends of Nonmetallic Wwireway shall be closed using listed fittings.

3BB-60 Grounding

Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the Nonmetallic Wireway.

Exception: Where the grounded conductor is used to ground equipment as permitted in Section 250-142.

362A-70 ~~362-26~~. Extensions from Nonmetallic Wireways

Extensions from N~~n~~onmetallic W~~w~~ireway shall be made with cord pendants or any wiring method of Chapter 3. A separate equipment grounding conductor shall be installed in, or an equipment grounding connection shall be made to, any of the wiring methods used for the extension.

C. Construction Specifications

3BB-120 ~~362-27~~. Marking

Nonmetallic Wwireways shall be marked so that the manufacturer's name or trademark and interior cross-sectional area in square inches shall be visible after installation. Nonmetallic Wwireways that have limited smoke-producing characteristics shall be permitted to be identified with the suffix LS.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering raceways other than those in circular cross section.

Currently Article 362 is made up of two parts. The purpose of this proposal was to separate each Part into two separate Articles. These two new articles follow the format developed by Sub-Task Group 1. This Sub-Task Group has completed their work, and has concluded that the goal of more user friendly code language would be best achieved by adopting a uniform format for each of the circular raceway articles.

A uniform format is proposed to achieve consistency across all of the raceways articles. This format is being proposed separately for each of the circular raceway articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

For the purpose of this proposal an article numbering scheme of "3BB" was used. It was not the intent of the submitter that this numbering scheme be adopted. Instead, a "NEW" article number would be assigned by the Technical Correlating Committee.

Explanation of renumbering and editorial changes;

- Title New Title added.
- 3BB-1 New Scope added to conform with the style manual.
- 3BB-2 (1) Definition renumbered from 362-14 to 3BB-2.
  (2) Deleted Part B from 362.
  (3) Capitalize Wireway because it is a proper name.
- 3BB-3 (1) Other Articles renumbered from Section 362-17 to 3BB-3.
  (2) Capitalize Nonmetallic Wireway because it is a proper name.
  (3) Moved grounding requirements to section 3BB-60.
- 3BB-6 (1) New section for listing requirements.
  (2) Move listing requirements from 3BB-10 (362-15, 99 NEC).
- 3BB-10 (1) Uses "Permitted" renumbered from Section 362-15 to 3BB-10.
  (2) Capitalize Nonmetallic Wireway because it is a proper name.
  (3) Moved listing requirements to 3BB-6
  (4) Added "Extension Trough Walls and Floors" 362-24.
- 3BB-12 (1) Uses "Not Permitted" renumbered from Section 362-16 to 3BB-12.
  (2) Capitalize Nonmetallic Wireway because it is a proper name.
- 3BB-21 (1) Size renumbered from Section 362-18 to 3BB-21.
  (2) Capitalize Nonmetallic Wireway because it is a proper name (Two Places).
- 3BB-22 (1) Number of Conductors renumbered from 362-19 to 3BB-22.
  (2) Capitalize Nonmetallic Wireway because it is a proper name (Two Places).
- 3BB-23 (1) Deflected Insulated Conductors renumbered from 362-20 to 3BB-23.
  (2) Capitalize Nonmetallic Wireway because it is a proper name (Three Places).
- 3BB-30 (1) Securing and Supporting renumbered and renamed from 362-22 Supporting to 3BB-30 Securing and Supporting.
  (2) Capitalize Nonmetallic Wireway because it is a proper name (Four Places).
- 3BB-44 (1) Expansion Fittings renumbered from 362-23 to 3BB-44.
  (2) Capitalize Nonmetallic Wireway because it is a proper name (Two Places).
  (3) Capitalize Rigid Nonmetallic Conduit because it is a proper name.
- 3BB-56 (1) Splices and Taps renumbered from 362-21 to 3BB-56.
  (2) Capitalize Nonmetallic Wireway because it is a proper nam (Two Places).

- 362-24 Moved Extension Through Walls and Floors to Uses Permitted 3BB-10(4).
- 3BB-58 (1) Dead Ends renumbered from Section 362-25 to 3BB-58.
  (2) Capitalize Nonmetallic Wireway because it is a proper name.
- 3BB-60 (1) New section for Grounding Requirements.
  (2) Moved Grounding requirments from 3BB-3 (362-17, 99 NEC).
- 3BB-70 (1) Extension from Nonmetallic Wireways renumbered from 362-26 to 3BB-70.
  (2) Capitalize Nonmetallic Wireway because it is a proper name.
- 3BB-120 (1) Marking renumbered from 362-27 to 3BB-120.
  (2) Capitalize Nonmetallic Wireway because it is a proper name.

PANEL ACTION: Accept in Principle.
Delete from the proposal 3BB-3.
In 3BB-6 amend language to read:
"Nonmetallic Wireways and associated fittings..."
In proposed 3BB-10(4) amend language to read:
4. "As extensions to pass transversely through walls..."
Correct 362A-70 to 3BB-70
PANEL STATEMENT: Section 2.2.1 of the 1999 NEC Style Manual states, "The approval of article scope statements is the responsibility of the Technical Correlating Committee". CMP-8 recommends approval of the scope section by the TCC.
The proposed 3BB-3 is deleted as 4.1.1 of the 1999 NEC Style Manual prohibits references being made to an entire article unless additional conditions are specified.
3BB-6 has been amended to clarify that nonmetallic wireways and associated fittings are required to be listed.
Proposed 3BB-10(4) has been amended to enhance clarity.
Change 362A-70 to 3BB-70 is editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2228)

8- 415 - (362-14): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[NOTE: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
DOLLINS: See Ganatra's Explanation of Negative Vote on Proposal 6-3.

(Log #855)

8- 416 - (362-15(1), (2)): Accept in Principle
NOTE: The Technical Correlating Committee understands that the following actions occur: The Panel action text for (1) replaces the reference to 640-24 with 3BB-10(4) of Proposal 8-414 and that the action for (2) will revise 3BB-10(2) with the text "Where subject to corrosive environments."
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(1) Only for exposed work, except as permitted in Section ~~640-24~~ 362-24.
(2) Where subject to corrosive vapors or liquids.
SUBSTANTIATION: Edit. Section 640-24 is irrelevant. Section 362-24 should be noted for correlation and avoidance of conflict. Since corrosive vapors are noted, it seems reasonable to include corrosive liquids.
PANEL ACTION: Accept in Principle.
Accept (1) as proposed.
Revise proposed (2) to read:
(2) Where subject to corrosive environments.
PANEL STATEMENT: The revision of (2) clarifies that nonmetallic wireway is permitted to be used in any corrosive environment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry
COMMENT ON AFFIRMATIVE:
BERMAN: I agree with Mr. Loyd that the panel statement is not consistent with the panel action. CMP-8 was in agreement that nonmetallic wireways are permitted where subject to corrosive environments. However, the panel statement incorrectly indicates that this product is permitted in any corrosive environment. Although the terms are not clearly defined. I believe it to be the intent of CMP-8 to permit nonmetallic wireways only in "normally" corrosive enviroments, and not "severely" corrosive environments.
LOYD: I disagree with the panel statement. Many corrosive atmospheres are also degrading to PVC; the manufacturer of this product publishes a list of materials that are degrading to PVC (I have provided a copy). Therefore the panel statement should be revised to reflect the conditions in which the product can be used.
NOTE: Supporting material is available for review at NFPA Headquarters.

(Log #2185)

8- 417 - (362-15(1)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(1) ~~Only~~ for exposed work, ~~except as permitted in accordance with Section 640-24.~~
SUBSTANTIATION: In the 1996 NEC 640-4 Exception c., wireways were permitted in concealed places. In the 1999 NEC in accordance with 640-24, "The use of ...wireways,...shall comply with applicable articles with respect to permitted locations...". There are no exceptions; therefore, wireways shall only be used for exposed work and this erroneous reference to 640-24 should be deleted.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 8-416.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2598)

8- 418 - (362-17): Accept
NOTE: The Technical Correlating Committee understands that the following actions occur:
1) The first sentence of the recommendation not be accepted based on the Panel Action on Proposal 8-414.
2) The added sentence becomes a new second sentence in 3BB-60 of Proposal 8-414.
3) That the Exception in 3BB-60 of Proposal 8-414 is deleted.
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise Section 362-17 by incorporating the Exception into the main text so the Section reads as follows:
362-17. Other Articles. Installations of nonmetallic wireways shall comply with the applicable provisions of Article 300. Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the nonmetallic wireway. A separate equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in Section 250-142.
~~Exception: Where the grounded conductor is used to ground equipment as permitted in Section 250-142.~~
SUBSTANTIATION: This proposal incorporates the Exception into the main text of the Section.
PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3453)

8- 419 - (362-17): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise Section 362-17 by incorporating the Exception into the main text so the Section reads as follows:
362-17. Other Articles. Installations of nonmetallic wireways shall comply with the applicable provisions of Article 300. Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the nonmetallic wireway. A separate equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in Section 250-142.
~~Exception: Where the grounded conductor is used to ground equipment as permitted in Section 250-142.~~
SUBSTANTIATION: This proposal incorporates the Exception into the main text of the Section.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 8-418.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3730)

8- 420 - (362-17): Accept in Principle
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Revise Section 362-17 by incorporating the exception into the main text so the section reads as follows:
362-17. Other Articles. Installations of nonmetallic wireways shall comply with the applicable provisions of Article 300. Where equipment grounding is required by Article 250, a separate equipment grounding conductor shall be installed in the nonmetallic wireway. A separate equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in Section 250-142.
~~Exception: Where the grounded conductor is used to ground equipment as permitted in Section 250-142.~~
SUBSTANTIATION: This proposal incorporates the exception into the main text of the section.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 8-418.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2599)

8- 421 - (362-20): Accept in Principle
NOTE: The Technical Correlating Committee understand that the recommendation is accepted with the modification shown in the panel action and that the text revises the accepted text in 3BB-23 of Proposal 8-414.
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise the first paragraph and add a new second paragraph to Section 362-20 so the section reads as follows:
362-20. ~~Deflected~~ Insulated Conductors. Insulated conductors installed in a nonmetallic wireway shall comply with (a) and (b).
(a) Deflected Insulated Conductors. Where insulated conductors are deflected within a nonmetallic wireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the nonmetallic wireway, or where the direction of the nonmetallic wireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6(a) shall apply.
(b) Where insulated conductors No. 4 or larger are pulled through a wireway, the distance between raceway and cable entries enclosing the same conductor shall not be less than that required in Section 370-28(a)(1) for straight pulls and Section 370-28(a)(2) for angle pulls.
SUBSTANTIATION: The addition of (a) to 373-6 is a specific reference. A reference to the entire 373-6 is confusing because we don't know whether to use 373-6(a) or 373-6(b). Also, where possible, we are to provide a specific reference.
Nonmetallic wireways, by definition, are for use with conductors which "are laid in place after the wireway has been installed as a complete system". The requirements for deflection of conductors in 362-20 are intended to be utilized with conductors which are "laid in place". In today's installations wireways are also being used as pull boxes. Where wireways are being used as pull boxes the dimensional requirements for pull boxes should apply.
PANEL ACTION: Accept in Principle.
The panel adds a title to (b) to read:
Nonmetallic Wireways used as Pull Boxes.
PANEL STATEMENT: The panel's action conforms with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3729)

8- 421a - (362-20): Accept in Principle
SUBMITTER: Wayne A. Lilly, Bridgewater, VA
RECOMMENDATION: Revise the first paragraph and add a new second paragraph to Section 362-20 so the section reads as follows:
362-20. ~~Deflected~~ Insulated Conductors. Insulated conductors installed in a nonmetallic wireway shall comply with (a) and (b).
(a) Deflected Insulated Conductors. Where insulated conductors are deflected within a nonmetallic wireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the nonmetallic wireway, or where the direction of the nonmetallic wireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6(a) shall apply.
(b) Wireways Used As Pullboxes. Where insulated conductors No. 4 or larger are pulled through a wireway, the distance between raceway and cable entries enclosing the same conductor shall not be less than that required in Section 370-28(a)(1) for straight pulls and Section 370-28(a)(2) for angle pulls.
SUBSTANTIATION: The addition of (a) to 373-6 is a specific reference. A reference to the entire 373-6 is confusing because we don't know whether to use 373-6(a) or 373-6(b). Also, where possible, we are to provide a specific reference.
Nonmetallic wireways, by definition are for use with conductors which "are laid in place after the wireway has been installed as a complete system". The requirements for deflection of conductors in 362-20 are intended to be utilized with conductors which are "laid in Place". In today's installations wireways are also being used as pullboxes. Where wireways are being used as pullboxes the dimensional requirements for pullboxes should apply.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 8-421.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4478)

8- 422 - (362-20): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first paragraph and add a new second paragraph to Section 362-20 so the section reads as follows:
362-20. ~~Deflected~~ Insulated Conductors. Insulated conductors installed in a nonmetallic wireway shall comply with (a) and (b).
(a) Deflected Insulated Conductors. Where insulated conductors are deflected within a nonmetallic wireway, either at the ends or where conduits, fittings, or other raceways or cables enter or leave the nonmetallic wireway, or where the direction of the nonmetallic wireway is deflected greater than 30 degrees, dimensions corresponding to Section 373-6(a) shall apply.
(b) Where insulated conductors No. 4 or larger are pulled through a wireway, the distance between raceway and cable entries enclosing the same conductor shall not be less than that required in Section 370-28(a)(1) for straight pulls and Section 370-28(a)(2) for angle pulls.
SUBSTANTIATION: The addition of (a) to 373-6 is a specific reference. A reference to the entire 373-6 is confusing because we don't know whether to use 373-6(a) or 373-6(b). Also, where possible, we are to provide a specific reference.

Nonmetallic wireways, by definition, are for use with conductors which "are laid in place after wireway has been installed as a complete system". The requirements for deflection of conductors in 362-20 are intended to be utilized with conductors which are "laid in place". In today's installations wireways are also being used as pull boxes. Where wireways are being used as pull boxes the dimensional requirements for pull boxes should apply.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 8-421.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2827)

8- 423 - (362-27): Accept
NOTE: The Technical Correlating Committee understands that this action revises the text in 3BB-120 of Proposal 8-414.
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise 362-27 to read:
362-27. Marking. Nonmetallic wireways shall be marked so that the manufacturer's name or trademark and interior cross-sectional area in square inches shall be visible after installation. ~~Nonmetallic wireways that have limited smoke-producing characteristics shall be permitted to be identified with the suffix LS.~~ Marking for limited smoke shall be permitted on the nonmetallic wireways that have limited smoke-producing characteristics.
SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).
Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.
Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.
Although the section does not deal with wire and cable products, this proposal is made for this section to address the change in the abbreviation for limited smoke marking.
The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 363 — FLAT CABLE ASSEMBLIES: TYPE FC

(Log #CP717)

7- 265a - (363): Accept
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 7
RECOMMENDATION: Rewrite Article 363 to comply with NEC Style Manual.

ARTICLE 363 -- Flat Cable Assemblies: Type FC

I General.

363-1. Scope. This article covers the use, installation, and construction specifications for Flat Cable Assemblies, Type FC.
363-2. Definition.
Flat Cable Assembly, Type FC. An assembly of parallel conductors formed integrally with an insulating material web specifically designed for field installation in surface metal raceway.

II Installation

363-10. Uses Permitted. Flat cable assemblies shall be permitted only:
(1) As branch circuits to supply suitable tap devices for lighting, small appliances, or small power loads. The rating of the branch circuit shall not exceed 30 amperes.
(2) Where installed for exposed work.
(3) In locations where they will not be subjected to severe physical damage.
Where a flat cable assembly is installed less than 2.5 m (8 ft.) above the floor or fixed working platform, it shall be protected by a metal cover identified for the use.
(4) In surface metal raceways identified for the use. The channel portion of the surface metal raceway systems shall be installed as complete systems before the flat cable assemblies are pulled into the raceways.
363-12. Uses Not Permitted. Flat cable assemblies shall not be used:
(1) Where subject to corrosive vapors unless suitable for the application
(2) In hoistways, or on elevators or escalators
(3) In any hazardous (classified) location
(4) Outdoors or in wet or damp locations unless identified for the use.
363-30. Securing and Supporting. The flat cable assemblies shall be supported by means of their special design features, within the surface metal raceways.
The surface metal raceways shall be supported as required for the specific raceway to be installed.
363-40. Boxes and Fittings.
(a) Dead Ends. Each flat cable assembly dead end shall be terminated in an end-cap device identified for the use.
The dead-end fitting for the enclosing surface metal raceway shall be identified for the use.
(b) Fixture Hangers. Fixture hangers installed with the flat cable assemblies shall be identified for the use.
(c) Fittings. Fittings to be installed with flat cable assemblies shall be designed and installed to prevent physical damage to the cable assemblies.
(d) Extensions. All extensions from flat cable assemblies shall be made by approved wiring methods, within the junction boxes, installed at either end of the flat cable assembly runs.

363-56. Splices and Taps.
(a) Splices. Splices shall be made in listed junction boxes.
(b) Taps. Taps shall be made between any phase conductor and the grounded conductor or any other phase conductor by means of devices and fittings identified for the use. Tap devices shall be rated at not less than 15 amperes, or more than 300 volts to ground, and they shall be color-coded in accordance with the requirements of Section 363-20.

III Construction.

363-100. Construction. The flat cable assemblies shall consist of either two, three, or four conductors.
363-104. Conductors. Flat cable assemblies shall have conductors of 10 AWG special stranded copper wires.
363-112. Insulation. The entire flat cable assembly shall be formed to provide a suitable insulation covering all of the conductors and using one of the materials recognized in Table 310-13 for general branch-circuit wiring.
363-120. Marking.
(a) Temperature Rating. In addition to the provisions of 310-11, Type FC cable shall have the temperature rating durably marked on the surface at intervals not exceeding 600 mm (24 in.).
(b) Identification of Grounded Conductor. The grounded conductor shall be identified throughout its length by means of a distinctive and durable white or natural gray marking.
(c) Terminal Block Identification. Terminal blocks identified for the use shall have distinctive and durable markings for color or word coding. The grounded conductor section shall have a white marking or other suitable designation. The next adjacent section of the terminal block shall have a black marking or other suitable designation. The next section shall have a red marking or other suitable designation. The final or outer section, opposite the grounded conductor section of the terminal block, shall have a blue marking or other suitable designation.
SUBSTANTIATION: This revision to Article 363 incorporates all of the proposals submitted by the Technical Correlating Committee, other similar proposals, and revisions by the panel consistent with the usability effort. Specific proposals addressed by this revision include 7-266, 7-268, 7-269, 7-270, 7-271, 7-272, 7-274, 7-276, and 7-278.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1391)

7- 266 - (363): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise text to read as follows:

Article 363 — Flat Cable Assemblies Type FC

I. General

~~363-1.~~ 363-2. Definition

~~Type FC, a flat cable assembly,~~ Flat Cable Assembly (Type FC). ~~is a~~ An assembly of parallel conductors formed integrally with an insulating material web specifically designed for field installation in surface metal raceway.

~~363-2.~~ 363-3. Other Articles. In addition to the provisions of this article, installation of Type FC cable shall conform with the applicable provisions of Articles 210, 220, 250, 300, 310, and 352.

II. Installation

~~363-3.~~ 363-10. Uses Permitted. Flat cable assemblies shall be permitted only as branch circuits to supply suitable tap devices for lighting, small appliances, or small power loads. Flat cable assemblies shall be installed for exposed work only. Flat cable assemblies shall be installed in locations where they will not be subjected to severe physical damage.

(a) ~~363-18.~~ Protective Covers. Where a flat cable assembly is installed less than 8 ft (2.44 m) above the floor or fixed working platform, it shall be protected by a metal cover identified for the use.

(b) ~~363-5. Installation~~ Surface Metal Raceways. Flat cable assemblies shall be installed in the field only in surface metal raceways identified for the use. The channel portion of the surface metal raceway systems shall be installed as complete systems before the flat cable assemblies are pulled into the raceways.

(c) ~~363-16.~~ Rating. The rating of the branch circuit shall not exceed 30 amperes.

~~363-4.~~ 363-12. Uses Not Permitted. Flat cable assemblies shall not be installed in the following:

1. Where subject to corrosive vapors unless suitable for the application
2. In hoistways
3. In any hazardous (classified) location
4. Outdoors or in wet or damp locations unless identified for use in wet locations

~~363-15. Supports.~~ 363-30 Securing and Supporting. The flat cable assemblies shall be supported by means of their special design features, within the surface metal raceways.

The surface metal raceways shall be supported as required for the specific raceway to be installed.

363-40 Boxes and Fittings

~~363-11.~~ (a) Dead Ends. Each flat cable assembly dead end shall be terminated in an end-cap device identified for the use.

The dead-end fitting for the enclosing surface metal raceway shall be identified for the use.

~~363-12.~~ (b) Fixture Hangers. Fixture hangers installed with the flat cable assemblies shall be identified for the use.

~~363-13.~~ (c) Fittings. Fittings to be installed with flat cable assemblies shall be designed and installed to prevent physical damage to the cable assemblies.

~~363-14.~~ (d) Extensions. All extensions from flat cable assemblies shall be made by approved wiring methods, within the junction boxes, installed at either end of the flat cable assembly runs.

363-56. Splices and Taps

~~363-9.~~ (a) Splices. Splices shall be made in listed junction boxes.

~~363-10.~~ (b) Taps. Taps shall be made between any phase conductor and the grounded conductor or any other phase conductor by means of devices and fittings identified for the use. Tap devices shall be rated at not less than 15 amperes, or more than 300 volts to ground, and they shall be color-coded in accordance with the requirements of Section 363-20. 363-120(c).

III. Construction Specifications

~~363-6. Number of Conductors.~~ 363-100. Construction. The flat cable assemblies shall consist of either two, three, or four conductors.

~~363-7. Size of Conductors.~~ 363-104. Conductors. Flat cable assemblies shall have conductors of No. 10 special stranded copper wires.

~~363-8.Conductor Insulation.~~ 363-112. Insulation. The entire flat cable assembly shall be formed to provide a suitable insulation covering all of the conductors and using one of the materials recognized in Table 310-13 for general branch-circuit wiring.

~~363-17.~~ 363-120. Marking

(a) Temperature Rating. In addition to the provisions of Section 310-11, Type FC cable shall have the temperature rating durably marked on the surface at intervals not exceeding 24 in. (610 mm).

~~363-19. Identification~~ (b) Identification of Grounded Conductor. The grounded conductor shall be identified throughout its length by means of a distinctive and durable white or natural gray marking.

~~363-20.~~ (c) Terminal Block Identification. Terminal blocks identified for the use shall have distinctive and durable markings for color or word coding. The grounded conductor section shall have a white marking or other suitable designation. The next adjacent section of the terminal block shall have a black marking or other suitable designation. The next section shall have a red marking or other suitable designation. The final or outer section, opposite the grounded conductor section of the terminal block, shall have a blue marking or other suitable designation.

SUBSTANTIATION: The Technical Correlating Committee Task Group on the Usability of the NEC has directed a Sub-Task Group to study the organization of the Articles covering cable and wiring.

A uniform format is proposed to achieve consistency across all of the cable and wiring articles. In these proposals, Section xxx-1 of each article covers scope, xxx-10 covers uses permitted, xxx-30 covers securing and supporting, etc. . The purpose of the re-formatting was to re-organize the structure of the article to permit parallel code section numbering within similar articles as stated in the NEC Style Manual 2.4.1. It is hoped that the parallel Code section numbering format from article to article will increase the usability of the code and assist in the proper application of NEC requirements.

For each of the article rewrites, it is intended that the basic requirements found in the 1999 NEC for cable and wiring not be changed. To fit the uniform format, some requirements have been relocated within an article, or rewritten for editorial clarity or consistency. Where revisions were considered to be of a substantive nature, they have been submitted as separate proposals.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1814)

7- 267 - (363): Reject
SUBMITTER: Edward Wesley, The Wiremold Co.
RECOMMENDATION: Revise as follows:

363-1. Scope. This article covers the use, installation, and construction specifications of Flat Cable Assemblies.

~~363-1~~ 2. Definition. Type FC, a flat cable assembly, is an assembly of parallel conductors formed integrally with an insulating material web specifically designed for field installation in surface metal raceway.

~~363-2~~ 3. Other Articles. In addition to the provisions of this article, installation of Type FC cable shall conform with the applicable provisions of Articles 210, 220, 250, 300, 310, and 352.

~~363-3~~ 4. Uses Permitted. Flat cable assemblies shall be permitted only as branch circuits to supply suitable tap devices for lighting, small appliances, or small power loads.

Flat cable assemblies shall be installed for exposed work only ~~Flat cable assemblies shall be installed~~. and in locations where ~~they will not be~~ subjected to severe physical damage.

~~363-4~~ 5. Uses Not Permitted. Flat cable assemblies shall not be installed in the following:

1. Where subject to corrosive vapors unless suitable for the application
2. In hoistways
3. In any hazardous (classified) location
4. Outdoors or in wet or damp locations unless ~~identified~~ listed for use in wet locations

~~363-5~~ 6. Installation. Flat cable assemblies shall be installed in the field only in surface metal raceways identified for the use. The channel portion of the surface metal raceway system shall be installed as a complete ~~systems~~ system before the flat cable ~~assemblies are~~ assembly is pulled into the ~~raceways~~ raceway.

~~363-6~~ 7. Number of Conductors. ~~The~~ Flat cable assemblies shall consist of ~~either~~ two or more insulated conductors. ~~three, or four~~ conductors.

~~363-7~~ 8. Size of Conductors. Flat cable assemblies shall have conductors of No. 10 ~~special~~ stranded copper wires.

~~363-8~~ 9. Conductor Insulation. The entire flat cable assembly shall be formed to provide a suitable insulation covering all of the conductors and using one of the materials recognized types listed in Table 310-13 for general branch-circuit wiring.

~~363-9~~ 10. Splices. Splices shall be made in listed junction boxes.

363-10 11. Taps. Taps shall be made between any phase conductor and the grounded conductor or any other phase conductor by means of devices and fittings identified listed for the use. Tap devices shall be rated at not less than 15 amperes, or nor more than 300 volts to ground, and they shall be color-coded or identified, in accordance with the requirements of Section 363-20.
363-11 12. Dead Ends. Each flat cable assembly dead end shall be terminated in an end-cap device identified listed for the use. The dead-end fitting for the enclosing surface metal raceway shall be identified listed for the use.
363-12 13. Fixture Hangers. Fixture hangers installed with the flat cable assemblies shall be identified listed for the use.
363-13 14. Fittings. Fittings to be installed with flat cable assemblies shall be designed and installed to prevent physical damage to the cable assemblies.
63-14 15. Extensions. All extensions from flat cable assemblies shall be made by approved wiring methods, within the junction boxes, installed at either end of the flat cable assembly runs.
363-15 16. Supports. The Flat cable assemblies shall be supported by means of their special design features, within the surface metal raceways.
The surface metal raceways shall be supported at intervals not exceeding 10 ft (3.0 M) and within 3 ft (914 mm) of each junction box or dead end. as required for the specific raceway to be installed.
363-16 17. Rating. The rating of the branch circuit shall not exceed 30 amperes.
363-17 18. Marking. In addition to the provisions of Section 310-11, Type FC cable shall have the temperature rating durably marked on the surface at intervals not exceeding 24 in. (610 mm).
363-18 19. Protective Covers. Where a flat cable assembly is installed less than 8 ft (2.44 m) above the floor or fixed working platform, it shall be protected by a metal cover identified listed for the use.
363-19 20. Identification. The grounded conductor shall be identified throughout its length by means of a distinctive and durable white or natural gray marking. outer finish.
The ungrounded conductors shall be identified black, red, blue, or by other approved means.
The equipment grounding conductor shall be identified by a continuous green outer finish.
363-20. Terminal Block Identification Terminal blocks identified for the use shall have distinctive and durable markings for color or word coding. The grounded conductor section shall have a white marking or other suitable designation. The next adjacent section of the terminal block shall have a black marking or other suitable designation. The next section shall have a red marking or other suitable designation. The final or outer section, opposite the grounded conductor section of the terminal block, shall have a blue marking or other suitable designation.
SUBSTANTIATION: This proposal is intended to editorially revise Article 363 into more clear language without substantial change. A Scope has been added for the CMP's consideration and for the Correlating Committee's acceptance. Section Nos. have been changed accordingly. Existing Section 363-20 has been revised to expand the "identification" of conductors to include ungrounded conductors and equipment grounding conductors. Provisions for "terminal blocks" have been deleted as they are no longer used and are no longer being manufactured. In lieu of terminal blocks, common twist-on splicing devices are used for conductor connections within the junction boxes.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the word listed in place of identified is more than editorial in nature and there are other proposed changes that are more than editorial. The panel is also concerned over the deletion of the section on terminal block identification with only substantiation from one manufacturer of this product. This article has been rewritten by the panel at the direction of the Technical Correlating Committee. See panel action on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1370)

7- 268 - (363-1): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add a new Section as follows:
<u>363-1. Scope. This article covers the use, installation, and construction specifications for Flat Cable Assemblies: Type FC.</u>
Renumber existing sections accordingly.
SUBSTANTIATION: NEC Style Manual requires that each article contain a statement of scope and that the scope statement be the first section of the article. See 2.2.1 .
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2080)

7- 269 - (363-1): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a Scope section to Article 363 to read as follows:
363-1. Scope. The provisions of this article covers the use and installation requirements of flat cable assemblies.
Renumber remaining sections.
SUBSTANTIATION: Each Article should have a scope section.
The NEC style manual on style also shows a scope article.
To keep the Articles consistent all Articles should be similar.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1440)

7- 270 - (363-2): Accept in Principle
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 363-2 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1372)

7- 271 - (363-3): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete this section:
~~363-3. Other Articles~~
~~In addition to the provisions of this article, installation of Type FC cable shall conform with the applicable provisions of Articles 210, 220, 250, 300, 310, and 352.~~
SUBSTANTIATION: Section 90-3 adequately covers this requirement. NEC Style Manual, Section 4.1 requires that references not be provided if the material is already covered by Section 90-3.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1373)

7- 272 - (363-3): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise existing 363-3 (363-10 New) to convert text to a list.

~~363-3.~~ 363-10. Uses Permitted
Flat cable assemblies shall be permitted only where all of the following conditions are met:
(1) ~~as~~ As branch circuits to supply suitable tap devices for lighting, small appliances, or small power loads.
(2) ~~Flat cable assemblies shall be installed for~~ For exposed work ~~only~~.
(3) ~~Flat cable assemblies shall be installed~~ Installed in locations where they will not be subjected to severe physical damage.
SUBSTANTIATION: NEC Style Manual Section 3.3.2 requires that where possible lists or tables be used to present requirements, rather than long text descriptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1864)

7- 273 - (363-3): Accept
NOTE: The Technical Correlating Committe understands this Proposal modifies 363-10(3) in Proposal 7-265a.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete the word "severe" in the last line.
SUBSTANTIATION: There is no distinction between "physical damage" and "severe physical damage" in the code; Type FC should not be subjected to physical damage.
Section 3.2.5.4 of the 1999 National Electrical Code Style Manual also shows "protection against physical damage".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1374)

7- 274 - (363-4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise 363-4 (363-12 New) to read as follows:
363-4. Uses Not Permitted. Flat cable assemblies shall not be used ~~installed in the following~~:
(1) Where subject to corrosive vapors unless suitable for the application
(2) In hoistways, or on elevators or escalators
(3) In any hazardous (classified) location
(4) Outdoors or in wet or damp locations unless identified for the use ~~in wet locations~~
SUBSTANTIATION: To incorporate text consistent with the other wire and cable Articles and to provide clarity in accordance with NEC Style Manual Section 3.3.4.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1074)

7- 275 - (363-7): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 10" to "10 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #1371)

7- 276 - (363-10): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise the new proposed 363-10 to read as follows:
363-10 Uses Permitted.
Flat cable assemblies shall be permitted only:
(1) as branch circuit(s) to supply suitable tap devices for lighting, small appliances, or small power loads.
The rating of the branch circuit shall not exceed 30 amperes.
(2) where installed for exposed work.
(3) in locations where they will not be subjected to severe physical damage.
Where a flat cable assembly is installed less than 8 ft (2.44 m) above the floor or fixed working platform, it shall be protected by a metal cover identified for the use
(4) in surface metal raceways identified for the use. The channel portion of the surface metal raceway systems shall be installed as complete systems before the flat cable assemblies are pulled into the raceways.
SUBSTANTIATION: To incorporate text consistent with other wire and cable articles and to provide clarity in accordance with NEC Style Manual, Section 3.3.4.
NEC Style Manual Section 3.3.2 requires that where possible lists or tables be used to present requirements, rather than long text descriptions.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #856)

7- 277 - (363-15): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence:
"The surface raceways shall be supported as ~~required for the specific raceway to be installed~~ specified in Section 352-47."
SUBSTANTIATION: Edit. To provide a specific reference to support requirements for the raceway type used in this application.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical substantiation that the current wording has caused problems in application of this wiring method.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #476)

7- 278 - (363-17 and 18): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 363-17 - change "24 in. (610 mm)" to "610 mm (24 in.)"
363-18 - change "8 ft (2.44 m)" to "2.5 m (8 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units in Section 363-17 are not rounded since the measurement is product specific and 610 mm may be required to complete the legend, 600 mm may be too short.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel's editorial action and statement on Proposal 7-265a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #857)

7- 279 - (363-18): Accept
NOTE: The Technical Correlating Committee understands that this Proposal modifies 363-10(3) of Proposal 7-265a.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
"Where a flat cable assembly is installed less than 8 ft (2.44 m) above the floor or fixed working platform, it shall be protected by a ~~metal~~ cover identified for the use."
SUBSTANTIATION: Edit. Section 352-40 permits either metallic or nonmetallic covers for strut type channel raceways which may be installed with the cover orientated in any position. If the panel feels a metal cover is required for FC cable because the cover is normally on the bottom, Section 352-40 should reflect this.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #2517)

7- 280 - (363-19): Accept in Principle
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
363-19. Identification. The grounded conductor shall be identified throughout its length by means of a distinctive and durable white ~~or natural gray~~ marking.
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concern is addressed by the panel's action on Proposal 7-281.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

(Log #4297)

7- 281 - (363-19): Accept
NOTE: The Technical Correlating Committee understands that this Proposal modifies 363-120(b) of Proposal 7-265a.
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
363.19. Identification. The grounded conductor shall be identified throughout its length by means of a distinctive and durable white or ~~natural~~ gray marking.
SUBSTANTIATION: Delete the word "natural" since the color natural gray is not defined and in fact does not exist as a specified color for wire insulation. This proposal goes with the definition of gray within a specified range of color per the Munsell color system as used by industry for wire color coding. The definition of the gray is provided in another proposal.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 1 Ensign

ARTICLE 364 — BUSWAYS

(Log #1294)

8- 424 - (364): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
364-4 (b) (4) Outdoors or in wet or damp locations unless identified for such use
Lighting busway and trolley busway shall not be installed less than 2.5 m (8 ft) ~~(2.44 m)~~ above the floor or working platform unless provided with a cover identified for the purpose.
364-5 Busways shall be securely supported at intervals not exceeding 1.5 m (5 ft) ~~(1.52 m)~~ unless otherwise designed and marked.
364-6 (b) (1) Busways shall be permitted to be extended vertically through dry floors if totally enclosed (unventilated) where passing through and for a minimum distance of 1.8 m (6 ft) ~~(1.83 m)~~ above the floor to provide adequate protection from physical damage.
364-6 (b) (2) In other than industrial establishments, where a vertical riser penetrates two or more dry floors, a minimum 100 mm (4-in.) ~~(102 mm)~~ high curb shall be installed around all floor openings for riser busways to prevent liquids from entering the opening. The curb shall be installed within 300 mm (12 in.) ~~(304.8 mm)~~ of the floor opening. Electrical equipment shall be located so that it will not be damaged by liquids that are retained by the curb.
364-8 (b) (2) The length of the cord or cable from a busway plug-in device to a suitable tension take-up support device shall not exceed 1.8 m (6 ft) ~~(1.83 m)~~.
Exception: In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, lengths exceeding 1.8 m (6 ft) ~~(1.83 m)~~ shall be permitted between the busway plug-in device and the tension take-up support device where the cord or cable is supported at intervals not exceeding 2.5 m (8 ft) ~~(2.4 m)~~.
364-11 Exception: For industrial establishments only, omission of overcurrent protection shall be permitted at points where busways are reduced in ampacity, provided that the length of the busway having the smaller ampacity does not exceed 15 m (50 ft) ~~(15.2 m)~~ and has an ampacity at least equal to one-third the rating or setting of the overcurrent device next back on the line, and provided that such busway is free from contact with combustible material.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #1441)

8- 425 - (364-3): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 364-3 in its entirety.
SUBSTANTIATION: 1999 National Electrical Code Style Manual:
Section 4.1 states "Do not use a reference if the requirement is already covered by 90.3."
Section 4.1.1 stipulates that "References shall not be made to an entire article... unless additional conditions are specified.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #858)

8- 426 - (364-4(a)(1)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise (a)(1):
"Located in the open and are visible, except as permitted in Section 364-6."
SUBSTANTIATION: Edit. For correlation with Section 364-6 and avoidance of conflict.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4215)

8- 427 - (364-6): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise to read as follows:
364-6. Installation Requirements.
(a) Through Walls and Floors. It shall be permissible to extend unbroken lengths of busways through dry walls. It shall be permissible to extend busways vertically through dry floors if totally enclosed (unventilated) where passing through and for a minimum distance of 6 ft (1.83 m) above the floor to provide adequate protection from physical damage.
FPN: See Section 300-21, Spread of Fire of Products of Combustion.
(b) Protection from Liquids, Moisture and Other Contaminants. Busway shall be protected from liquids, moisture, and other contaminants or corrosion which could result in electrical failure.
(1) During Construction. Indoor busways shall be protected from moisture during storage as well as during or after installation. Special consideration shall be given to riser busways to protect them from moisture from uncompleted roofs, walls, etc.
Outdoor busways shall be treated the same as indoor busways until after busway is properly installed, as it is not weather resistant until completely and properly installed.
Busway shall have the exposed ends of uncompleted runs protected to prevent accidental contamination during the construction period.
(2) Protection from Snow Buildup. Outdoor busway shall be mounted in such a manner as to prevent snow or ice buildup forcing water into the busway through weep holes. This may require that consideration be given to horizontal snow or ice buildup or drifting of snow.
(3) Curbing. Four in. (102 mm) high minimum curbs shall be installed around all floor openings for riser busways to prevent floor level liquids from entering the opening.
(4) Protection from Falling Liquids. Slant shields, drip pans, or other approved protective shields shall be installed to protect indoor busway in locations where there is a possibility of water spillage or dripping condensate from roof drains, water pipes, and the like.
(5) Tests Prior to Energizing. Busway system joint tightness and joint resistance, phasing, and insulation resistance shall be verified by test prior to energizing the system for the first time. A written record of these tests shall be made available to the authority having jurisdiction.
SUBSTANTIATION: This is, essentially, extracted material from the NEMA busway standard governing installation practice for busways. It has been in the Massachusetts Electrical Code for five Code cycles. Now that CMP 8 took a major step towards including one of its key provisions (on curbing) in the 1999 NEC, the Advisory Committee wanted to take this opportunity to put the rest of the requirements on the table, ones that have worked well in this state for a long time. The proposal is in the form as it was adopted for the 1987 cycle, with the following exceptions:
First, in (b), "… may result in failure" has been changed to "could result in failure" to comply with the Style Manual, since this doesn't describe a discretionary action by an authority having jurisdiction. Second, the word "high" was added to (b)(3) to incorporate the 1999 clarification. The industrial waiver and the two or more dry floor threshold in the 1999 NEC is not part of this proposal, has never been in place in Massachusetts, and is not recommended because the Advisory Committee regards the substantiation presented for those allowances in the NEC as insufficiently substantiated. Third, in (5), the Committee added a requirement to test for joint resistance before first use in the 1993 adoption cycle. The 1993 state proposal noted that one shouldn't make an inference about joint resistance on the basis of bolt tightness in and of itself due to the fact that foreign material could have entered the joint surfaces.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter stated in the substantiation that the proposed language is essentially "extracted material from the NEMA busway standard governing installation practice for busways." The NEC is not a design manual, project specification manual, or installation instruction booklet. The proposed requirements are best left to manufacturer's installation instructions, project specifications, and engineering considerations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #859)

8- 428 - (364-8(a)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
"Branches from busways shall be made in accordance with Articles 330, 331, 333, 334, 345, 346, 347, 348, 350, 351, 352, and 364. Where a ~~nonmetallic raceway is used connection of equipment grounding conductors in the nonmetallic raceway~~ separate equipment grounding conductor is used, connection of the equipment grounding conductor to the busway shall comply with Sections 250-8 and 250-12."
SUBSTANTIATION: Edit. Wiring methods of Articles 330 and 331 warrant inclusion. The proposal would include all separate equipment grounding conductors whether in metal or nonmetallic raceways or cables or cord assemblies.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel believes that the submitter intended to reference Article 333 in his substatiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4216)

8- 429 - (364-8(b)(2), Exception): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
By special permission in industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, lengths exceeding 6 ft (1.83 m) shall be permitted ~~between the busway and the plug-in device and the tension take-up support device~~ to extend horizontally greater lengths than 8 ft (2.44 m) where the longer length is essential for periodic repositioning of equipment. The flexible cord or bus drop cable shall be supported at intervals not exceeding 8 ft (2.44 m), and suitable tension take-up device(s) shall be installed at the end of the horizontal run to relieve strain in both the horizontal and vertical directions.
SUBSTANTIATION: The proposal puts reasonable limitations on the exception. It would now depend on special permission based on a finding that the greater distance is actually needed for the intended use. Otherwise the exception, as presently worded in the NEC, is an open invitation to wire the entire facility in cord or bus-drop cable. The proposed wording also clarifies a requirement for both horizontal and vertical strain relief, which is very important if heavy cords extend over substantial horizontal distances.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC permits the use of cord or bus drop cable where it is installed in accordance with the provisions of 400-7, 400-8, and other applicable Code rules. Items 1 through 4 can not be used if the cables and cords are not installed within the limitations of the first paragraph of 364-8(b).
Horizontal strain relief is not an issue as the current requirement is for support at no more than 8 foot intervals and the installation is limited to "industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #860)

8- 430 - (364-10 Exception No. 1): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Exception No. 1: The applicable provisions of Section 240-3, 240-92, and Part I of Article 240 shall be permitted.
SUBSTANTIATION: Edit. The additional sections proposed would bring busways under provisions provided for other conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement in 364-10 is for busway to "be protected against overcurrent in accordance with the allowable current rating of the busway." Exception No. 1 is an exception to busway being protected against overcurrent in accordance with the allowable current rating of the busway. The exception allows busway to be protected at other than the rating of the busway in accordance

with the applicable provisions of 240-3.
Section 240-92 deals with protection of conductors at their point of supply. This section does not deal with the same material as 364-10.
Part I of Article 240 covers overcurrent protection for over 600 volts. Any references to that part of 240 should be located in Part B of Article 364.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #861)

8- 431 - (364-12 Exception No. 2): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete:
~~Exception No. 2: For fixed or semi-fixed lighting fixtures, where branch-circuit overcurrent device is part of the fixture cord plug on cord-connected fixtures.~~
SUBSTANTIATION: An overcurrent device in a cord plug is unlikely to be considered or listed as a branch-circuit overcurrent device, but rather a supplemental one. Branch-circuit overcurrent devices are generally located on the supply side of the outlet (bus plug-in connection point). No special requirement is needed for supplemental overcurrent devices in cord plugs where connected to suitable lighting bus circuits per Section 240-4. The rule relates to branch-circuit overcurrent devices.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception mandates that the device be suitable for branch circuit overcurrent protection and does not permit supplemental protection devices as a substitute for such protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2186)

8- 432 - (364-27): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Ventilated bus enclosures shall be installed in accordance with Article 110, Part C, and Section 490-24~~, unless designed so that foreign objects inserted through any opening will be deflected from energized parts.~~
SUBSTANTIATION: The deleted portion is in compliance with Section 110 Part C; therefore, it is incorrect to say "unless". The rest of the deleted part is stated exactly as written in both Section 110-31(a)(1) and Section 110-31(c); therefore, it is redundant and there in no need to repeat it here. The NEC Style Manual 4.1.2 states, "Use references to other NEC rules to avoid repeating a requirement."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 365 — CABLEBUS

(Log #1295)

8- 433 - (365): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
365-3 (a) Types of Conductors. The current-carrying conductors in cablebus shall have an insulation rating of 75°C (167°F) or higher of an approved type and suitable for the application in accordance with Articles 310 and 490.
365-3 (c) Size and Number of Conductors. The size and number of conductors shall be that for which the cablebus is designed, and in no case smaller than No. 1/0.
365-3 (d) Conductor Supports. The insulated conductors shall be supported on blocks or other mounting means designed for the purpose.
The individual conductors in a cablebus shall be supported at intervals not greater than 900 mm (3 ft) ~~(914 mm)~~ for horizontal runs and 450 mm (1 1/2 ft) ~~(457 mm)~~ for vertical runs. Vertical and horizontal spacing between supported conductors shall not be less than one conductor diameter at the points of support.
365-6 (a) Support. Cablebus shall be securely supported at intervals not exceeding 3.7 m (12 ft) ~~(3.66 m)~~.
Exception: Where spans longer than 3.7 m (12 ft) ~~(3.66 m)~~ are required, the structure shall be specifically designed for the required span length.
365-6 (c) Through Dry Floors and Platforms. Except where firestops are required, cablebus shall be permitted to extend vertically through dry floors and platforms, provided the cablebus is totally enclosed at the point where it passes through the floor or platform and for a distance of 1.8 m (6 ft) ~~(1.83 m)~~ above the floor or platform.
365-6 (d) Through Floors and Platforms in Wet Locations. Except where firestops are required, cablebus shall be permitted to extend vertically through floors and platforms in wet locations where (1) there are curbs or other suitable means to prevent water flow through the floor or platform opening, and (2) where the cablebus is totally enclosed at the point where it passes through the floor or platform and for a distance of 1.8 m (6 ft) ~~(1.83 m)~~ above the floor or platform.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #CP809)

8- 433a - (365-1): Accept
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 8
RECOMMENDATION: Create new scope statement for this article.
365-1. Scope. This article covers the use and installation requirements of cablebus and associated fittings.
Renumber remaining sections accordingly.
SUBSTANTIATION: The panel action conforms with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #862)

8- 434 - (365-1): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence:
"Cablebus is an assembly of ~~insulated~~ conductors with fittings and conductor terminations in a completely enclosed, ventilated metal housing."
SUBSTANTIATION: Edit. To avoid any inference that bare conductors cannot be used for grounded service conductors or equipment grounding conductors. Requirements for insulation are covered elsewhere, e.g., Section 310-2.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concern is adequately addressed by 365-9. All current carrying conductors are required to be insulated in accordance with 365-3(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #863)

8- 435 - (365-2(a), (b)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(a) ~~600 VOLTS or LESS.~~ Approved cablebus shall be permitted at any voltage or current for which spaced conductors are rated and shall be installed for exposed work only, except as permitted in Section 365-6. Cablebus installed outdoors or in corrosive, wet, or damp locations shall be identified for such use. Cablebus shall not be installed in hoistways or hazardous (classified) locations unless specifically approved for such use. Cablebus shall be permitted for branch circuits, feeders, and services.
~~(b) OVER 600 VOLTS. Approved cablebus shall be permitted for systems in excess of 600 volts, nominal. See Section 300-37.~~
SUBSTANTIATION: The text of (a) indicates any voltage is permitted which renders (b) superfluous. A reference to Section 365-6 would eliminate a perceived conflict.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #864)

8- 436 - (365-3(a), (d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(a) Types of Conductors. The insulated current-carrying conductors in cablebus shall have an insulation rating of 75°C (167°F) or higher of an approved type and suitable for the application in accordance with Articles 110 Part B and 310. ~~and 710.~~
(d) Conductor Supports. The ~~insulated~~ conductors shall be supported on blocks of insulating material or other mounting means designed for the purpose.
SUBSTANTIATION: Edit. To correct the reference to Article 710 and to allow for bare conductors permitted by Sections 230-41 (if my proposal for that section is accepted) and 250-184 Exception No. 1.
Proposal also requires insulating blocks for bare service neutrals and grounding conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The reference to Article 710 has been amended to Article 490 in the NEC. The current text sufficiently covers the requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1075)

8- 437 - (365-3(c)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 1/0" to "1/0 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #865)

8- 438 - (365-5): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Cablebus shall be protected against overcurrent in accordance with the allowable ampacities of the cablebus conductors. ~~in accordance with Section 240-3.~~
Exception: The applicable provisions of Sections 240-3, 240-92, and Part I of Article 240 ~~Overcurrent protection~~ shall be permitted. ~~in accordance with Section 240-100 for over 600 volts, nominal.~~
SUBSTANTIATION: Edit. Section 240-3 first paragraph is the only part of that section that concurs with the basic requirement of this section, the other parts are "otherwise permitted or required" and basically exceptions. The proposal provides the basic requirement with an exception which covers approved alternatives as in the first paragraph of Section 240-3 and in Section 364-10 which are more technically correct. Overcurrent protection is only provided where the rating does not exceed conductor ampacity and is located at the point of supply for the conductors.
PANEL ACTION: Reject.
PANEL STATEMENT: The present text of the NEC sufficiently covers the overcurrent protection requirements for cablebus. The panel does not consider the proposal to be only editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 370 — OUTLET, DEVICE, PULL AND JUNCTION BOXES, CONDUIT BODIES AND FITTINGS

(Log #537)

9- 6 - (370): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: (a) Section 370-16(a)(1): Before "cubic inch", add "cubic centimeter or".
(b) Section 370-16(a)(2): Replace "100 in.^{3} (1640 cm^3)" with "1650 cm^3 (100 in.^{3})"; Before "cubic inch", add "cubic centimeter or" in 3 locations.
(c) Section 370-16(b)(1): Before "cubic inches", add "cubic centimeters or".
(d) Section 370-16(c)(2): Before "cubic inch", add "cubic centimeter or".
(e) Section 370-17(c): Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)" in 2 locations.
(f) Section 370-17(c) Exception: Replace "2 1/4 in. x 4 in." with "60 mm x 100 mm (2 1/4 in. x 4 in.)"; Replace "8 in. (203 mm)" with "200 mm (8 in.)"; Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
(g) Section 370-18: Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
(h) Section 370-20: Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
(i) Section 370-21: Replace "1/8 in. (3.18 mm)" with "3 mm (1/8 in.)".
(j) Section 370-23(b)(1): Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
(k) Section 370-23(b)(2): Replace "0.020 in. (508 µm)" with "0.51 mm (0.020 in.)"; Replace "1 in. x 2 in." with "25 mm x 50 mm (1 in. x 2 in.)".
(l) Section 370-23(d): Replace "100 in.^{3} (1640 cm^3)" with "1650 cm^3 (100 in.^{3})".
(m) Section 370-23(e): Replace "100 in.^{3} (1640 cm^3)" with "1650 cm^3 (100 in.^{3})"; Replace "3 ft (914 mm)" with "900 mm (3 ft)"; Replace "18 in. (457 mm)" with "450 mm (18 in.)".
(n) Section 370-23(f): Replace "100 in.^{3} (1640 cm^3)" with "1650 cm^3 (100 in.^{3})"; Replace "18 in. (457 mm)" with "450 mm (18 in.)".
(o) Section 370-23(f) Exception No. 2: Replace "3 ft (914 mm)" with "900 mm (3 ft)" in 2 locations; Replace "12 in. (305 mm)" with "300 mm (12 in.)" in 3 locations; Replace "8 ft (2.44 m)" with "2.5 m (8 ft)" in 2 locations; Replace "20 lb (9.08 kg)" with "9 kg (20 lb)".
(p) Section 370-23(h)(2): Replace "18 in. (457 mm)" with "450 mm (18 in.)"; Replace "8 ft (2.44 m)" with "2.5 m (8 ft)" in 2 locations; Replace "3 ft (914 mm)" with "900 mm (3 ft)"; Replace "12 in. (305 mm)" with "300 mm (12 in.)".
(q) Section 370-24: Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)"; Replace "15/16 in. (23.8 mm)" with "24 mm (15/16 in.)".
(r) Section 370-27(a) Exception: Replace "6 lb (2.72 kg)" with "3 kg (6 lb)"; Replace "16 in. (406 mm)" with "400 mm (16 in.)".
(s) Section 370-28(a)(1): Replace "trade" with "nominal".
(t) Section 370-28(a)(2): Replace "trade" with "nominal" in 2 locations.
(u) Section 370-28(b): Replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
(v) Section 370-40(b): Replace "100 in.^{3} (1640 cm^3)" with "1650

cm^3 (100 in.^{3})"; Replace "0.0625 in. (1.59 mm)" with "1.59 mm (0.0625 in.)"; Replace "3/32 in. (2.38 mm)" with "2.38 mm (3/32 in.)"; Replace "1/8 in. (3.17 mm)" with "3.17 mm (1/8 in.)".

(w) Section 370-40(c): Replace "100 in.^{3}" in title with "1650 cm^3 (100 in.^{3})"; Replace "100 in.^{3} (1640 cm^3)" in text with "1650 cm^3 (100 in.^{3})"; Replace "0.053 in. (1.35 mm)" with "1.35 mm (0.053 in.)".

(x) Section 370-41: Replace "1/32 in. (0.79 mm)" with "0.79 mm (1/32 in.)".

(y) Section 370-52: Replace "3 ft (914 mm)" with "900 mm (3 ft)"; Replace "2 1/2 ft (762 mm)" with "750 mm (2 1/2 ft)"; Replace "6 ft (1.83 m)" with "1.8 m (6 ft)"; Replace "1 ft (305 mm)" with "300 mm (1 ft)".

(z) Section 370-52 Exception: Replace "2 ft (608 mm)" with "600 mm (2 ft)"; Replace "6 ft (1.83 m)" with "1.8 m (6 ft)".

(aa) Section 370-53: Replace "100 lb (45.4 kg)" with "45 kg (100 lb)".

(bb) Section 370-54: Replace "6 ft (1.83 m)" with "1.8 m (6 ft)".

(cc) Section 370-55(a): Replace "26 in. x 22 in. (659 mm x 557 mm)" with "650 mm x 550 mm (26 in. x 22 in.)"; Replace "26 in. (659 mm)" with "650 mm (26 in.)".

(dd) Section 370-55(a) Exception: Replace "2 ft (608 mm)" with "600 mm (2 ft)".

(ee) Section 370-55(d): Replace "100 lb (45.4 kg)" with "45 kg (100 lb)".

(ff) Section 370-72(e): Replace "100 lb (45.4 kg)" with "45 kg (100 lb)"; Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.

PANEL ACTION: Accept in Principle.

Revise the specified parts of the proposal as follows:

(a) Instead of the recommended action, delete the phrase in the existing Code, "cubic inch capacity" and insert "their volume."

(b) Instead of the final recommended action, delete the phrase in the existing Code, "cubic inch capacity" (three times) and replace it with "volume". The numbers will be 1650 cm^3 (100 in.^{3}).

(c) Instead of the recommended action, delete the phrase in the existing Code "in cubic inches".

(d) Instead of the recommended action, delete the phrase in the existing Code "cubic inch capacity" and replace it with "volume".

(e) No changes.

(f) Revise the first dimension in the proposed text to read: "57 mm x 100 mm (2 1/4 in. x 4 in.)"

(g) through (i) No changes

(j) Use a soft conversion, "6.35 mm (1/4 in.)".

(k) No change.

(l) No change.

(m) No changes.

(n) No changes.

(o) No changes.

(p) No changes.

(q) Use soft conversions, as follows: "23.8 mm (15/16 in.)" and "12.7 mm (1/2 in.)".

(r) To correlate with the action on Proposal 9-39, change the weight limit to "7 kg (15 lb)" and delete the length limit.

(s) Retain the word "trade." In addition, add the following sentence to the end of Section 370-28(a), immediately before Section 370-28(a)(1): "Where an enclosure dimension is to be calculated based on the trade diameter of entering raceways, the trade diameter shall be the trade size designator expressed in the units of measurement employed."

(t) Retain the word "trade"

(u) through (aa) No changes.

(bb) Delete the dimension entirely to correlate with the action on Proposal 9-50.

(cc) through (ff) No changes.

In addition to the actions on the recommendations submitted as part of the proposal, in Section 370-16(a), delete the words "in cubic inches" from the existing Code.

PANEL STATEMENT: The panel has made the revisions for the following reasons:

(a) through (d) editorial.

(f) Correction of an error.

(j) Soft conversion so as to not inadvertently force the redesign of products built to current standards.

(m) through (p) no changes.

(q) Soft conversion so as to not inadvertently force the redesign of products built to current standards.

(r) Correlation.

(s) This part of the Code uses a trade size multiplied by a pure number to get a required dimension. The trade size and the nominal size aren't necessarily the same thing. Trade sizes are no longer to be denominated in units of length. Furthermore, the only way to produce a dimension is to multiply the pure number in the calculations by a dimension. The additional sentence provides, by rule, the procedure to do this, namely, to take the trade size and assign it english or metric units as required, thereby making it a true dimension once again. For example, if using english measurements on a 4 raceway for a straight-across pull, the pull box needs to be 32 in.; if using the metric system on the same (103) raceway, the pull box would need to be 824 mm. Placing the sentence here avoids the necessity of elaborate parenthetical expressions in numerous places in the paragraphs that follow.

(t) This correlates with the action on item (s) above.

(u) through (aa) No changes.

(bb) Correlation.

(cc) through (ff) No changes.

The final item corrects a possible oversight.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

HARTWELL: In revision "(a)", the deleted words should have been stated as "a cubic inch capacity."

(Log #CP902)

9- 6a - (370): Accept

NOTE: The Technical Correlating Committee advises that article titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: CMP 9

RECOMMENDATION: Change the title of Article 370 to read as follows:

"Article 370 - Outlet, Device, Pull and Junction Boxes, Conduit Bodies, Fittings, and Manholes"

SUBSTANTIATION: The additon of Part D should be noted in the title.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1076)

9- 7 - (370): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: 370-5 - change "No. 6" to "6 AWG"
370-16 - change "No. 4" to "4 AWG"
370-16(b)(1) Exception - change "No. 14" to "14 AWG"
370-16(c)(1) - change "No. 6" to "6 AWG"
370-17(d) - change "No. 4" to "4 AWG"
370-28(a) - change "No. 4" to "4 AWG" in two places.

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #866)

9- 8 - (370-1): Accept in Part

NOTE: The Technical Correlating Committee advises that article scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise first sentence:

Scope. This article covers the installation and use of all boxes and conduit bodies used as outlet, <u>device,</u> junction, or pull boxes, ~~depending on their use,~~ and other electric enclosures intended for personnel entry.

SUBSTANTIATION: Edit. If box use is to be indicated, "device" should be included. A switch box, for example may not be an outlet, junction, or pull box. The phrase "depending on their use" is superfluous as use is already stated.

PANEL ACTION: Accept in Part.

The panel accepts adding the word "device", and rejects the remainder of the proposal.
PANEL STATEMENT: The existing wording, "depending on their use", is still appropriate to modify device, outlet, and pull boxes. The panel believes the submitter inadvertently left out the word "manholes" as it wasn't addressed in the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #867)

9- 9 - (370-3): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Nonmetallic Boxes. Nonmetallic boxes shall be permitted only with open wiring on insulators, concealed knob-and-tube wiring, nonmetallic-sheathed cable, Type UF cable, Type SE cable, flexible cords and cables, and nonmetallic raceways.
Exception No. 1: No change
"Exception No. 2: Where integral bonding means with a provision for attaching an equipment ~~grounding~~ bonding jumper inside the box are provided..." (remainder unchanged)
SUBSTANTIATION: Edit. Even though Type UF cable may be installed under provisions of Article 336 it does not become Type NM, and should be indicated for clear intent. Type SE should also be suitable. Flexible cords and cables should be included to accommodate their use in Articles 305, 430, 553, 555, etc. where they may be permitted to be permanently connected.
The first part of Exception No. 2 refers to bonding and it seems equipment bonding jumper is correct terminology. There is no definition for equipment grounding jumper and the term does not appear to be used in the Code.
PANEL ACTION: Accept in Principle.
Revise the main text of the proposal to read as follows: "...knob and tube wiring, cabled wiring methods with entirely nonmetallic sheaths, flexible cords, and nonmetallic raceways."
The panel accepts the proposed wording to Exception No. 2.
PANEL STATEMENT: The revised text meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3634)

9- 10 - (370-3 Exception No. 3 (New)): Reject
SUBMITTER: Pat Richardson, City of Coral Springs, FL
RECOMMENDATION: Add an Exception to read as follows:
Exception No. 3: Systems not required to be grounded per 250-21.
SUBSTANTIATION: 370-3 states that you cannot use metal raceways with plastic boxes. When running certain low voltage systems you would have to provide a ground to bond raceway(s), as per Exceptions No. 1 and No. 2.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 250-21 refers to the power distribution systems that are required to be delivered through grounded raceway systems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1EXPLANATION OF NEGATIVE:
HARTWELL: The submitter makes a valid point, although his proposal is incorrectly worded, and needlessly introduces a third exception. This section doesn't line up properly with allowances in Section 250-112(i). The appropriate action would have been to amend existing Exception No. 1 as follows:
"Exception No. 1: Where internal bonding means are provided between all entries, or for wiring not requiring grounding continuity by other provisions of this code, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables."

(Log #3923)

9- 11 - (370-3 Exception No. 3 (New)): Reject
SUBMITTER: Patrick Richardson, City of Coral Springs, FL
RECOMMENDATION: Add a new Exception No. 3 to Section 370-3:
Systems not required to be grounded per 250-21.
SUBSTANTIATION: 370-3 states that you cannot use metal raceways with plastic boxes. When running certain low voltage systems you would have to provide a ground to bond raceway(s), as per Exception No. 1 and 2.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 9-10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HARTWELL: See my Explanation of Negative Vote on Proposal 9-10.

(Log #2972)

9- 12 - (370-15(a)): Accept in Principle
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
(a) Damp or Wet Locations. In damp or wet locations, boxes, conduit bodies, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the box, conduit body, or fitting. Boxes, conduit bodies, and fittings installed in wet locations shall be listed for use in wet locations. Junction Boxes used for direct burial applications shall have an enclosure Type 6P rating.
SUBSTANTIATION: This proposal revises the aforementioned section to protect the conductors and cables from corrosions due to water that may accumulate in the junction boxes due to underground water tables and watering. UL currently requires Junction Boxes to maintain a 6P rating to be listed for use in direct burial applications.
PANEL ACTION: Accept in Principle.
Revise the proposed wording to read as follows:
"Junction boxes installed below finished grade in accordance with Section 370-29, Exception shall have an enclosure Type 6P rating."
PANEL STATEMENT: The words "direct burial" indicate an application that is beyond the intent of the code in accordance with Section 370-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
HARTWELL: The panel action inadvertently begs the question of how a direct-buried box needs to be rated if it doesn't comply with Section 370-29, Exception. In addition, it omits other smaller boxes more routinely buried, such as device and outlet boxes. The wording should be changed in the comment period to "Boxes installed below finished grade, as covered in Section 370-29, Exception, shall have an enclosure Type 6P rating."

(Log #CP903)

9- 12a - (370-16): Accept
SUBMITTER: CMP 9
RECOMMENDATION: Delete the parenthetical statement: "(See Section 430-12)".
Insert a Fine Print Note after the second paragraph to read as follows:
"FPN: For volume requirements of motor terminal housings, see Section 430-12."
SUBSTANTIATION: To comply with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3727)

9- 13 - (370-16): Reject
SUBMITTER: Joseph F. Healey, Jr., TA Rietdorf & Sons Inc.
RECOMMENDATION: Add new text to read:
A switch / outlet box designed to accommodate a GFCI receptacle and dimmer switch wiring. Increase cu. in displacement for a specifically designed box.
SUBSTANTIATION: Current boxes cause a substantial problem in the installation of GFCI receptacles and dimmer switches. See accompanying drawing for a better understanding of improving installations difficulties.
(Drawing received at NFPA is illegible)
PANEL ACTION: Reject.
PANEL STATEMENT: The present "two deduction rule" was instituted to accommodate GFCI receptacles and dimmer switch wiring. It has been re-evaluated in subsequent code cycles. The panel has determined that the "two deduction rule" is proper.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #538)

9- 14 - (Table 370-16(a)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 370-16(a) to add metric

Table 370-16(a). Metal Boxes

Box Dimension			Minimum Capacity		Maximum Number of Conductors*						
mm	in.	Box Type	cm^3	$in.^3$	No. 18	No. 16	No. 14	No. 12	No. 10	No. 8	No. 6
100x 32	4 x 1 1/4	round/octagonal	205	12.5	8	7	6	5	5	5	2
100x38	4 x 1 1/2	round/octagonal	255	15.5	10	8	7	6	6	5	3
100x54	4 x 2 1/8	round/octagonal	355	21.5	14	12	10	9	8	7	4
100x32	4 x 1 1/4	square	295	18.0	12	10	9	8	7	6	3
100x38	4 x 1 1/2	square	345	21.0	14	12	10	9	8	7	4
100x54	4 x 2 1/8	square	495	30.3	20	17	15	13	12	10	6
120x32	4-1 1/16 x 1 1/4	square	420	25.5	17	14	12	11	10	8	5
120x38	4-1 11/16 x 1 1/2	square	485	29.5	19	16	14	13	11	9	5
120x54	4-1 1/16 x 2 1/8	square	690	42.0	28	24	21	18	16	14	8
75x50x38	3 x 2 x 1 1/2	device	125	7.5	5	4	3	3	3	2	1
75x50x50	3 x 2 x 2	device	165	10.0	6	5	5	4	4	3	2
75x50x57	3 x 2 x 2 1/4	device	170	10.5	7	6	5	4	4	3	2
75x50x65	3 x 2 x 2 1/2	device	205	12.5	8	7	6	5	5	4	2
75x50x70	3 x 2 x 2 3/4	device	230	14.0	9	8	7	6	5	4	2
75x50x90	3 x2 x 3 1/2	device	295	18.0	12	10	9	8	7	6	3
100x54x38	4 x 2 1/8 x 1 1/2	device	170	10.3	6	5	5	4	4	3	2
100x54x48	4 x 2 1/8 x 1 7/8	device	215	13.0	8	7	6	5	5	4	2
100x54x54	4 x 2 1/8 x 2 1/8	device	240	14.5	9	8	7	6	5	4	2
95x50x65	3 3/4 x 2 x 2 1/2	masonry box/gang	230	14.0	9	8	7	6	5	4	2
95x50x90	3 3/4 x 2 x 3 1/2	masonry box/gang	345	21.0	14	12	10	9	8	7	2
min. 44 depth	min. 1 3/4 depth	FS – single cover/gang	220	13.5	9	7	6	6	5	4	2
min. 60 depth	min. 2 3/8 depth	FD – single cover/gang	295	18.0	12	10	9	8	7	6	3
min. 44 depth	min. 1 3/4 depth	FS – multiple cover/gang	295	18.0	12	10	9	8	7	6	3
min. 60 depth	min. 2 3/8 depth	FD – multiple cover/gang	395	24.0	16	13	12	10	9	8	4

~~NOTE: For SI units, 1 $in.^3$ = 16/4 cm^3~~
*Where no volume allowances are required by Sections 370-16(b)(2) through 370-16(b)(5).
conversions as follows:

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
Make the following changes to the table as proposed:
(a) Delete the proposed left dimension column (SI units) entirely.
(b) Delete the subheaders "mm" and "in." to the left of the "Box Type" header as shown in the recommendation.
(c) Revise the left column header to read "Box Trade Size."
(d) Combine the remaining dimension column with the "Box Type" to form a single column under "Box Trade Size" as created immediately above. For example, one box in the new "Box Trade Size" column would be "4 x 1 1/2 square."
(e) For the FS and FD boxes only, express the depths using a soft conversion, as follows:
1. For minimum 1 3/4 in. depth boxes, use "44.5 mm (1 3/4 in.)"
2. For minimum 2 3/8 in. depth boxes, use "60.3 mm (2 3/8 in.)"
(f) Change the "Minimum Capacity" header to read "Minimum Volume".
(g) Use soft conversions in the body of the table, as follows:

cm^3	$in.^3$
205	12.5
254	15.5
353	21.5
295	18.0
344	21.0
497	30.3
418	25.5
484	29.5
689	42.0
123	7.5
164	10.0
172	10.5
205	12.5
230	14.0
295	18.0
169	10.3
213	13.0
238	14.5
230	14.0
344	21.0
221	13.5
295	18.0
295	18.0
395	24.0

PANEL STATEMENT: (a) through (d) These changes transform the opening column into a dimensionless trade size column, avoiding metric parameters which could cause problems with testing laboratories evaluating boxes with somewhat conflicting sizes.
(e) The depths of FS and FD boxes aren't trade sizes, and need to be stated as dimensions. To avoid unintended problems with existing designs, the panel decided to use a soft conversion for these numbers.
(f) This is an editorial change correlating with the action taken on items (a) through (d) in Proposal 9-6, which generally makes the corresponding text refer to volume instead of cubic inch capacities.
(g) The revised volumes reflect recalculations based on the soft conversion concept, done in a way that generally preserves precision to three significant figures. In concert with comparable numbers in Table 370-16(b) as modified by the action on Proposal 9-15, which also uses three significant figures, the resulting calculations don't upset box fill results for the boxes listed in Table 370-16(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #539)

9- 15 - (Table 370-16(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 370-16(b) to add metric
Table 370-16(b). Volume Allowance Required per Conductor

Size of Conductor (AWG)	Free Space Within Box for Each Conductor	
	Cm^3	in.^{3}
18	24.6	1.50
16	28.7	1.75
14	32.8	2.00
12	36.9	2.25
10	41.0	2.50
8	49.2	3.00
6	81.9	5.00

~~NOTE: For SI units, 1 in.^{3} = 16.4 cm^3~~
conversions as follows:

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4278)

9- 16 - (370-16(b)(1)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Add a line after the existing first line.
"Each loop of a conductor installed in the box in a loop or coil shape shall be counted once."
SUBSTANTIATION: It is a common practice to leave extra length of a conductor in a loop or coil shape. The box can be over filled with the present box fill calculation.
PANEL ACTION: Reject.
PANEL STATEMENT: The code defines the required length of free conductors at outlets, junctions, and switch points in Section 300-14. It then makes allowances in volume for the defined lengths. While the additional wire may be good for future work, it is undefined and, therefore, an allowance cannot be determined.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
HARTWELL: This proposal should have been accepted in principle, modified to distinguish between a small loop left to assist wire pulling and a large loop left to allow cutting in the middle and then adding a splice or a device. The revision would be as follows:
"(1) Conductor Fill. Each conductor that originates outside the box and terminates or is spliced within the box shall be counted once, and each conductor that passes directly through the box without splice or termination shall be counted once. A looped, unbroken conductor not less than twice the minimum length required for free conductors in Section 300-14 shall be counted twice. The conductor fill, in cubic inches, shall be computed using Table 370-16(b). A conductor, no part of which leaves the box, shall not be counted."
SENGUPTA: The panel statement in support of rejecting my proposal refers to 300-14. Section 300-14 defines the requirement of a free conductor to be "at least 6 in. (152 mm)" and it does not address a normal wiring practice of keeping extra length of wire in loop or coil form in a box.
The panel statement "while the additional wire may be good for future work, it is undefined and, therefore, an allowance cannot be determined" allows any extra length of wire left in a box without considering the code's requirement.

(Log #4280)

9- 17 - (370-16(b)(1)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Delete the last line of first paragraph.
"A conductor, no part of which leaves the box, shall not be counted."
SUBSTANTIATION: A conductor in a box always occupies space whether it leaves the box or not. For example the number of external jumpers behind a control device in a box may be more than the number of conductors leaving the box. The box based on the present conductor fill calculation may become an undersized box.
PANEL ACTION: Reject.
PANEL STATEMENT: The external jumpers attached to control devices were taken into account when the code was revised to require a double deduction for devices.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SENGUPTA: Control devices are designed and manufactured with a number of external terminals and the wiring is done based on a control system's design. External terminals are there for addition of external jumpers to meet the control schematic's requirement.
With the present code, we can add any number of external jumpers which do not leave the box without considering any volume requirement.

(Log #3316)

9- 18 - (370-16(b)(4)): Reject
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Revise as follows:
370-16(b)(4) Device or Equipment Fill. For each yoke or strap containing one or more devices or equipment a ~~double~~ single volume allowance in accordance with Table 370-16(b)....
SUBSTANTIATION: Over the years the revised NECs have justifiably required more and more room in device and other boxes to facilitate uncrowded wiring and prevent damage during installation to conductors and devices. Meanwhile however, the wiring devices have been reduced in size, the splicing devices are better designed and smaller sizes will accommodate more conductors, and, the insulation on the conductors themselves has been substantially reduced in thickness while becoming more resistant to abrasion and accidental cutting.
This latest restriction requiring a double volume allowance approaches overkill, e.g. a 3 x 2 x 2 3/4 device box with cable clamps and a wiring device cannot, by code, accommodate 2 entries of 14-2 NM cable.
Clamps 1
Grounding conductors 1
Device 2
Number of conductors to be counted in 2 14-2 entries = 4
Total number of "conductors" = 8
Permissible number of conductors for a 3 x 2 x 2 3/4 device box = 7
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 9-13.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #868)

9- 19 - (370-17(b), (c)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(b) ~~Metal~~ Boxes and Conduit Bodies. Where metal boxes or metal or nonmetallic conduit bodies are installed with open wiring or concealed knob-and-tube wiring, conductors shall enter through insulating bushings, or in dry locations, through flexible tubing extending from the last insulating support to no less than 1/4 in. (6.35 mm) inside the box and beyond any cable clamps, and firmly secured to the box or conduit body. Where raceway or cable is installed with ~~metal~~ boxes or conduit bodies, the raceway or cable shall be secured to such boxes and conduit bodies, except that securing of nonmetallic-sheathed cable to a box shall not be required where all of the following conditions are met: (1) the cable(s) enter a surface-mounted box through one or more surface-mounted nonflexible raceways not less than 18 in. (457 mm) or more than 10 ft (3.05 m) in length; (2) the cable(s) is fastened within 12 in. (305 mm), measured along the sheath, of the outer end of the raceway; (3) a fitting is provided on each end of the

raceway(s) to protect the cable from abrasion; (4) the raceway(s) is sealed or plugged at the outer end using approved means; (5) the cable sheath is continuous through the raceway and extends beyond the raceway fitting into the box no less than 1/4 in. (6.35 mm); (6) the raceway(s) is fastened at the outer end and at other points in accordance with the respective raceway article.

(c) Nonmetallic Boxes. Nonmetallic boxes shall be suitable for the lowest temperature rated conductor entering the box. Where nonmetallic boxes are used with open wiring or concealed knob-and-tube wiring, the conductor shall enter the box through individual holes. Where flexible tubing is used to ~~encase~~ enclose the conductors, the tubing shall extend from the last insulating support to no less than 1/4 in. (6.35 mm) inside the box and beyond any cable clamp. Where nonmetallic-sheathed cable or multiconductor Type UF cable is used, ~~the cable assembly, including~~ the sheath shall extend ~~into the box~~ no less than 1/4 in. (6.35 mm) inside the box and beyond any cable clamp. ~~through a nonmetallic sheathed cable knockout opening.~~ In all instances, all permitted wiring methods shall be secured to the boxes.

Exception: Where nonmetallic-sheathed cable or multiconductor Type UF cable is used with boxes no larger than a nominal size 2-1/4 in. by 4 in. flush-mounted in walls or ceilings and where the cable is fastened within 8 in. (2.03 mm) of the box, measured along the sheath, and where the sheath extends through a cable knockout no less than 1/4 in. (6.35 mm), securing the cable to the box shall not be required. Multiple cable entries shall be permitted in a single cable knockout opening.

SUBSTANTIATION: The requirements of the first sentence in (b) should be clearly indicated to apply to metal and nonmetallic conduit bodies. Tubing should extend beyond clamps, where used, to prevent conductor insulation damage.

The proposed additional text would legitimize a common long-standing practice and is similar to Section 373-5(c) which covers cabinets and cut-out boxes. It basically provides for support and protection for what would otherwise be exposed NMSC, and which is already permitted by the Code provided the raceway ends a few inches from the box to permit cable connectors or clamps to be used. This type installation is a viable surface-mounted method for installing NMSC to receptacle outlets, switches, etc., on walls of basements, garages, and other locations. Cable support, protection, and a neat, workmanlike, and aesthetic installation is achieved.

Though Type UF cable may be installed under provisions of Article 336 it does not become NMSC specified in the exception for (c) which is a specific cable.

All nonmetallic boxes do not have cable knockouts, some may have hubs.

PANEL ACTION: Accept in Principle in Part.

Revise the proposal to read as follows:

" (b) Metal Boxes and Conduit Bodies. Where metal boxes or conduit bodies are installed with open wiring or concealed knob-and-tube wiring, conductors shall enter through insulating bushings or, in dry locations, through flexible tubing extending from the last insulating support to not less than 6 mm (1/4 in.) inside the box and beyond any cable clamps. The wiring shall be firmly secured to the box or conduit body. Where raceway or cable is installed with metal boxes or conduit bodies, the raceway or cable shall be secured to such boxes and conduit bodies except as provided in Section 300-15(c).

(c) Nonmetallic Boxes and Conduit Bodies. Nonmetallic boxes and conduit bodies shall be suitable for the lowest temperature-rated conductor entering the box. Where nonmetallic boxes and conduit bodies are used with open wiring or concealed knob-and-tube wiring, the conductors shall enter the box through individual holes. Where flexible tubing is used to enclose the conductors, the tubing shall extend from the last insulating support to not less than 6 mm (fl in.) inside the box and beyond any cable clamp. Where nonmetallic-sheathed cable or multiconductor Type UF cable is used, the sheath shall extend not less than 6 mm (fl in.) inside the box and beyond any cable clamp. In all instances, all permitted wiring methods shall be secured to the boxes.

Exception: Where nonmetallic-sheathed cable or multiconductor Type UF cable is used with single gang boxes not larger than a nominal size 57 mm x 100 mm (2 1/4 in. x 4 in.) mounted in walls or ceilings, and where the cable is fastened within 200 mm (8 in.) of the box measured along the sheath and where the sheath extends through a cable knockout not less than 6 mm (1/4 in.), securing the cable to the box shall not be required. Multiple cable entries shall be permitted in a single cable knockout opening."

PANEL STATEMENT: The panel accepts the principle of including nonmetallic conduit bodes, but prefers using (c). The panel rejects the extension of the panoply of Section 373-5(c) Exception provisions into a section that would seldom apply to those applications. The provisions of Section 300-15(c) adequately address the submitter's objectives. The panel rejects the inclusion of the word "flush" because it does not add anything to the present requirement. The remainder of the proposal has been accepted with editorial improvements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4375)

9- 20 - (370-20 Note (New)): Accept in Principle

SUBMITTER: Joseph A. Hertel, Safety and Buildings Div., State of Wisconsin

RECOMMENDATION: Add a note to indicate:

A wall with wood or metal studs covered by plaster or gypsum board is considered to be a wall of noncombustible material for the purposes of NEC 370-20.

SUBSTANTIATION: By defining these walls as noncombustible for the purpose of this section many disagreements will be eliminated. Most electricians and inspectors will treat a wall of this construction as noncombustible, but we always seem to find the exception, who will not agree since 370-20 only lists concrete, tile and other noncombustible materials. The second sentence refers to walls or ceilings, constructed of wood and does not elaborate on the possible use of a noncombustible surface treatment.

PANEL ACTION: Accept in Principle.

Revise the existing code text to read as follows:

"In walls or ceilings with a surface of concrete, tile, gypsum, plaster or other noncombustible material, boxes shall be installed so that the front edge of the box will not be set back of the finished surface more than 6 mm (1/4 in.) .

In walls and ceilings constructed of wood or other combustible surface material, boxes shall be flush with the finished surface or project therefrom."

PANEL STATEMENT: The panel agrees with the submitter and has modified the rule to address the submitter's concern.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #869)

9- 21 - (370-22): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise:

Exposed Surface Extensions. Surface extensions from a flush-mounted box ~~of a concealed wiring system~~ shall be made by mounting and mechanically securing ~~a box or~~ an extension ring over the ~~concealed~~ flush box. ~~Where required~~ Equipment grounding and bonding shall be in accordance with Article 250.

"Exception: A surface extension shall be permitted to be made from the cover of a ~~concealed~~ flush-mounted box where the cover is designed so it is unlikely to fall off, or be removed if its securing means becomes loose. The wiring method shall be flexible for a length sufficient to permit removal of the cover and provide access to the box interior, and arranged so that any bonding or grounding continuity is independent of the connection between the box and cover...".

SUBSTANTIATION: Edit. Boxes are not permitted to be concealed per Section 370-29. Wiring systems may supply flush boxes yet not be concealed, such as exposed wiring in an attic connected to boxes in the ceiling below. Present wording does not specify any opening in the back of a box installed over a flush box; is it intended that conductors may be extended through knockouts in the surface box? Bonding is added since it is technically different from grounding. Removal of "where required" removes inference that bonding/grounding rules only apply where specified by the Code.

The length reference for the flexible extension is proposed as the present wording can be interpreted as requiring the entire portion of the extended wiring method to be flexible.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #2427)

9- 22 - (370-22): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Make the text that is there Part A and add a Part B stating:
"Metal boxes may have one extension ring to increase the volume of the box. The extension ring shall not have any conduit or cable entries in it."
SUBSTANTIATION: There are many instances where a 4 in. square, 1 1/2 in. deep box is used and then extension rings added as many as 2 and 3. The extension ring works good for one, but the more there are the box becomes very unstable and the rings come off easy. The 6 in. free conducted is usually violated and when they run conduit into the extension they cannot be removed to get to the connections, etc. If this continues to be allowed why make several other box sizes?
PANEL ACTION: Reject.
PANEL STATEMENT: The 1999 code revisions to section 300-14 address access to the conductors. The mechanical suitability of mutliple extension rings is adequately addressed in the product standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4363)

9- 23 - (370-22): Reject
SUBMITTER: Ed Stubbs, City of Atlanta, GA
RECOMMENDATION: Add new text to read as follows:
370-22 Extension Boxes.
(a) Exposed Surface Extensions (no change)
(b) Extensions on Existing Surface Mounted Boxes. When a surface-mounted box exists where additional circuits are added, an additional extension box, no larger than the existing box, shall be allowed if all of the following conditions are met:
(1) The additional conductors do not exceed the total cubic in. of the two boxes together,
(2) Only the unused knockouts of the existing box can be used to connect raceways or cables,
(3) The extension box shall not be used to support any raceways, cables, fixtures or equipment,
(4) The boxes shall be accessible and,
(5) The existing boxes shall be on building structure, not on supporting wires not rigidly supported.
SUBSTANTIATION: For years, contractors have dealt with existing surface-mounted boxes in an existing ceiling. What about a situation where a change order calls for additional circuit or fixture, etc.; is required? My understanding for an extension on an exposed surface extension box was to pick up existing circuits flush in the wall. The only difference here is trying to remove an existing box to accommodate more conductors to a larger box, just to meet the cubic inches required on Table 370-16. What about all the damage you can cause by pulling all the cables back out, cutting the raceways and trying to reanchor the new box in on a concrete ceiling that may have been shot in. You may not be able to resupport it. Is it not the intent the same? Think how long the tenant would be without service in the area with this structure change. I feel this code section will accommodate those impossible situations.
PANEL ACTION: Reject.
PANEL STATEMENT: In Section 370-16(a), the code already permits what the submitter requests. There is no code limit to the use of extension boxes on surface wiring applications, either new or existing. Section 370-22 addresses a transition from flush to surface wiring.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4368)

9- 23a - (370-22): Reject
SUBMITTER: Ed Stubbs, City of Atlanta, GA
RECOMMENDATION: Revise text as follows:
370.22. Extension Boxes. (Add new text)
(a) Exposed Surface Extensions. (no change)
(b) Extensions on Existing Surface Mounted Boxes. When a surface-mounted box exists where additional circuits are added, an additional extension box, no larger than the existing box, shall be allowed if all of the following conditions are met:
(1) The additional conductors do not exceed the total cubic inches of the two boxes together,
(2) Only the unused knockouts of the existing box can be used to connect raceways or cables,
(3) The extension box shall not be used to support any raceways, cables, fixtures or equipment,
(4) The boxes shall be accessible, and,
(5) The existing boxes shall be on building structure, not on supporting wires not rigidly supported.
SUBSTANTIATION: For years, contractors have dealt with existing surface-mounted boxes in an existing ceiling. What about a situation where a change order calls for additional circuit or fixture, etc.; is required? My understanding for an extension on an exposed surface extension box was to pick up existing circuits flush in the wall. The only difference here is trying to remove an existing box to accommodate more conductors to a larger box, just to meet the cubic inches required on Table 370-16. What about all the damage you can cause by pulling all the cables back out, cutting the raceways and trying to reanchor the new box in on a concrete ceiling that may have been shot in. You may not be able to resupport it. Is not the intent the same? Think how long the tenant would be without service in the area with this structure change. I feel this code section will accommodate those impossible situations.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 9-23.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4432)

9- 24 - (370-22(a) and (b) (New)): Reject
SUBMITTER: Craig Schwab, Tray, CA
RECOMMENDATION: Add new text to read as follows:
(a) Junction Boxes with extension shall be tapped to accept a 10/32 machine screw to maintain ground continuity and provide rigidity of the extension that is attached to the junction box.
(b) No more than two extensions shall be used, and only the primary extension knockouts shall be used, so that the conductors in the junction box are not concealed and unsafe to work on being too short for safe access per Section 300-14.
SUBSTANTIATION: I often find loose extensions, junction box overfill, concealed conductors and more than two extensions used.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 9-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1479)

9- 25 - (370-23(b)): Reject
SUBMITTER: Michael C. Reid, Southeast Service Corp.
RECOMMENDATION: Revise to read as follows:
An enclosure supported from a structural member of a building or from grade shall be rigidly supported either directly, or by using ~~a metal~~ polymeric or wood brace.
SUBSTANTIATION: 1) Delete wording and 2) the use of metal drywall supporting brace. The use of metal drywall supporting brace shall not be used in attachment of boxes in drywalls. The device causes a ground when it comes in contact with a live circuit.
PANEL ACTION: Reject.
PANEL STATEMENT: Metal drywall supporting braces are accepted industry practice, and are safe when installed in a workmanlike manner.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #611)

9- 26 - (370-23(b)(1)): Accept
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Change section to read:
Nails and Screws. Nails and screws, where used as a fastening means,...
SUBSTANTIATION: Because the intent of this section covers both screws and nails as the fastening means for the boxes mentioned in this article, both methods should be included in this ruling.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2483)

9- 27 - (370-23(d)(2)): Accept in Part
SUBMITTER: James M. Imlah, City of Hillsboro, OR
RECOMMENDATION: Revise as follows:
(2) Support Wires. The installation shall comply with the provisions of Section 300-11(a). The enclosure shall be secured, using methods identified for the purpose, to ceiling support ~~wires~~ wire(s) including any additional support ~~wires~~ wire(s) installed for that purpose. Support ~~wires~~ wire(s) used for enclosure support shall be fastened at each end so as to be taut within the ceiling cavity.
Boxes having less than 100 In^3 may be supported by a single support wire where an approved box wire support is used.
SUBSTANTIATION: A better clarification is needed of when multiple or a single wire should be used for support of enclosures in the ceiling cavity. There are devices that do provide adequate support for boxes as listed in Table 370-16(a). All of the boxes smaller than 100 In^3 will allow for a box extension if additional area is required and still are under 100 In^3. Wiring in this area is generally for lighting fixtures and the weight on the boxes supported by a wire is adequate for the weight being applied to a box(es) by conductors and raceways when support requirements are followed. This makes it clear that boxes larger than 100 In^3 will then have multiple support wires going to building structure to provide adequate enclosure support.
PANEL ACTION: Accept in Part.
The panel rejects the last sentence of the submitter's recommended text, and accepts the remainder of the proposal.
PANEL STATEMENT: The last sentence of the proposal is redundant.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
HARTWELL: By "redundant" the panel is referring to the parent language in Section 370-23(d).

(Log #3322)

9- 28 - (370-23(d)(3) (New)): Reject
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Add a (3) to 370-23(d):
(3) Raceway Supported Boxes Over Suspended Ceilings. Standard steel boxes not exceeding 4 11/16 x 2 1/8 trade size and containing only splices or conductors run through without splices shall be considered adequately supported by two or more conduit entries of electrical metallic tubing, intermediate metal conduit and/or rigid metal conduit employing locknuts where said box is isolated by elevation.
SUBSTANTIATION: This change/addition will make legitimate a long time and widespread practice in the trade.
PANEL ACTION: Reject.
PANEL STATEMENT: The box could be supported by the locknuts if this proposal were accepted. Locknuts on rigid or intermediate metal conduits are not acceptable for this purpose. Where required, the box can be fitted with hubs for this purpose within the present code. The use of EMT for box support violates Section 348-5(5).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #870)

9- 29 - (370-23(e), (f)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(e) Raceway Supported Enclosures, Without Devices or Fixtures. ~~An enclosure~~ A box that ~~does not~~ contains only conductors and no ~~a~~ device(s) other than splicing devices, and does not ~~or~~ support a fixture(s) or other equipment, and is supported by entering raceways shall not exceed 100 $in.^3$ (1640 cm^3) inches in size. It shall have threaded entries or hubs identified for the purpose. It shall be supported by two or more conduits threaded wrenchtight into the box ~~enclosure~~ or hubs. Each conduit shall be secured within 3 ft (914 mm) of the box ~~enclosure~~ or within 18 in. (457 mm) of the box ~~enclosure~~ or within 18 in. (457 mm) of the box ~~enclosure~~ if all entering ~~entries~~ conduits are on the same side. ~~Exception:~~ Rigid metal, intermediate metal, or rigid nonmetallic conduit or electrical metallic tubing shall be permitted to support a conduit body of any size that contains only conductors and no devices other than splicing devices, and does not support a fixture(s) or other equipment, including a conduit body with only one ~~conduit~~ raceway entry, provided the conduit body is not larger than the largest trade size of the conduit or electrical metallic tubing and the conduit or tubing is secured within 3 ft (914 mm) of the conduit body.
(f) Raceway Supported Enclosures, with Devices or Fixtures. ~~An enclosure~~ A box that contains a device(s) other than splicing devices, or supports a fixture(s) or other equipment and is supported by entering raceways shall not exceed 100 $in.^3$ (1640 cm^3) in size. It shall have threaded entries or have hubs identified for the purpose. It shall be supported by two or more conduits threaded wrenchtight into the enclosure or hubs. Each conduit shall be secured within 18 in. (457 mm) of the box. ~~enclosure. Exception No. 1:~~ Rigid metal conduits or intermediate metal conduit(s) shall be permitted to support a A conduit body of any size including a conduit body constructed with only one conduit entry shall be permitted to be supported in accordance with the foregoing, except that one conduit shall be permitted, provided the conduit body ~~bodies are~~ is not larger than the largest trade size of the conduit(s).
Exception No. 1 ~~2~~: An unbroken length ~~(s)~~ of rigid or intermediate metal conduit(s) shall be permitted to support a box or conduit body used for fixture support, or to support a wiring enclosure that is an integral part of a fixture and used in lieu of a box in accordance with Section 300-15(b), where all of the following conditions are met:
(a) through (e): No change.
(f) At the fixture end, the conduit(s) is threaded wrenchtight into the box, conduit body, or integral wiring enclosure, or into hubs identified for the purpose.
(g) A conduit supported box or conduit body not an integral part of a fixture shall be connected to the fixture by wrenchtight threaded conduit connections or by means such as bolts or rivets. Hubs not an integral part of a fixture shall be connected to the fixture by threaded connections or by means such as bolts or rivets. A locknut and bushing type connection shall not be considered a threaded connection.
SUBSTANTIATION: Edit. A "device" can include wire connectors, supplementary fuses, etc. in addition to receptacles, switches, push buttons, etc. which appear to be the type intended. A box may have entries on more than one side which literally voids the 18 in. requirement; the proposal clarifies the intent is that it applies to all entering conduits.
In effect the "enclosures" of (e) only applies to boxes, since if it is a conduit body the size limit, threaded connection, two raceways, and 18 in. support are relieved by the exception, which becomes the de facto rule for conduit bodies. The proposal incorporates it into the rule. An exception which negates the rule should be part of the rule.
The present exception for (e) refers to EMT; some conduit bodies constructed for use only with EMT have nonthreaded openings not suitable for conduit, which the proposed word "raceway" would cover.
Since the present exception for (e) implies threaded connections are not required (RNMC, EMT) and Exception No. 1 for (f) is similarly worded some may infer threaded connections are also not required. The proposal simply references the basic requirements, and exempts only the two conduit requirement.
In present Exception No. 2 for (f) inclusion of conduit bodies is appropriate as they are commonly used for such applications. The wiring enclosure should not be limited to within a fixture, but an integral part as indicated in Section 300-15(b), which in all cases is

not within the fixture.

Present Exception No. 2 is quite detailed but doesn't address connection of the supported box, conduit body, or hub, to the fixture. Section 410-16(f) is not specific.
PANEL ACTION: Accept in Principle in Part.
Revise existing code Sections 370-23(e) and (f) to read as follows:
"(e) Raceway Supported Enclosure, Without Devices or Fixtures. An enclosure that does not contain a device(s) other than splicing devices or support a fixture(s) or other equipment, and is supported by entering raceways, shall not exceed 1650 cm^3 (100 in^3.) in size. It shall have threaded entries or have hubs identified for the purpose. It shall be supported by two or more conduits threaded wrenchtight into the enclosure or hubs. Each conduit shall be secured within 900 mm (3 ft) of the enclosure, or within 450 mm (18 in.) of the enclosure if all conduit entries are on the same side.
Exception: Rigid metal, intermediate metal, or rigid nonmetallic conduit or electrical metallic tubing shall be permitted to support a conduit body of any size, including a conduit body constructed with only one conduit entry, provided the trade size of the conduit body is not larger than the largest trade size of the conduit or electrical metallic tubing.
(f) Raceway Supported Enclosures, with Devices or Fixtures. An enclosure that contains a device(s) or supports a fixture(s) or other equipment, and is supported by entering raceways, shall not exceed 1650 cm^3 (100 $in.^3$) in size. It shall have threaded entries or have hubs identified for the purpose. It shall be supported by two or more conduits threaded wrenchtight into the enclosure or hubs. Each conduit shall be secured within 450 mm (18 in.) of the enclosure.
Exception No. 1: Rigid metal or intermediate metal conduit shall be permitted to support a conduit body of any size, including a conduit body constructed with only one conduit entry, provided the trade size of the conduit body is not larger than the largest trade size of the conduit.
Exception No. 2: An unbroken length(s) of rigid or intermediate metal conduit shall be permitted to support a box used for fixture support, or to support a wiring enclosure that is an integral part of a fixture and used in lieu of a box in accordance with Section 300-15(b), where all of the following conditions are met.
(a) through (e), no change.
f. At the fixture end, the conduit(s) is threaded wrenchtight into the box, conduit body, or integral wiring enclosure, or into hubs identified for the purpose. Where a box or conduit body is used for support, the fixture shall be secured directly to the box or conduit body, or through a threaded conduit nipple not over 75 mm (3 in.) long."
PANEL STATEMENT: The panel accepts the concept of including splicing devices into the rules, however, no additional reference need be added to Section 370-23(f) since its provisions necessarily include devices.
The panel rejects the inclusion of the exceptions on conduit bodies into the rules because the material is clearer in the exception form. In this case, the exceptions focus on size and add certain wiring methods only to Section 370-23(e) Exception.
The existing language allows the use of threaded reducing bushings when the conduit bodies are smaller than 100 cu. in.; the proposal muddies that concept. The panel action adds the words "trade size of the" ahead of the term "conduit body" to reflect the action on Proposal 9-30. The panel notes that the proposal misquotes the Code in omitting the word "constructed" in the case of conduit bodies with a single entry.
The panel accepts the concept of the change in Section 370-23(f) Exception No. 2 covering boxes on or within a fixture. However, if a conduit nipple is used, the panel wishes to assure that there isn't a significant change in the mechanical advantage gained by the fixture at the end of the run. A 3 in. nipple allowance meets the submitter's intent; as written, the proposal would literally allow another 10 ft conduit run. The panel rejects the final sentence of the proposal because the phrase "threaded into" in the existing Code does not include locknut connections.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3321)

9- 30 - (370-23(e) and (f)): Accept
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Revise as follows:
Exception: ... shall be permitted to support a conduit body of any size, including a conduit body constructed with only one conduit entry provided the <u>trade size</u> of the conduit body is not larger than the largest trade size of the conduit or electrical metallic tubing.
SUBSTANTIATION: As written, the conduit body is being compared to the entering conduit. A conduit body is always larger than the entering conduit as it usually has the female thread so must necessarily have a larger overall size than the entering conduit. If you agree with my rationale and the need for clarification, the same logic would apply to the exception for 370-23(f).
PANEL ACTION: Accept.
PANEL STATEMENT: See panel action on Proposal 9-29.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2304)

9- 31 - (370-23(e), Exception): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.
RECOMMENDATION: Revise text to read as follows:
Exception: Rigid metal, intermediate metal, or rigid nonmetallic conduit or electrical metallic tubing shall be permitted to support a conduit body, including a conduit body constructed with only one conduit entry, provided the conduit body is not larger than the largest trade size of the conduit or electrical metallic tubing. Where oversized conduit fittings are used they shall be supported independently of the conduit system.
SUBSTANTIATION: The deletion of the words "of any size" would eliminate confusion as to whether or not oversized conduit bodies may be used without being supported individually. The additional sentence at the end of the paragraph would clarify the intent of the exception.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal would prohibit a 1 in. LB with reducing bushings supported by 1/2 in. conduit. The only time the exception comes into play is when the conduit body exceeds 100 cu. in., or is an E fitting.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3320)

9- 32 - (370-23(f)): Reject
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Revise as follows:
Raceway Supported Enclosures with Devices or Fixtures. An enclosure that contains a device(s) or supports a fixture(s) or other equipment and is supported <u>only</u> by entering raceways shall not exceed 100 $in.^3$ (1640 cm^3) in size. It shall have threaded entries or have hubs identified for the purpose. It shall be supported by two or more <u>rigid or intermediate metal</u> conduits threaded wrenchtight...
SUBSTANTIATION: Great license is taken with this permissive rule. It is not unusual to see cast boxes used to support lighting fixtures etc., supported exclusively by 2 EMT or PVC conduit entries.
The terms conduit and raceway alone suggest that such an installation meets this requirement.
PANEL ACTION: Reject.
PANEL STATEMENT: Use of EMT or PVC is a violation of the existing code rules within their respective articles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2305)

9- 33 - (370-23(f) Exception No. 1): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.
RECOMMENDATION: Revise text to read as follows:
Exception: Rigid metal or intermediate metal conduit shall be permitted to support a conduit body, including a conduit body constructed with only one conduit entry, provided the conduit body is not larger than the largest trade size of the conduit. Where

oversized conduit fittings are used they shall be supported independently of the conduit system.
SUBSTANTIATION: The deletion of the words "of any size" would eliminate confusion as to whether or not oversized conduit bodies may be used without being supported individually. The additional sentence at the end of the paragraph would clarify the intent of the exception.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 9-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2300)

9- 34 - (370-23(g)): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.
RECOMMENDATION: Add new text to read:
Raceway Supported Conduit Bodies. Rigid metal conduit or intermediate metal conduit shall be permitted to support an oversized conduit body provided the conduit body doesn't exceed the trade size of the largest conduit by two trade sizes.
SUBSTANTIATION: Many times conduit bodies are oversized in order to splice within them in accordance with Section 370-16(c)(2). With the present wording of Section 370-23(e) Exception and 370-23(f) Exception No. 1, oversized conduit bodies are not permitted to be used without supporting the conduit body. There isn't any good way to support an LB or a T fitting independently. The only option is to drill a hole in the fitting to anchor it to some type of support. It is a common practice to oversize fittings and not support them independently. Limiting the amount that one may oversize the fitting to two trade sizes would ensure that the fitting would be adequately supported and would meet the intent of Section 370-23.
PANEL ACTION: Reject.
PANEL STATEMENT: The code already allows what is proposed. See panel action and statement on Proposal 9-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #871)

9- 35 - (370-25): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
"In completed installations, each box shall have a cover, faceplate, lampholder, or fixture canopy, except where the installation complies with Section 410-14(b)."
SUBSTANTIATION: Edit. To correlate with Section 410-14(b) and to include lampholders such as porcelain or plastic types. Lampholders per definition of lighting outlet is not the same as a lighting fixture.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3884)

9- 36 - (370-27): Accept in Part
SUBMITTER: J. Philip Simmons, Simmons Electrical Services
RECOMMENDATION: Revise text as follows:
(a) Boxes at Lighting Fixture Outlets. Boxes used at lighting fixture outlets shall be designed for the purpose. At every outlet used exclusively for lighting, the box shall be designed or installed so that a lighting fixture may be attached.
Exception: A wall-mounted fixture weighing not more than 6 lb (2.72 kg) and not exceeding 16 in. (406 mm) in any dimension shall be permitted to be supported on other boxes, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.
(b) Maximum Fixture Weight. Outlet boxes or fittings installed as required by Section 370-23 shall be permitted to support lighting fixtures weighing 50 lb (22.7 kg) or less. A lighting fixture that weighs more than 50 lb (22.7 kg) shall be supported independent of the outlet box unless the outlet box is listed for the weight to be supported.
Renumber the following subsections.
SUBSTANTIATION: The rules on using outlet boxes for supporting lighting fixtures need to be located here in Article 370 rather than in Article 410. The expertise for the use and installation of outlet boxes is with CMP-9 while the expertise for lighting fixtures is with CMP-18.
Locating all the support rules here will improve the organization of the Code and make it more user friendly by consolidating similar requirements in one location.
PANEL ACTION: Accept in Part.
1. The panel accepts new subsection (b) with the change of the word "independent" to "independently". Change the weight to read: "23 kg (50 lb.)".
2. The panel does not accept (a) or the Exception of the proposal.
PANEL STATEMENT: 1. Editorial.
2. The panel revised the wording of the exception in Proposal 9-39.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1399)

9- 37 - (370-27(a), Exception): Accept in Principle
SUBMITTER: Larry T. Smith, Nat'l Electrical Seminars
RECOMMENDATION: Revise to read as follows:
Boxes at Lighting Fixture Outlets. Boxes used at lighting fixture outlets shall be designed for the purpose. At every outlet used exclusively for lighting, the box shall be designed or installed so that a lighting fixture may be attached.
Exception: A ceiling or wall-mounted fixture weighing not more than ~~6 lb (2.72kg) and not exceeding 16 in. (406mm) in any dimension~~ 15 lbs (6.80 kg) shall be permitted to be supported on other boxes, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.
SUBSTANTIATION: This exception was enacted in the 1999 cycle, and was originally intended to permit device boxes to support small fixtures, an age-old practice in the industry. While the intent was laudable, the weight limitation of six pounds for wall-mounted boxes was misguided.
The submitter's proposal cited Section 410-15, wherein the maximum fixture weight permitted to be supported by the screw shell of a lampholder is six pounds and the fixture cannot exceed sixteen in. in any dimension. Note that Section 410-15 does not specify whether the fixture is ceiling or wall-mounted.
Underwriters Laboratories had previously investigated and listed device boxes, metallic outlet boxes (QCIT), for use in existing structures for the support of fixtures, smoke detectors, and carbon monoxide detectors weighing not more than 15 pounds without regard to wall or ceiling mounting.
Underwriter's investigation had proved that an old work device box cut into an existing ceiling is capable of supporting a fixture up to fifteen pounds. Surely, a device box roughed into a brick wall, a device box mailed to a ceiling joist, or a 4 in. sq. box with a single gang 1 1/2 in. tile ring installed in a poured concrete wall is capable of supporting a fixture weighing 15 lbs.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 9-39 which meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1711)

9- 38 - (370-27(a), Exception): Accept in Principle
SUBMITTER: Ray C. Mullin, Ray C. Mullin Books
RECOMMENDATION: Revise text as follows:
Exception: A wall-mounted lighting fixture weighing not more than 6 lb (2.72 kg) ~~and not exceeding 16 in. (406 mm) in any dimension~~ shall be permitted to be supported on other boxes, or plaster rings that are secured to the other boxes, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.
SUBSTANTIATION: Many of the decorative strip type lighting fixtures installed along side and above mirrors in bathrooms exceed

16 inches in length, yet they weight less than 6 pounds. Electricians install device boxes for this type of installation because of the narrow width of the lighting fixture. Removing the 16 in. limitation would permit these light weight decorative lighting fixtures to be supported by the "other boxes."

Adding the words or plaster rings that are secured to the other boxes would clarify the intent that when a plaster ring is attached to a box, for all practical purposes it becomes part of the box, and should be treated as such.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 9-39 which meets the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4217)

9- 39 - (370-27(a), Exception): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

Exception: A ~~wall mounted~~ fixture weighing not more than ~~6 lb (2.72 kg)~~ 15 lb (6.80 kg) and not exceeding 16 in. (406 mm) in any dimension shall be permitted to be supported on other boxes, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.

SUBSTANTIATION: Before the ink was dry on the 1999 NEC, UL released the 1998 edition of the Green Book recognizing device boxes as generically adequate to support up to 15 lb fixtures (and carbon monoxide detectors), with no orientation restriction. After expressing consternation at this turn of events, that effectively circumvented the intended limits in the 1999 NEC, UL backed off in the next edition of the Green Book. However, their technical evaluation should now be considered on its merits, which I think are quite good. This proposal is intended as a vehicle to allow just that.

PANEL ACTION: Accept in Principle.

Revise the proposed wording of the Exception to read as follows:

"Exception: A fixture weighing not more than 7 kg (15 lb) shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided the fixture or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws."

PANEL STATEMENT: The change recognizes the substantiation of the submitter and further removes the 16 in. limitation after receiving the technical information about the product testing. The plaster ring was added based on the substantiation in Proposal 9-38.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3372)

9- 40 - (370-27(c) and (d)): Reject

SUBMITTER: Jack Wells, Pass & Seymour/Legrand

RECOMMENDATION: Revise 370-27(c) as follows:

Boxes at Ceiling Suspended (Paddle) Fan Outlets. ~~Outlet boxes shall not be used as the sole support for ceiling suspended (paddle) fans.~~

~~Exception: Boxes listed for the application shall be permitted as the sole means of support.~~

Boxes used at ceiling-suspended (paddle) fan outlets shall be listed outlet boxes that are identified for the purpose. Other boxes shall be permitted to be used if the ceiling-suspended (paddle) fan is supported in accordance with Section 422-18.

Add new subsection 370-27(d):

(d) Ceiling Boxes. Boxes installed in ceilings not less than 7 1/2 feet (2.3 meters) above the floor shall be boxes designed or installed so that a lighting fixture or a ceiling-suspended (paddle) fan may be attached.

SUBSTANTIATION: Revising 370-27(c) restates the requirement in positive language and correlates this requirement with Section 422-18. The revision also makes it clear that ceiling suspended fan boxes must be listed for the purpose unless independent support is provided in accordance with 422-18.

New subsection 370-27(d) is proposed because most of the boxes installed in a ceiling higher than 7-1/2 feet will be used for either lighting or ceiling fan installations. This new subsection will ensure that the appropriate box is installed for the support of fixtures and fans.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed positive language does correlate with Section 422-18. However, this is not an improvement in the code. The negative language tends to draw one's attention, therefore, stressing the importance of the correct installation. As for the new subsection, there is not substantiated technical data provided to indicate that a safety hazard exists with the present system.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HARTWELL: This rule should be recast in affirmative language, as one part of the submittal suggested, I will submit the following as a public comment:

"Boxes used at suspended ceiling (paddle) fan outlets shall be listed for the purpose where used as the sole support of the fan. The installation shall comply with Section 422-18."

(Log #3964)

9- 41 - (370-27(c) and (d)): Reject

SUBMITTER: Jack Wells, Pass & Seymour/Legrand

RECOMMENDATION: Revise 370-27(c) as follows:

Boxes at Ceiling-Suspended (Paddle) Fan Outlets. ~~Outlet boxes shall not be used as the sole support for ceiling suspended (paddle) fans.~~

~~Exception: Boxes listed for the application shall be permitted as the sole means of support.~~

Boxes used at ceiling-suspended (paddle) fan outlets shall be listed outlet boxes that are identified for the purpose. Other boxes shall be permitted to be used if the ceiling-suspended (paddle) fan is supported in accordance with Section 422-18.

Add new Subsection 370-27(d):

(d) Ceiling Boxes. Boxes installed in ceilings not less than 7-1/2 ft (2.3 m) above the floor shall be boxes designed or installed so that a lighting fixture or a ceiling-suspended (paddle) fan may be attached.

SUBSTANTIATION: Revising 370-27(c) restates the requirement in positive language and correlates this requirement with Section 422-18. The revision also makes it clear that ceiling-suspended fan boxes must be listed for the purpose unless independent support is provided in accordance with 422-18.

New Subsection 370-27(d) is proposed because most of the boxes installed in a ceiling higher than 7-1/2 feet will be used for either lighting or ceiling fan installations. This new subsection will insure that the appropriate box is installed for the support of fixtures and fans.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 9-40.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HARTWELL: See my Explanation of Negative Vote on Proposal 9-40.

(Log #394)

9- 42 - (370-27(c), Exception): Reject

SUBMITTER: Richard Schuh, Edwardsville Electric

RECOMMENDATION: Revise 370-27(c) to read as follows:

Outlet boxes shall not be used as the sole means of support for ceiling (paddle) fans unless listed for application. In bedrooms, dining rooms, family rooms, living rooms, boxes more than five ft from wall shall be listed for ceiling fans.

SUBSTANTIATION: Most ceiling fans are installed in boxes not listed for such use by homeowners following an inspection. Retrofitting existing box locations for fans is difficult, so not done. I have replaced fans that have fallen to the floor.

PANEL ACTION: Reject.

PANEL STATEMENT: The intent of the submitter's proposal is to require a listed outlet box suitable for fan support in bedrooms, dining rooms, family rooms, and living rooms. Code-Making Panel 9 does not support this concept.

The panel notes that there is nothing in the NEC that prohibits an electrician from installing listed outlet boxes suitable for fan support in ceiling locations described by the submitter. The installer may choose to provide this extra equipment for the homeowner's convenience. Installing these boxes at the location mentioned by the submitter will comply with the existing NEC.

The panel notes there are alternate methods to provide suitable support for a paddle fan. Many retrofit devices are available for the support of paddle fans. Listed boxes are not the only suitable means for support.

The technical information available to the panel indicated that paddle fans fell due to improper installation and not a failure of the box. Product packaging and labeling has been changed to address the problem of improper installation.

Changes in the NEC rule will not increase safety if the homeowner chooses to improperly install the equipment. The requirement of providing listed boxes for future fan support in every ceiling lighting fixture location as described by the submitter is prohibitive since alternate retrofit support means are available.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2958)

9- 43 - (370-28): Accept

NOTE: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Dick Murray, Randolph, MA
RECOMMENDATION: Revise the title as follows:
370-28 Conduit Bodies Pull and Junction Boxes.
SUBSTANTIATION: This proposal is not intended to change the code requirement but to make it more user friendly.

This change will make it easier for the user to locate dimension requirements that apply to conduit bodies used for pull and junction boxes containing conductors No. 4 or larger. The requirements for conduit bodies containing conductors No. 6 and smaller are easily located in Section 370-16(c) because they are included in the title.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
HARTWELL: The title should be reorganized to reflect the relative importance of terms, as follows: "Pull and Junction Boxes, and Conduit Bodies."

(Log #CP904)

9- 43a - (370-28(a)(3), 370-71(b)(1), 370-71(b)(2)): Accept
SUBMITTER: CMP 9
RECOMMENDATION: Add a title to 370-28(a)(3) to read:
"Smaller Dimensions."
Add a title to 370-71(b)(1) to read:
"Distance to Opposite Wall."
Add a title to 370-71(b)(2) to read:
"Distance Between Entry and Exit."
SUBSTANTIATION: To comply with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2503)

9- 44 - (370-28(a)(3)): Accept
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
RECOMMENDATION: Revise as follows:
Boxes or conduit bodies of dimensions less than those required in (a)(1) and (a)(2) shall be permitted for installations of combination of conductors that are less than the maximum conduit or tubing fill (of conduits or tubing being used) permitted by Table 1 of Chapter 9, provided the box or conduit body has been ~~approved~~ listed for and is permanently marked with the maximum number and maximum size of conductors permitted.
SUBSTANTIATION: These code requirements are a testing lab function and the change reflects that.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #872)

9- 45 - (370-29): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
"Conduit Bodies, ~~Junction, Pull,~~ and ~~Outlet~~ Boxes to be Accessible. Conduit bodies, ~~junction, pull, and outlet~~ boxes shall be so installed that the wiring contained in them can be..." (remainder unchanged)
SUBSTANTIATION: Edit. By designating boxes used for certain purposes boxes used for other purposes such as a device (switch) box are inferred as not covered. The word "box" is sufficient and covers any specific use designation.
PANEL ACTION: Accept in Principle.
Revise the proposed wording to read as follows:
"Boxes and Conduit Bodies to be Accessible. Boxes and conduit bodies shall be installed so that the wiring contained in them can be...".
PANEL STATEMENT: The panel agrees with the submitter's substantiation, but have reordered the title and text to reflect the relative importance of the terms. The word "so" is relocated to comply with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1459)

9- 46 - (370-29): Reject
SUBMITTER: Joseph E. McCann, City of Coral Springs, FL
RECOMMENDATION: Revise to read as follows:
Outlet boxes installed above suspended ceiling shall be not more than four ft above the suspended ceiling.
SUBSTANTIATION: When outlet boxes are installed in high bay bar joist construction with suspended ceiling below many times the outlet box will be at the bar joist height say 20 ft or more and not reachable from a ladder at an 8 ft ceiling height.
PANEL ACTION: Reject.
PANEL STATEMENT: Access to these boxes can be provided through other means such as removing the grid. The substantiation does not identify a problem that is within the scope of the NEC. See Section 90-1(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3760)

9- 47 - (370-29 Exception No. 2 (New)): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for information.

SUBMITTER: Timothy M. Croushore, Allegheny Power Service Corp.
RECOMMENDATION: Number the existing exception as Exception No. 1 and add a new Exception No. 2 to read as follows:
Exception No. 2: Listed pull boxes containing no taps or splices shall be permitted to be installed underground and under sidewalks, paving, earth, or other substances that is to be used to establish the finished grade.
SUBSTANTIATION: This new exception is necessary to permit pull boxes that are used during the initial installation of conductors in an underground circuit to be covered over by a finished grade or surface. Often large areas of land are paved for parking lots or pedestrian use. The paving covers over the installation of circuit raceways used for lighting and other electric circuit conductors. Pull boxes are often used in long runs of conduit to make the installation of conductors manageable. These pull boxes currently have to be rendered accessible after the installation of the paving materials. These pull boxes at the surface are often damaged by snow removal equipment, vehicles, grass cutting equipment, frost heaves, and earth movement. The damaged pull boxes can expose conductors to pedestrians, form tripping hazards, or become hazards to vehicles. Pull boxes that do not contain splices or taps are rarely accessed for maintenance or adding taps. These pull boxes should be permitted to be buried in the earth and covered over after the initial installation. This new exception will permit

pull boxes having no taps or splices to be installed underground and under finished surfaces.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not comply with the intent of Section 300-18(a). If the pull box is inaccessible and a failure occurs, a repairing contractor will be tempted to try and pull between available access points, rather than digging up the parking lot. This could include pulling through the buried box, even if the conduits did not line up, resulting in hidden conductor damage. Handholes with appropriate covers are readily available for this purpose, and if installed correctly will not be damaged by snow removal. Alternatively, the box could be placed under loose soil at a landscaped island, with its location identified in accordance with existing rules.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2771)

9- 48 - (370 Part D): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Delete and relocate Part D in Article 370 to Article 110 in a new Part E.
SUBSTANTIATION: While it is true, that this part covers enclosures it also covers the subject of manholes which can be "subsurface enclosures" now covered by Section 110-12(b).
PANEL ACTION: Reject.
PANEL STATEMENT: A manhole, in concept, is an enclosure that is large enough for personnel entry as now covered in the scope of Article 370. The technical correlating committee agreed with the placement of the material in the previous code cycle.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4343)

9- 49 - (370-52): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: CMP 9 should investigate the discrepancies between
370-52
110-26
110-34
SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: There are no discrepancies between the cited sections. Section 370-52 is cabling work space; only Section 370-53 requires correlation, and it does correlate with Sections 110-26 and 110-34.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3891)

9- 50 - (370-52(a) and (b) (New)): Accept in Principle
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Add text as follows:
370-52(a) Access to Enclosures. Conductors shall be racked to provide ready and safe access in underground and subsurface enclosures, into which persons enter for installation and maintenance.
370-52(b) Cabling Work Space. (Include existing text of Section 370-52.)
SUBSTANTIATION: The text of this subsection is identical to Section 110-12(b) and should be moved to this location to aid the user of the Code.
PANEL ACTION: Accept in Principle.
Revise the final sentence of existing Section 370-54 to read as follows:
"All conductors shall be cabled, racked up, or arranged in an approved manner that provides ready and safe access for persons to enter for installation and maintenance."
PANEL STATEMENT: This revision meets the intent of the submitter. However, the panel believes the material belongs in Section 370-54.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:
HARTWELL: Adding the word "arranged" allows for something short of racking in smaller enclosures where safe access can be achieved through raceway placement, conductor cabling, or other methods.

(Log #4106)

9- 51 - (370-60 (New)): Accept in Principle
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for action on Article 110, Part C. This action will be considered by Panel 1 as a Public Comment. The Technical Correlating Committee further directs that this Proposal be forwarded to Code-Making Panel 13 for information.
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Change title to: 370 Part D. Manholes, Vaults and Other Electric Enclosures Intended for Personnel Entry.
Add new paragraph as follows:
370-60. Fire Resistivity of Electrical Vaults. The walls, roof, floors, and doorways of vaults containing conductors and equipment over 600 volts nominal shall be constructed of materials that have adequate structural strength for the conditions with a minimum fire rating of 3 hours. The floors of vaults in contact with the earth shall be of concrete that is not less than 4 in. (102 mm) thick, but where the vault is constructed with a vacant space or other stories below it, the floor shall have adequate structural strength for the load imposed thereon and a minimum fire resistance of 3 hours. For the purpose of this section, studs and wallboards shall not be considered acceptable.
SUBSTANTIATION: "Vaults" are referred to in numerous paragraphs of Part D and should be included in the title. Vaults are a type of construction that implies fire resistance as outlined in Article 450. Making these changes will promote consistency in the Code. All vault design requirements should be contained in 370 Part D.
PANEL ACTION: Accept in Principle.
Relocate this new section to Article 110, Part C in a new section 110-xx. Make no change in the title of Article 370, Part D.
PANEL STATEMENT: Although the proposal has merit, it is the opinion of the panel that this material belongs in Article 110. The panel requests that the Technical Correlating Committee refer this proposal to Code-Making Panel 1 for action in Part C of Article 110. Code-Making Panel 9 understands that the focus of the proposal is medium voltage systems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CROUSHORE: This proposal should have been accepted as originally submitted. This proposal contains good information for constructing manholes and electrical vaults.

(Log #4218)

9- 52 - (370-70(2)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
2. In Part B, Sections 370-15; 370-17; 370-18; 370-20; 370-23(a), (b), or (g); 370-28(b); and 370-29.
SUBSTANTIATION: When we changed from "applicable provisions" to specifying exactly which provisions, I knew, I just knew we were going to leave something out. We did. This material is especially critical now that we have the manhole rules in this article. This proposal fixes that oversight.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 373 — CABINETS, CUTOUT BOXES, AND METER SOCKET ENCLOSURES

(Log #540)

9- 53 - (373): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: a) Section 373-2(a): Replace "1/4-in. (6.35-mm)" with "6 mm (1/4 in.)".
b) Section 373-3: Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
c) Section 373-4: Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
d) Section 373-5(c) Exception: Replace "18 in. (457 mm)" with "450 mm (18 in.)"; Replace "10 ft (3.05 m)" with "3.0 m (10 ft)"; Replace "12 in. (305 mm)" with "300 mm (12 in.)"; Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
e) Section 373-10(b): Replace "0.053 in. (1.35 mm)" with "1.35 mm (0.053 in.)".
f) Section 373-11(a)(1): Replace "1/16 in. (1.59 mm)" with "1.6 mm (1/16 in.)".
g) Section 373-11(a)(2): Replace "1 in. (25.4 mm)" with "25 mm (1 in.)".
h) Section 373-11(a)(2) Exception: Replace "0.093 in. (2.36 mm)" with "2.36 mm (0.093 in.)"; Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".
i) Section 373-11(a)(3): Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)"; Replace "1 in. (25.4 mm)" with "25 mm (1 in.)".
j) Section 373-11(a)(3) Exception: Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
Make the following changes:
(a) through (e) No changes
(f) Use the soft conversion, "1.59 mm (0.0625 in.)".
(g) Use the soft conversion, "25.4 mm (1.00 in.)
(h) Use the soft conversion for the final dimension, "12.7 mm (0.500 in.)
(i) Use soft conversions, as follows: "12.7 mm (0.500 in.)" and "25.4 mm (1.00 in.)".
(j) Use the soft conversion, "12.7 mm (0.500 in.)
PANEL STATEMENT: The panel has modified the proposal to use soft conversions in instances where hard conversions could inadvertently jeopardize the continuing viability of present equipment designs.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4455)

9- 54 - (373-3): Reject
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
RECOMMENDATION: Revise as follows:
"... other combustible material... 1/4 in." ... <u>that in the course of intended use, including installation and maintenance and repair, will not release potential contaminants.</u>
SUBSTANTIATION: There is a strong argument for adding explicit wording right here. It takes a broad interpretation of 110-12(c), which does not directly address installation, to override the permission in 373-3.
The purpose of enclosures is to form a barrier between their contents and that which has not been investigated for this purpose. This purpose is especially important when the enclosures guard protective equipment, as opposed to, for example, ceiling lights or receptacles. For example, I have found the inside of cabinet, including the circuit breakers, coated with plaster dust despite the fact that there were no open knockouts, and that the mounting openings in the back were snug against the wood support. The source of such dust was in this case, and often in my experience appears to be, the drywall that was installed over the cabinet, recessing the enclosure proper about a quarter inch behind its cover. In the not-unusual case of my example, the main breaker appeared to be defective. I can't be certain that the coating of dust had infiltrated the internal mechanisms, but manufacturers warn that circuit breakers' need for arc chutes exposes the workings of these essential protective devices to injury by dust or other particles. I also have found circuit breakers incapacitated where paint has coated the inside of enclosures, and exposed to interior spider webs and other evidence of vermin. I can provide a photograph of a small pile of sawdust or bug nest sitting on top of MAIN circuit breakers. Clearly some of these problems can be laid to causes other than the gaps caused by recessing the cabinets, but what we can try to control by explicit wording should be addressed in some way such as the wording I suggest.
PANEL ACTION: Reject.
PANEL STATEMENT: No "broad interpretation" of Section 110-12(c) is required. The substantiation points to one of the very reasons that this subsection is in the code. There are now products specifically designed to correct those problems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #612)

9- 55 - (373-4): Accept in Principle
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Add the following text at the end of section:
"from the outer surface of the enclosure."
SUBSTANTIATION: As with ruling from Section 370-18, the purpose of this section is to reduce "touch-potential". Current wording is confusing, change will promote understanding.
PANEL ACTION: Accept in Principle.
Add the phrase "of the enclosure" to the end of the existing code wording.
PANEL STATEMENT: Editorial clarification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3933)

9- 56 - (373-4):
Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" to correlate with the action of Code-Making Panel 1 on Proposal 1-215. The Technical Correlating Committee directs that this Proposal be forwarded to Code-Making Panel 1 for information.
SUBMITTER: William F. Laidler, Town of Hanover, MA
RECOMMENDATION: Strike this entire section:
~~373-4. Unused Openings. Unused openings in enclosures within the scope of this article shall be effectively closed to afford protection substantially equivalent to that of the enclosures within the scope of this article. Where metal plugs or plates are used with nonmetallic cabinets or cutout boxes, they shall be recessed at least 1/4 in. (6.35 mm) from the outer surface.~~
SUBSTANTIATION: Section 373-4 addresses the procedures for closing unused openings in enclosures only, I have submitted a proposal to include the term enclosure within the text of 110-12(a) and append the second sentence of now Section 373-4 regarding metal plugs in nonmetallic cabinets and cutout boxes. In the process of creating a more user friendly code all this information may now be located to one section and prevent repetitive information in several locations.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel requests that the Technical Correlating Committee correlate this proposal with the action on Section 110-12(a), Proposal 1-215. The wording of this section has been modified by the action on Proposal 9-55. This action is conditional on the acceptance of Proposal 1-215 by Code-Making Panel 1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1981)

9- 57 - (373-4(a) and (b) (New)): Reject
SUBMITTER: John M. O'Connor, North American Technologies, Inc.
RECOMMENDATION: Revise as follows:
373-4. Unused Openings. Unused openings in enclosures within the scope of this article shall be effectively closed to afford protection substantially equivalent to that of the enclosures within the scope of this article.

(a) Nonmetallic. Where metal plugs or plates are used with nonmetallic cabinets or cutout boxes, they shall be recessed at least 1/4 in. (6.35 mm) from the outer surface.

(b) Meter Socket Enclosures. Meter sockets shall be effectively closed by a closure which is integral to the meter socket enclosure when a meter is not installed in the socket.

SUBSTANTIATION: The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27. Guarding of Live Parts. In many instances meters are bypassed, often by noncode approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

Note: This is a companion proposal to my proposal on Section 230-62.

PANEL ACTION: Reject.

PANEL STATEMENT: The basic rule in Section 373-4(a) requires that unused openings shall be effectively closed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HARTWELL: In all my years in the trade, and in all the seminars I have given across the country, I have never found an electrician who would think to apply this section to a vacant meter socket. the universal trade practice is to cover the jaws with part of the carton and hope it holds up in the rain until the utility gets there to set a meter. Many utilities, including my own, allow for hot-work cut and reconnects. If an old A-base meter is being replaced, that means the socket will be energized in this condition for some period of time.

This section has to do with omitted knock-out sections, and the coordinate responsibility to provide knock-out seals of equivalent heft to that of the enclosure. If this material is relocated to Article 110, we will have an open section number, and we should use this opportunity to write a clear requirement. I suggest the following:

"373-4. Meter Socket Enclosures. Meter socket enclosures shall be completed by the installation of a meter, or by a closure assembly identified for use with the meter socket enclosure employed."

This language avoids the problem in the proposal as written, which would prohibit meter socket closure assemblies added to ring-type meter sockets.

(Log #2099)

9- 58 - (373-4(b)): Reject

SUBMITTER: John M. O'Connor, North American Technologies, Inc.

RECOMMENDATION: Revise text to read as follows:

373-4. Unused Openings. Unused openings in enclosures within the scope of this article shall be effectively closed to afford protection substantially equivalent to that of the enclosures within the scope of this article.

(a) Nonmetallic. Where metal plugs or plates are used with nonmetallic cabinets or cutout boxes, they shall be recessed at least 1/4 in. (6.35 mm) from the outer surface.

(b) Meter Socket Enclosures. Meter sockets shall be effectively closed by a closure which is integral to the meter socket enclosure when a meter is not installed in the socket.

SUBSTANTIATION: The enclosure of a meter socket is UL listed only when a meter is installed in a socket. The service which is energized without a meter being installed does not meet Section 111-27 Guarding of Live Parts. In many instances meters are bypassed, often by non-code approved means, in order to provide temporary power on construction jobsites. The protection of these live parts may or may not exist, depending on the installer and when or if a meter is installed.

These hazardous situations are occurring at new homes, offices, construction sites and at temporary classrooms (which are usually located on school playgrounds) while they are waiting to have meters installed. Utility deregulation may also cause increased incidence of these situations.

The addition of an integral closure to a meter socket would protect workers, children and others from a potentially dangerous situation, one that is preventable. Listed metering assemblies with integral socket closures are already commercially available.

Note: This is a companion proposal to my proposal on Section 230-62.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 9-57.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HARTWELL: See my Explanation of Negative Vote on Proposal 9-57.

(Log #3612)

9- 59 - (373-5): Reject

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

373-5. Cabinets, Cutout Boxes, and Meter Socket Enclosures. Conductors entering enclosures within the scope of this article shall be protected from abrasion and shall comply with (a) through (c).

... (no change)

(c) Cables. Where cable is used, each cable shall be secured to the cabinet, cutout box, or meter socket enclosure.

Exception: Cables with entirely nonmetallic sheaths shall be permitted to enter ~~the top of a surface mounted~~ an enclosure through one or more nonflexible raceways not less than 18 in. (457 mm) or more than 10 ft (3.05 m) in length, provided all the following conditions are met.

a. Each cable is fastened within 12 in. (305 mm), measured along the sheath of the outer end of the raceway.

b. The raceway does not penetrate a structural ceiling ~~The raceway extends directly above the enclosure and does not penetrate a structural ceiling.~~

c. A fitting is provided on each end of the raceway to protect the cable(s) from abrasion and the fittings remain accessible after installation.

d. The raceway is sealed or plugged at the outer end using approved means so as to prevent access to the enclosure through the raceway.

e. The cable sheath is continuous through the raceway and extends into the enclosure beyond the fitting not less than 1/4 in. (6.35 mm).

f. The raceway is fastened at its outer end and at other points in accordance with the applicable article.

g. Where installed as conduit or tubing, the allowable cable fill does not exceed that permitted for complete conduit or tubing systems by Table 1 of Chapter 9 of this Code, and all applicable notes thereto.

FPN: See Table 1 in Chapter 9, including Note 9, for allowable cable fill in circular raceways. See Section 310-15(b)(2)(a) for required ampacity reductions for multiple cables installed in a common raceway.

SUBSTANTIATION: The use of nonflexible raceway to provide physical protection for cable or to provide a passage through finished structure should not be limited to extending up only or entering through the top of the enclosure, as it is a common practice to go down or horizontally from these enclosures.

When the cable sheathing is stripped away for termination, the stress is the same as individual conductors used in typical raceway installations.

PANEL ACTION: Reject.

PANEL STATEMENT: The exception permits only top entry through a raceway not less than 18 in. long to assure that the outer raceway termination will not provide access into the enclosure through the raceway, while preserving the principle use of the Exception. The requirement that the raceway not penetrate a structural ceiling is to prevent the spread of fire or products of combustion.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HARTWELL: I agree that entry to these enclosures from other directions is harmless; I opposed the original restriction during the course of panel discussions. I only assented to assure that the concept would enter the code in some way, which at the time was in doubt. Now that the allowance is in place, proposals such as this are pertinent to sort out, one by one, the merits of the various restrictions.

(Log #1511)

9- 60 - (373-5(c)): Reject
SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text as follows:
373.5 Cabinets, Cutout Boxes, and Meter Socket Enclosures. Conductors entering enclosures within the scope of this article shall be protected from abrasion and shall comply with (a) through (c).
...
(c) Cables. Where cable is used, each cable shall be secured to the cabinet, cutout box, or meter socket enclosure.
Exception: Cables with entirely nonmetallic sheaths shall be permitted to enter ~~the top of a surface mounted~~ an enclosure through one or more nonflexible raceways not less than 18 in. (457 mm) or more than 10 ft (3.05 m) in length, provided all the following conditions are met.
a. Each cable is fastened within 12 in. (305 mm), measured along the sheath, of the outer end of the raceway.
~~b. The raceway extends directly above the enclosure and does not penetrate a structural ceiling.~~
b.~~c.~~ A fitting is provided on each end of the raceway to protect the cable(s) from abrasion and the fittings remain accessible after installation.
c.~~d.~~ The raceway is sealed or plugged at the outer end using approved means so as to prevent access to the enclosure through the raceway.
d.~~e.~~ The cable sheath is continuous through the raceway and extends into the enclosure beyond the fitting not less than 1/4 in. (6.35 mm).
e.~~f.~~ The raceway is fastened at its outer end and at other points in accordance with the applicable article.
f.~~g.~~ Where installed as conduit or tubing, the allowable cable fill does not exceed that permitted for complete conduit or tubing systems by Table 1 of Chapter 9 of this Code, and all applicable notes thereto.
FPN: See Table 1 in Chapter 9, including Note 9, for allowable cable fill in circular raceways. See Section 310-15(b)(2)(a) for required ampacity reductions for multiple cables installed in a common raceway.
SUBSTANTIATION: The use of nonflexible raceway to provide physical protection for cable or to provide a passage through finished structure should not be limited to extending up only or entering through the top of the enclosure, as it is a common practice to go down or horizontally from these enclosures.
When the cable sheathing is stripped away for termination, the stress is the same as individual conductors used in typical raceway installations.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 9-59.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
HARTWELL: In this case the panel action is appropriate. Structural penetrations were never contemplated in this context.

(Log #608)

9- 61 - (373-5(c), Exception): Reject
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
RECOMMENDATION: Add the following to the beginning of the first sentence of the exception:
Exception: Feeder and Branch Circuit cables with entirely nonmetallic sheaths shall...
SUBSTANTIATION: This would clarify that service entrance (SE) conductors are not to be installed with the conductors permitted by this section, unless they are for feeder or branch circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 230-7 prohibits conductors, other than service conductors, in the same service raceway or service cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4376)

9- 62 - (373-5(c), Exception): Reject
SUBMITTER: Joseph A. Hertel, Safety and Buildings Div., State of Wisconsin
RECOMMENDATION: Revise as follows:
Exception: Cables with entirely nonmetallic sheaths shall be permitted to enter the top of a surface-mounted enclosure through one or more nonflexible raceways not less than ~~18~~ 12 in. (~~457~~ 305 mm) or more than 10 ft (3.05 m) in length, provided all the following conditions are met.
SUBSTANTIATION: The State of Wisconsin has had a similar provision in the state supplement to the NEC for many years and it is only the minimum raceway length that differs. A 12 inch raceway length allows this provision to be used almost universally in one and two family dwellings for branch circuits to the service panel in the basement area. A 12-inch length from the top of the service panel places the raceway opening between the joists where the cables may be fastened. The use of an 18-inch length, in many installations, places the raceway opening in close proximity to the underside of the floor and restricts the cable installation and proper fastening of the cables.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception permits top entry through a raceway not less than 18 in. long to assure that the upper raceway termination will not provide access into the enclosure through the raceway. While preserving the principle use of the exception, it provides safe and consistent installation requirements for the common practice of using raceway sleeves for nonmetallic sheathed cables entering panelboards and the like.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
NEGATIVE: 3
EXPLANATION OF NEGATIVE:
HARTWELL: I agree with the substantiation. Twelve inches is long enough to assure that the nipple isn't being used as a giant cable connector, and the cable securement rules at its outer end remain applicable.
LeMAY: There is no reason not to consider using a nonflexible raceway length of 12 in. The submitter of this proposal provides reasonable substantiation and a solution to a real installation problem. The mandate of a sleeve to be 18 in. long to eliminate the entry of foreign material into the enclosure being served, as the panel statement suggests, can be equally accomplished using a 12 in. sleeve, while allowing for acceptable clearances from the underside of the floor and other structural framing. I believe lengths shorter than 12 in. will threaten the "secured to the..." and the "Openings to be closed" rules(s).
WELNAK: This proposal should be accepted. I agree with the submitter. A 12 in. raceway length allows this provision to be used almost universally in one and two family dwellings for branch circuits to the service panel in the basement area. A 12 in. length from the top of the service panel places the raceway opening between the joists where the cables may be fastened. The use of an 18 in. length, in many installations, places the raceway opening in close proximity to the underside of the floor and restricts the cable installation and proper fastening of the cables.

(Log #317)

9- 63 - (373-5(c), Exception (h)-(New); 373-5(c) FPN): Reject
SUBMITTER: Roy D. Broderson, Washington State Labor and Industries
RECOMMENDATION: Add to 373-5(c) exception, a new subsection (h) to read as follows:
(h) Where multiple cables are installed in a raceway longer than 24 in. see Section 310-15(b)(2)(a) for required ampacity reductions.
Delete FPN following 373-5(c).

SUBSTANTIATION: Section 373-5(c) Exception (g), makes first sentence of FPN redundant.
New Section 373-5(c) Exception (h) will put in positive text, the second sentence of FPN.
PANEL ACTION: Reject.
PANEL STATEMENT: Clause (g) of the exception to Section 373-5(c) is written in the style of the preceding clauses, and correctly references Table 1 of Chapter 9. The Fine Print Note provides additional reference material to the user.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #541)

9- 64 - (Table 373-6(a)): Accept in Principle
NOTE: The Technical Correlating Committee understands that the title of the table is as stated in the recommendation of the Proposal. The Technical Correlating Committee directs the Panel to clarify their action relative to the Notes to the Table. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 373-6(a) to add metric conversions as follows:

Table 373-6(a). Minimum Wire-Bending Space at Terminals and Minimum Width of Wiring Gutters ~~in Inches~~

Wire Size (AWG or kcmil)	Wires per Terminal 1 mm	1 in.	2 mm	2 in.	3 mm	3 in.	4 mm	4 in.	5 mm	5 in.
14–10	Not specified		—		—		—		—	
8–6	38	1 1/2	—		—		—		—	
4–3	50	2	—		—		—		—	
2	65	2 1/2	—		—		—		—	
1	75	3	—		—		—		—	
1/0 – 2/0	90	3 1/2	125	5	175	7	—		—	
3/0 – 4/0	100	4	150	6	200	8	—		—	
250	115	4 1/2	150	6	200	8	250	10	—	
300–350	125	5	200	8	250	10	300	12	—	
400–500	150	6	200	8	250	10	300	12	350	14
600–700	200	8	250	10	300	12	350	14	400	16
750–900	200	8	300	12	350	14	400	16	450	18
1000–1250	250	10	—		—		—		—	
1500–2000	300	12	—		—		—		—	

Notes~~:~~
~~1. For SI Units, 1 in. = 25.4 mm.~~
~~2.~~ Bending space at terminals shall be measured in a straight line from the end of the lug or wire connector (in the direction that the wire leaves the terminal) to the wall, barrier, or obstruction.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
Use soft conversions throughout, as follows:

Wire Size (AWG or kcmil)	Wires per Terminal 1 mm	1 in.	2 mm	2 in.	3 mm	3 in.	4 mm	4 in.	5 mm	5 in.
14–10	Not specified		—		—		—		—	
8–6	38.1	1 1/2	—		—		—		—	
4–3	50.8	2	—		—		—		—	
2	63.5	2 1/2	—		—		—		—	
1	76.2	3	—		—		—		—	
1/0 – 2/0	88.9	3 1/2	-		-		—		—	
3/0 – 4/0	102	4	127	5	-		—		—	
250	114	4 1/2	152	6	203	8	-		—	
300–350	127	5	152	6	203	8	3254	10	—	
400–500	152	6	203	8	254	10	305	12	-	
600–700	203	8	203	8	254	10	305	12	456	14
750–900	203	8	254	10	305	12	356	14	406	16
1000–1250	254	10	305	12	356	14	406	16	457	18
1500–2000	305	12	—		—		—		—	

PANEL STATEMENT: The panel has modified the proposal to use soft conversions throughout because hard conversions could inadvertently jeopardize the continuing viability of present equipment designs.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #542)

9- 65 - (Table 373-6(b)): Accept in Principle

Note: The Technical Correlating Committee understands that the title of the table is as stated in the Recommendation of the Proposal. The Technical Correlating Committee directs the Panel to clarify their action relative to the notes to the table. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Table 373-6(b) to add metric conversions as follows:

Table 373-6(b). Minimum Wire-Bending Space at Terminals ~~in Inches~~

Wire Size (AWG or kcmil)	Wires per Terminal 1 mm	1 in.	2 mm	2 in.	3 mm	3 in.	4 or More mm	4 or More in.
14–10	Not specified		—	—	—	—	—	—
8	38	1 1/2	—	—	—	—	—	—
6	50	2	—	—	—	—	—	—
4	75	3	—	—	—	—	—	—
3	75	3	—	—	—	—	—	—
2	90	3 1/2	—	—	—	—	—	—
1	115	4 1/2	—	—	—	—	—	—
1/0	140	5 1/2	140	5 1/2	175	7	—	—
2/0	150	6	150	6	190	7 1/2	—	—
3/0	165 a	6 1/2 a	165 a	6 1/2 a	200	8	—	—
4/0	175 b	7 b	190 c	7 1/2	215 a	8 1/2 a	—	
250	215 d	8 1/2 d	215 d	8 1/2 d	225 b	9 b	250	10
300	250 e	10 e	250 d	10 d	275 b	11 b	300	12
350	300 e	12 e	300 e	12 e	325 e	13 e	350 d	14 d
400	325 e	13 e	325 e	13 e	350 e	14 e	375 e	15 e
500	350 e	14 e	350 e	14 e	375 e	15 e	400 e	16 e
600	375 e	15 e	400 e	16 e	450 e	18 e	475 e	19 e
700	400 e	16 e	450 e	18 e	500 e	20 e	550 e	22 e
750	425 e	17 e	475 e	19 e	550 e	22 e	600 e	24 e
800	450	18	500	20	550	22	600	24
900	475	19	550	22	600	24	600	24
1000	500	20	—	—	—	—	—	—
1250	550	22	—	—	—	—	—	—
1500	600	24	—	—	—	—	—	—
1750	600	24	—	—	—	—	—	—
2000	600	24	—	—	—	—	—	—

Notes:

~~For SI units, 1 in. = 25.4 mm.~~

1. ~~2.~~ Bending space at terminals shall be measured in a straight line from the end of the lug or wire connector in a direction perpendicular to the enclosure wall.

2. ~~3.~~ For removable and lay-in wire terminals intended for only one wire, bending space shall be permitted to be reduced by the amount ~~number of inches~~ shown below ~~in parentheses.~~

(a) 13 mm (1/2 in.)
(b) 25 mm (1 in)
(c) 38 mm (1-1/2 in.)
(d) 50 mm (2 in.)
(e) 75 mm (3 in.)

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
Use soft conversions throughout, as follows:

Wire Size (AWG or kcmil)	Wires per Terminal 1 mm	1 in.	2 mm	2 in.	3 mm	3 in.	4 or More mm	4 or More in.
14–10	Not specified		—	—	—	—	—	—
8	38.1	1 _	—	—	—	—	—	—
6	50.8	2	—	—	—	—	—	—
4	76.2	3	—	—	—	—	—	—
3	76.2	3	—	—	—	—	—	—
2	88.9	3 1/2	—	—	—	—	—	—
1	114	4 1/2	—	—	—	—	—	—
1/0	140	5 1/2	140	5 1/2	178	7	—	—
2/0	152	6	152	6	190	7 1/2	—	—
3/0	165 a	6 1/2 a	165 a	6 1/2 a	203	8	—	—
4/0	178 b	7 b	190 c	7 _ c	216 a	8 1/2 a	—	
250	216 d	8 1/2 d	229 b	9 b	254	10	254	10
300	254 e	10 e	254 d	10 d	279 b	11 b	305	12
350	305 e	12 e	305 e	12 e	330 e	13 e	356 d	14 d
400	330 e	13 e	330 e	13 e	356 e	14 e	381 e	15 e
500	356 e	14 e	356 e	14 e	381 e	15 e	406 e	16 e
600	381 e	15 e	406 e	16 e	457 e	18 e	483 e	19 e
700	406 e	16 e	457 e	18 e	508 e	20 e	559 e	22 e
750	432 e	17 e	483 e	19 e	559 e	22 e	610 e	24 e
800	457	18	508	20	559	22	610	24
900	483	19	559	22	610	24	610	24
1000	508	20	—	—	—	—	—	—
1250	559	22	—	—	—	—	—	—
1500	610	24	—	—	—	—	—	—
1750	610	24	—	—	—	—	—	—
2000	610	24	—	—	—	—	—	—

Notes:
1. (unchanged)
2. (unchanged, except reduction values, as follows:)
(a) 12.7 mm (1/2 in.)
(b) 25.4 mm (1.0 in)
(c) 38.1 mm (1-1/2 in.)
(d) 50.8 mm (2 in.)
(e) 76.2 mm (3 in.)

PANEL STATEMENT: The panel has modified the proposal to use soft conversions throughout because hard conversions could inadvertently jeopardize the continuing viability of present equipment designs.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
DEMING: I agree with the panel action, but question which Table 373-6(b) will appear in the new edition of the code. Hopefuly, it will be the table appearing in the present (1999) edition of the code with the English measurements converted to Metric. I do not believe it is the panel's intent to use the table appearing with the proposal which begins with the words: "use soft conversions throughout as follows."

(Log #2241)

9- 66 - (Table 373-6(b)): Accept

NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 9-65. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

Table 373-6(b). Minimum Wire-Bending Space at Terminals in Inches

Wire Size (AWG or kcmil)		Wires per Terminal									
		1		2		3		4 or More	
All Other Compact Conductors	Stranded AA-8000 Aluminum Alloy Conductors (See Note 4)								
14–10	12-8			Not specified		—		—	—
8	6			1 1/2		—		—	—
6	4			2		—		—	—
4	2			3		—		—	—
3	1			3		—		—	—
2	1/0			3 1/2		—		—	—
1	2/0			4 1/2		—		—	—
1/0	3/0			5 1/2		5 1/2		7	—
2/0	4/0			6		6		7 1/2	—
3/0	250			6 1/2 (1/2)	6 1/2 (1/2)	8		—	
4/0	300			7 (1)		7 1/2 (1 1/2)		8 1/2 (1/2)	—
250	350			8 1/2 (2)	8 1/2 (2)	9 (1)	10		
300	400			10 (3)	10 (2)	11 (1)	12		
350	500			12 (3)	12 (3)	13 (3)	14 (2)		
400	600			13 (3)	13 (3)	14 (3)	15 (3)		
500	700-750	14	(3)	14 (3)	15 (3)	16 (3)			
600	800-900	15	(3)	16 (3)	18 (3)	19 (3)			
700	1000			16 (3)	18 (3)	20 (3)	22 (3)		
750				17 (3)	19 (3)	22 (3)	24 (3)		
800				18		20		22	24
900				19		22		24	24
1000				20		—		—	—
1250				22		—		—	—
1500				24		—		—	—
1750				24		—		—	—
2000				24		—		—	—

RECOMMENDATION: Revise Table 373-6(b) as follows:

Notes:

1. For SI units, 1 in. = 25.4 mm.
2. Bending space at terminals shall be measured in a straight line from the end of the lug or wire connector in a direction perpendicular to the enclosure wall.
3. *For removable and lay-in wire terminals intended for only one wire, bending space shall be permitted to be reduced by the number of inches shown in parentheses.*
4. *This column shall be permitted to determine the required wire bending space for compact stranded aluminum conductors in sizes up to 1000 kcmil and manufactured using AA-8000 series electrical grade aluminum alloy conductor material in accordance with 310-14.*

SUBSTANTIATION: New Information for this Proposal:

Key Points:

1. The proposal does not change the bending space requirements for all conductors.
2. The proposal does not affect negatively any existing products designed and manufactured in accordance with the current bending space requirements.
3. The proposal may actually increase the potential for applications of the existing products designed and manufactured in accordance with the current bending space requirements.
4. The proposal proposes adjustments to accommodate electrically equivalent sizes of compact stranded aa-8000 series aluminum alloy conductors.

(a) These conductor materials were recognized in the Code in 1981 for sizes up to No. 8 and then in 1984 for sizes up to 1000 kcmil.

(b) The work for the current bending space requirements was done in 1978.

(c) The data presented in the Fact Finding Report of 1978 for the Bending Space Report suggests that the compact stranded AA-8000 series aluminum alloy conductors manufactured commercially since early 1980's and today were not used in the study at that time. Unidirectional (or unilay) stranded compact conductors of aluminum alloys used today are smaller in diameter and more flexible than the reverse-lay stranded concentric conductors of aluminum used in the 1978 study.

Attached Fact Finding Study provides the necessary substantiation to the Panel so the proposed change can be accepted. It was initiated to provide a comparative data, in a manner consistent with the NEMA/UL Fact Finding Study (wire bending study) done for the 1981 NEC, Proposal No. 38 for Code-Making Panel 9, in the 1980 Technical Committee Report. Recommendation in this proposal has been edited for clarity purpose compared to the recommendation shown in the Fact Finding Report.

Results presented in this fact finding study support this proposal.

Background: See Proposal 9-77 and Comment 9-49 for 1999 NEC. See Appendix A of the attached Fact Finding Report.

Note: Supporting material available for review at NFPA Headquarters.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

HARTWELL: The panel action on this proposal needs to be correlated with the action on Proposal 9-65. At the time the CMP 9 Metrication Task Group reported, the panel had not acted on this proposal, and we failed to anticipate the effect on the notes, notes that this proposal modifies. It may be sufficient to renumber the proposed Note 4 as Note 3 (also in the body of the table), but that is an editorial judgment for the panel to make.

(Log #CP905)

9- 66a - (373-6(b)(1) and 373-6(b)(2)): Accept
SUBMITTER: CMP 9
RECOMMENDATION: Add a title to Section 373-6(b)(1) to read as follows:
"Conductors Not Entering or Leaving Opposite Wall."
Add a title to Section 373-6(b)(2) to read as follows:
"Conductors Entering or Leaving Opposite Wall."
SUBSTANTIATION: To comply with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1755)

9- 67 - (373-10(d) (New)): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Add new text to read as follows:
373-10. Material. Cabinets and cutout boxes shall comply with (a) through (c) below.
(a) Metal Cabinets and Cutout Boxes. Metal cabinets and cutout boxes shall be protected both inside and outside against corrosion.
(FPN): For protection against corrosion, see Section 300-6.
(b) Strength. The design and construction of cabinets and cutout boxes shall be such as to secure ample strength and rigidity. If constructed of sheet steel, the metal thickness shall not be less than 0.053 in. (1.35 mm) uncoated.
(c) Nonmetallic Cabinets. Nonmetallic cabinets shall be listed or they shall be submitted for approval prior to installation.
(d) Razor Sharp Edges. Metal cabinets and cutout boxes shall be designed installed and maintained that users, installers and maintenance personnel will not be likely to come into contact with razor sharp edges.
SUBSTANTIATION: Some equipment is manufactured or modified in the field that the installer or users of the equipment come into contact with razor sharp edges. Often cutting there fingers or hands. Some examples are punched or cut enclosures and knockouts that leave a razor sharp edge near the front of the enclosure that one has to reach over or by to work on or in the equipment. Please see similar proposal 110-15.
PANEL ACTION: Reject.
PANEL STATEMENT: Product standards provide requirements and tests for sharp edges. Problems should be directed to manufacturers or follow-up service departments of the various testing laboratories.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 374 — AUXILIARY GUTTERS

(Log #1296)

8- 439 - (374): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
374-2. Extension Beyond Equipment
An auxiliary gutter shall not extend a greater distance than 9 m (30 ft) ~~(9.14 m)~~ beyond the equipment that it supplements.
Exception: As permitted in Section 620-35 for elevators, an auxiliary gutter shall be permitted to extend a distance greater than 9 m (30 ft) ~~(9.14 m)~~ beyond the equipment that it supplements.
374-3 (a)
Sheet Metal Auxiliary Gutters. Sheet metal auxiliary gutters shall be supported throughout their entire length at intervals not exceeding 1.5 m (5 ft) ~~(1.52 m)~~.
374-3 (b)
Nonmetallic Auxiliary Gutters. Nonmetallic auxiliary gutters shall be supported at intervals not to exceed 900 mm (3 ft) ~~(914 mm)~~ and at each end or joint, unless listed for other support intervals. In no case shall the distance between supports exceed 3 m (10 ft) ~~(3.05 m)~~.
374-6. Ampacity of Conductors
(a) Sheet Metal Auxiliary Gutters. Where the number of current-carrying conductors contained in the sheet metal auxiliary gutter is 30 or less, the correction factors specified in Section 310-15(b)(2)(a) shall not apply. The current carried continuously in bare copper bars in sheet metal auxiliary gutters shall not exceed 1.55 amperes/mm2 (1000 amperes/in.2) ~~(645 mm2)~~ of cross section of the conductor. For aluminum bars, the current carried continuously shall not exceed 1.09 amperes/mm2 (700 amperes/in.2) ~~(645 mm2)~~ of cross section of the conductor.
374-7. Clearance of Bare Live Parts
Bare conductors shall be securely and rigidly supported so that the minimum clearance between bare current-carrying metal parts of different potential mounted on the same surface will not be less than 50 mm (2 in.) ~~(50.8 mm)~~, nor less than 25 mm (1 in.) ~~(25.4 mm)~~ for parts that are held free in the air. A clearance not less than 25 mm (1 in.) ~~(25.4 mm)~~ shall be secured between bare current-carrying metal parts and any metal surface. Adequate provisions shall be made for the expansion and contraction of busbars.
374-9 (b) Substantial Construction. Gutters shall be of substantial construction and shall provide a complete enclosure for the contained conductors. All surfaces, both interior and exterior, shall be suitably protected from corrosion. Corner joints shall be made tight, and where the assembly is held together by rivets, bolts, or screws, such fasteners shall be spaced not more than 300 mm (12 in.) ~~(305 mm)~~ apart.
374-9 (2) (a) (4) Have expansion fittings installed where the expected length change due to expansion and contraction due to temperature change is more than 6 mm (0.25 in.) (6.35 mm).
374-9 (2) (b) (2) Have expansion fittings installed where expected length change, due to expansion and contraction due to temperature change, is more than 1/2 in. (6.35 mm).
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.
In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.
In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #CP810)

8- 439a - (374-1): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 8
RECOMMENDATION: Revise as follows:
"374-1. Scope. This article covers the use, installation and construction requirements of metal auxiliary gutters and nonmetallic auxiliary gutters and associated fittings."
Renumber remaining sections accordingly.
SUBSTANTIATION: The panel action conforms with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1706)

8- 440 - (374-5(1)): Accept in Principle
SUBMITTER: Joseph E. York, Aurora Electric
RECOMMENDATION: Revise text as follows:
Sheet metal auxiliary gutters shall not contain more than 30 current-carrying conductors at any cross section unless complying with 374-5(4).

SUBSTANTIATION: To help clarify the sentence. Sheet metal auxiliary gutters shall not contain more than 30 current-carrying conductors at any cross section. This sentence is too direct.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are adequately covered by the panel's action on Proposal 8-442.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #873)

8- 441 - (374-5(4)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
(4) ~~Where the 20 percent fill specified in (3) is not exceeded and the derating~~ Derating factors specified in Section 310-15(b)(2)(a) shall not be required, but where they are ~~is~~ applied, the number of current-carrying conductors shall not be limited.
SUBSTANTIATION: Edit. The phrase "where the 20 percent fill specified in (3) is not exceeded" infers it may be exceeded though there is nothing to suggest (3) is not a hard and fast rule, therefore the phrase is extraneous. The wording also suggests the derating factors are not required but there is no specific wording to modify Section 310-15(b)(2)(a). Inference interpretation is not good Code.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are adequately covered by the panel's action on Proposal 8-442.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4219)

8- 442 - (374-5(a)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
(a) Sheet Metal Auxiliary Gutters. The sum of the cross-sectional areas of all contained conductors at any cross-section of a sheet metal auxiliary gutter shall not exceed 20 percent of the interior cross-sectional area of the sheet metal auxiliary gutter. The derating factors in Section 310-15(b)(2)(a) shall be applied only where the number of current-carrying conductors, including neutral conductors classified as current-carrying under the provisions of Section 310-15(b)(4), exceeds 30. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors.

~~The number of conductors permitted in a sheet metal auxiliary gutter shall be in accordance with (1) through (4).~~

~~1. Sheet metal auxiliary gutters shall not contain more than 30 current-carrying conductors at any cross section. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors.~~

~~2. As provided in Section 620-35 for elevators, the 30-conductor limitation shall not apply.~~

~~3. The sum of the cross-sectional areas of all contained conductors at any cross section of a sheet metal auxiliary gutter shall not exceed 20 percent of the interior cross-sectional area of the sheet metal auxiliary gutter.~~

~~4. Where the 20 percent fill specified in (3) is not exceeded and the derating factors specified in Section 310-15(b)(2)(a) is applied, the number of current-carrying conductors shall not be limited.~~

SUBSTANTIATION: This is an editorial simplification of a rule that has become more complex than it needs to be. The only real limit on fill is the 20 percent limitation. The opening statement about 30 conductors doesn't address fill, it addresses mutual conductor heating. The result is one paragraph to get us into trouble and another to get us back out by saying the putative opening limit ("not contain more than 30") isn't a real limit if you want to pay the derating penalty. It's much better to use one sentence to set out the physical limitation (20 percent), and then one sentence to say when you pay the derating penalty. I threw in the appropriate reference on when neutrals are current-carrying for clarity. Then I included the control circuit sentence, and that's it. A simple paragraph with three declarative sentences, written positively. The reference to elevator gutters now violates the Style Manual because Section 90-3 adequately addresses it, so I threw that out as well.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2316)

8- 443 - (374-5(a)(1)): Reject
SUBMITTER: Michael L. True, Abbott True Electric, Inc.
RECOMMENDATION: Revise text to read as follows:
(1) ~~Sheet metal auxiliary gutters shall not contain more than 30 current-carrying conductors at any cross section.~~ Conductors for signaling circuits or controller conductors between a motor and starter and used only for starting duty shall not be considered as current-carrying conductors. Fill shall be based on percentage of cross section with the most current-carrying conductors.
SUBSTANTIATION: Gutter fill has become an issue in serving meter centers. A 1000 amp three phase service made up of 3 sets of 400 kcmil wire will put 12 current-carrying conductors in the gutter. Six three phase services tapped in the gutter will add 24 current-carrying conductors for a total of 36 current-carrying conductors, a code infraction. Auxiliary gutter fill should be based on percentage of fill only.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel reaffirms that the number of current carrying conductors is permitted to exceed 30 provided that ampacity adjustment factors are applied. See panel action on Proposal 8-442.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #2319)

8- 444 - (374-5(a)(4)): Reject
SUBMITTER: Michael L. True, Abbott True Electric, Inc.
RECOMMENDATION: Revise text to read as follows:
(4) Where the 20 percent fill specified in (3) is not exceeded and the current-carrying conductors are not bundled ~~and the derating factors in Section 310-15(b)(2)(a) is applied~~ the number of current-carrying conductors shall not be limited.
SUBSTANTIATION: Table 310-15(b)(2)(a) is based on 40 percent conduit fill where the current-carrying conductors are "bundled". This should not apply to a sheet metal auxiliary gutter. The gutter allows the current-carrying conductors to be spread out over a larger area than a conduit, thus allowing heat to dissipate. Table 310-15(b)(2)(a) should not apply to a gutter that is 20 percent filled. The derating chart should apply to gutters and wireways that are over 20 percent filled.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate technical substantiation to remove the limitation on the number of conductors without applying the ampacity adjustment factors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

ARTICLE 380 — SWITCHES

(Log #543)

9- 68 - (380): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: a) Section 380-5 Exception: Replace "6 in. (152 mm)" with "150 mm (6 in.)".
b) Section 380-8(a): Replace "6 ft 7 in. (2.0 m)" with "2.0 m (6 ft 7 in.)".
c) Section 380-9(c): Replace "0.030 in. (0.762 mm)" with "0.76 mm (0.030 in.)"; Replace "0.040 in. (1.016 mm)" with "1.02 mm (0.040 in.)"; Replace "0.010 in. (2.54 mm)" with "2.54 mm (0.010 in.)" in 2 locations.
d) Section 380-10(a): Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
In part (a) of the recommendation, use a soft conversion, as follows: "152 mm (6.0 in.)". The panel accepts the remainder of the recommendations as presented. PANEL STATEMENT: The dimension in part (a) is a minimum safety requirement, reflected in relevant standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3323)

9- 69 - (380-2): Reject
SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.
RECOMMENDATION: Revise as follows:
... switches and outlets shall be in accordance with Section 300-20(a).
Where multi-conductor cable is employed for this purpose the provisions of Section 200-7(c)(2) shall apply.
SUBSTANTIATION: The recent change in the code requiring reidentification of the grounded conductor in switch loops is a radical departure from standard and established practice. Extra effort should be made to call attention to this change.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not believe that the cross-reference is necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3057)

9- 70 - (380-2(a)):
NOTE: The Technical Committee notes that the action on this Proposal received less than the two-thirds affirmative vote. It was the action of the Technical Correlating Committee that this action be reconsidered based on the comments expressed in the voting. This action will be considered by the Panel as a Public Comment..
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise text as follows:
Three-Way and Four-Way Switches. Three-way and four-way switches shall be wired so that all switching is done only in the ungrounded circuit conductor. Where in metal raceways or metal-armored cables, wiring between switches and outlets shall be in accordance with Section 300-20(a).
~~Exception: Switch loops shall not require a grounded conductor.~~
An insulated grounded circuit conductor shall be provided on all single pole and 3-way switch loops in residential and commercial installations when wired with cable systems.
SUBSTANTIATION: Many products are available today such as programmable controllers, timers, home automation switches, occupancy sensors, etc., and some of these devices may require a connection to a grounded circuit conductor. In some cases, grounded circuit conductors may be present in the device box; in other cases, where a switch loop is installed, a grounded circuit conductor may not be present.
During replacement or retrofit of a standard wall switch, some installers have made an improper connection to a grounding conductor. This proposal addresses that impropriety.
Section 90-3 of the NEC identifies the Introduction as part of the Code and within the Introduction in 90-8 future expansion and convenience is identified as a necessary provision.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 90-1(b) does not provide for future adequacy of the wiring system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
DEMING: The panel should have accepted this proposal. During the 1999 code cycle, the panel recognized the inherent danger of using the grounding conductor as a grounded circuit conductor. During the public comment period, some of the panel members changed their position because of the far-reaching ramifications this requirement would have created.
This proposal now limits the requirement to single pole and three-way switch loops in residential and commercial installations when wired with cable systems. To my knowledge there are no accessories or retrofit kits available to get a grounded circuit conductor into an enclosure at a later date when the wiring method originally used was a cable system.
HIDAKA: This proposal should be accepted. As the use of electronic switching devices has increased, the need for a grounded circuit conductor at each switch outlet is becoming a necessity. The addition of a grounded circuit conductor will allow electronic switching devices to be installed at any time during the life of the building without encouraging the practice of using the equipment grounding conductor as an inappropriate grounded circuit conductor path.
LeMAY: I believe that if a "switch loop" wiring method is employed, the grounded circuit conductor should be brought from the lighting outlet to the first control device outlet box.
While complications are introduced by requiring the grounded circuit conductor at 3-way and 4-way devices, it should not preclude the grounded circuit conductor from at least being installed to the first control point.
Section 90-1(b) FPN specifically states that hazards can occur by not providing for increases in the use of electricity. An end user installing a device requiring a grounded circuit conductor or installing a utilization equipment requiring additional control is an increase in the use of electricity.
REED: Use of electronic switching devices has increased, and many of these devices use the grounded circuit conductor for thier circuitry power. The addition of a grounded circuit conductor in the switching circuits will eliminate having the occupant use the equipment grounding conductor when the grounded conductor is not present. This will improve safety in today's applications.

(Log #4003)

9- 71 - (380-2(c) (New)): Accept in Principle
SUBMITTER: James T. Dollard, Jr., IBEW Local Union 98/Rep. IBEW Eastern Code Advisory Group
RECOMMENDATION: Add the following text:
380-2(c) Occupancy Sensors. Occupancy sensors used as switches shall disconnect all ungrounded conductors when in the "OFF" position.
SUBSTANTIATION: This proposal attempts to remove a serious shock hazard which is presently permitted by the NEC. This proposal is directed to the members of Panel 9 and Article 380 due to the fact that in the 1999 cycle, Panel 2 voted to hold comments on Proposal 2-250 and the TCC directed that this issue go to Panel 9 in the 2002 cycle. This proposal addresses the use of occupancy sensors as permitted in 210-70(a)(1), Exception No. 2.
Section 210-70(a)(1), Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to wall switches or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.
This exception permits an occupancy sensor in addition to a wall switch or in place of a switch provided the sensor is equipped with a manual override that will allow the sensor to function as a wall switch. In order to function as a wall switch, the OFF position should disconnect all ungrounded conductors. When in the OFF position occupancy sensors DO NOT DISCONNECT THE UNGROUNDED CONDUCTORS. This is presently permitted by the NEC. These devices are listed and in the OFF position do not mean a no voltage situation. The manufacturers of these devices acknowledge that OFF no longer means OFF. The manufacturers state that the maximum amount of current that could flow is well below the let go level and therefore does not present a serious danger. Tell that to the homeowner or even an electrician working a fixture with the switch in the OFF position that receives a shock resulting in a fall that causes serious injury or even death.
Upon the removal of a single fixture or the last fixture where multiple fixtures are installed full voltage is present with the device in the OFF position. A switch in any type of installation that has an OFF position should disconnect all ungrounded conductors! OFF must mean a no voltage situation!
If occupancy sensors installed as a SWITCH in accordance with the NEC are permitted to have an OFF position that does not mean that all ungrounded conductors have been disconnected,

then perhaps we should include in Article 100 a definition for the word OFF that simply says "check with the manufacturer."
I have submitted with this proposal copies of Proposal 2-250 and Comments 2-139, 2-140, 2-141, and 2-142.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 9-88a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4470)

9- 72 - (380-2(c) (New)): Reject
SUBMITTER: Gordon E. Berg, W. St. Paul, MN
RECOMMENDATION: Add new paragraph (c) to read as follows:
(c) The ungrounded screws on 15 and 20 amp switches shall be covered or protected before the switch is installed in a metal electrical box.
SUBSTANTIATION: The screws on 15 and 20 amp switches should be covered before securing them in a metal electrical box. This additional protection would prohibit strands of wire or an uncentered switch from coming in contact with the grounded edge of an electrical box and also avoid the danger of exposed screws should the plates ever come off or break.
PANEL ACTION: Reject.
PANEL STATEMENT: The designs of the switches and boxes are such that the screw will not contact the box after assembly. Proper faceplates should be provided in accordance with Sections 380-9 and 370-25. Use of stranded wire on terminal screws is a workmanship issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11COMMENT ON AFFIRMATIVE:
DEMING: I agree with the panel action, but want to add the following to the panel statement: "Unused terminal screws should be tightened into the device and not left in their most outward position."
HARTWELL: The stranded wire issue is valid, but not addressable here. It should be addressed in Section 110-14, through additional wording substantially as follows: "Where stranded conductors are terminated on and not looped through such terminals, the terminals shall be identified for such use, or the strands at the terminals shall be made solid."
Surprisingly, it isn't a violation of any listing requirement to use side-wired devices with stranded wire. Normally such devices are used without problems for residential applications with solid wire, but nothing restricts them to such applications. Present product standards don't adequately address the near impossibility of back-wrapping 19-stranded conductors under a screw head, especially on lower quality devices. Take receptacles, for example. At present UL 498 appears to have no testing protocol to adequately assure the containment of stranded wires on binding screw lugs. Paragraph 12.5 simply parrots the present NEC rule under discussion here.
Conductors looping through devices are okay because insulation on both sides of the skinned section of wire contains the strands. If necessary, a little work with a soldering tool quickly makes a solid conductor out of a stranded one. A number of highly qualified individuals have discussed the problem with the standard privately, pointing to the issue of stranding characteristics. They were referring to the fact that the standed was drawn at a time when the stranded conductors typically used with these devices, if stranded wire were ever actually used, would be 7-strand instead of today's 19-strand conductors, which makes the problem even worse today. NEMA and UL should stop stonewalling this type of proposal in CMP 1.

(Log #874)

9- 73 - (380-3 Exception No. 1): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
Exception No. 1: ~~Pendant and surface type snap switches and~~ Knife switches mounted on an open-face switchboard or panelboard shall be permitted without enclosures.
SUBSTANTIATION: Pendant type and surface type snap switches generally have enclosures as part of the listed device though the enclosures may be different than those for switches and circuit breakers of the rule.
PANEL ACTION: Reject.
PANEL STATEMENT: Installation of pendant and suface type snap switches with enclosures are not precluded by this article.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #331)

9- 74 - (380-4): Reject
SUBMITTER: Richard L. Miell, Otero County, CO
RECOMMENDATION: 380-4. Wet Locations
A switch or circuit breaker in a wet location or outside of a building shall be enclosed in a weatherproof enclosure or cabinet that shall comply with Section 373-2(a). Switches shall not be installed within the Bathtub and Shower Zone, unless installed as a part of a listed tub or shower assembly.
SUBSTANTIATION: Over the years we have seen additional rules for this area around and above tubs and shower stalls. The current rule uses vague language to identify the space where switches are not allowed. This change will properly identify the zone, as defined in Article 100, and make the use of switches in this zone a violation, just like a receptacle or a light fixture.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing code is clear. A bathtub and shower zone is not defined in Article 100 of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4220)

9- 75 - (380-6(c)): Accept in Principle in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Connection of Switches. Single-throw knife switches and bolted pressure contact switches ~~with butt contacts~~ shall be connected so that the blades are de-energized when the switch is in the open position. Single-throw knife switches, molded-case switches, switches with butt contacts, and circuit breakers used as switches shall be connected so that the terminals supplying the load are de-energized when the switch is in the open position.
SUBSTANTIATION: This corrects an error in this submitter's original proposal which went undetected throughout the process, only coming to light when I was working on my 1999 NEC analysis. Butt contact switches don't have knives; what was intended for the first sentence was bolted pressure contact switches that do. The butt-contact design properly appears in the second sentence.
PANEL ACTION: Accept in Principle in Part.
Revise the wording of the proposal to read as follows:
"Single-throw knife switches, bolted pressure contact switches, and switches with butt contacts shall be connected so that the blades are de-energized when the switch is in the open position. Single-throw knife switches, bolted pressure contact switches, molded case switches, switches with butt contacts, and circuit breakers used as switches shall be connected so that the terminals supplying the load are de-energized when the switch is in the open position."
PANEL STATEMENT: It is equally important that the blades of bolted pressure contact switches be de-energized when the switch is in the open position, and that the terminals supplying the load are de-energized when the switch is in the open position.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3267)

9- 76 - (380-6(c), Exception): Accept
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise the 380-6(c) Exception with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

Exception: The blades and terminals supplying the load of a switch shall be permitted to be energized when the switch is in the open position where the switch is connected to circuits or equipment inherently capable of providing a backfeed source of power. For such installations, a permanent sign shall be installed on the switch enclosure or immediately adjacent to open switches ~~that reads:~~ with the following words or equivalent:

WARNING - LOAD SIDE TERMINALS MAY BE ENERGIZED BY BACKFEED.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #875)

9- 77 - (380-7): Accept in Principle

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise first paragraph:

"General-use and motor circuit switches and circuit breakers, where mounted in an enclosure as described in Section 380-3, and molded-case switches, shall clearly indicate whether they are in the open "off" or closed "on" position.

SUBSTANTIATION: Edit. Molded-case switches should also warrant the requirement.

PANEL ACTION: Accept in Principle.

Revise the existing code text to read as follows:

"General-use and motor-circuit switches, circuit breakers, and molded case switches, where mounted...".

PANEL STATEMENT: The revised wording meets the intent of the submitter, and editorially rearranges the order of the terms.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #368)

9- 78 - (380-8 Exception No. 2): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 11 for information.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add:

where there is compliance with Section 430-107.

SUBSTANTIATION: Proposal would clarify that Section 430-107 is not abrogated by this section, if that is the intent.

PANEL ACTION: Reject.

PANEL STATEMENT: These provisions extend to many other applications outside of Article 430. The relationship between Section 430-107 and this section must be addressed by Code-Making Panel 11 within Article 430.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #876)

9- 79 - (380-8 Exception No. 2 and (b)): Accept in Principle

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Exception No. 2: Switches and circuit breakers installed adjacent to motors, appliances, or other equipment that they supply shall be permitted to be located higher than specified in the foregoing and to be accessible by portable means.

(b) Voltage Between Adjacent Switch(es) or Other Devices. A snap switch~~es~~ shall not be grouped or ganged in enclosures with other snap switches, receptacles, or other devices unless they ~~can be~~ are arranged so that the voltage between adjacent ~~switches~~ devices does not exceed 300, or unless they are installed in enclosures equipped with permanently installed barriers between adjacent ~~switches~~ devices.

SUBSTANTIATION: Circuit breakers should be included in Exception No. 2 since switches with fuses are permitted by Section 240-24(a)(4), and that section implies circuit breakers are permitted.

Switches on 277 volt circuits may also be installed in enclosures adjacent to receptacles on 120 volt circuits where the voltage difference can exceed 300. The hazard of such exposed terminals is just as great regardless of the type of device.

The phrase "can be arranged" does not invoke a rule, only a possibility.

PANEL ACTION: Accept in Principle.

Revise (b) of the proposal to read as follows:

"(b) Voltage Between Adjacent Switch(es). A snap switch shall not be grouped or ganged in enclosures with other snap switches, receptacles, or similiar devices unless they are arranged so that the voltage between adjacent devices does not exceed 300 volts, or unless they are installed in enclosures equipped with permanently installed barriers between adjacent devices."

PANEL STATEMENT: The panel wishes to assure that the restriction is not applied to motor starter control circuits and the like.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #28)

9- 80 - (380-8(a) Exception No. 2): Accept

NOTE: The following proposal consists of Comment 9-58 on Proposal 9-90 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 9-90 was:

Add text at the end to read:

Switches installed adjacent to motors, appliances, or other equipment that they supply shall be permitted to located higher than specified in the foregoing if readily accessible from the platform installed for service of equipment and accessible by portable means.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Accept in Principle revised as follows:

Switches and circuit breakers installed adjacent to motors, appliances, or other equipment that they supply shall be permitted to be located higher than specified in the foregoing ~~if readily accessible from the platform installed for the service of equipment~~ and to be accessible by portable means.

SUBSTANTIATION: Clarification. Section 240-24 Exception No. 4 permits overcurrent devices (circuit breakers) to be accessible by portable means. The text and Exception No. 1 indicate circuit breakers are technically not the same as switches. If circuit breakers are specifically noted, it would eliminate confusion and enhance the user friendly concept.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #369)

9- 81 - (380-9): Accept in Part

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise 380-9 to read as follows:

380-9. Provisions for General use Snap Switches ~~Faceplates.~~

(a) ~~Position~~ Faceplates. Faceplates provided for snap ~~Snap~~ switches mounted in boxes and other enclosures shall ~~have faceplates~~ be installed so as to completely cover the opening, and where the switch is flush-mounted, seat against the finish surface:

(b) Grounding. Snap switches with metal yokes, including dimmer switches shall be effectively grounded and provide a means to ground metal faceplates, whether or not a metal faceplate is installed. Snap switches shall be considered effectively grounded if either of the following conditions ~~are~~ is met.

(1) The switch is mounted with metal screws to a grounded metal box or other enclosure or to a nonmetallic box or other enclosure with integral means for grounding ~~devices~~ the switch.

(2) No change.

Snap switches with nonmetallic yokes shall be permitted where provided with a faceplate of insulating material.

Exception to (b): Where no grounding means exists within the snap switch enclosure, ~~or where the wiring method does not include or provide an equipment ground,~~ a snap switch ~~without a grounding connection~~ with a metal yoke shall be permitted for replacement purposes only, ~~A snap switch wired under the provisions of this exception~~ and where located within reach of earth grade, conducting floors or other conducting surfaces shall be provided with a faceplate of ~~nonconducting, noncombustible~~ insulating material. The faceplate mounting screws shall be nonmetallic.

SUBSTANTIATION: Snap switches have many forms; it appears this section is intended to apply to general-use type defined in Article 100 and as covered in Section 380-14. The requirements should apply to enclosures other than boxes only, such as cabinets, surface wireways, and enclosures covered in Section 336-21 for exposed Type NM cable. Since a switch plate for a surface-mounted box may be considered by some to be a faceplate, the requirement to seat against the surface is modified to apply to flush switches.

The grounding provisions of (b) in effect disallow the use of switches with nonmetallic yokes for which grounding is not needed and not practically feasible. Some forms of these switches have nonconducting faceplates which snap on without the use of screws. Where limited to use with insulating plates there is nothing to be energized. Various sections of the code permit insulation as an alternative to grounding.

The metal box of (b)(1) should be specified as grounded since that is the intent, but not literally required.

The literal wording of the exception indicates a switch that does have a grounding termination is not suitable as a replacement. The reference to wiring method is superfluous as it is covered by "where no grounding means exists". Earth grade, which may not be equated as a conducting surface, and metal faceplate mounting screws can also contribute to potential shock hazard.

"Nonconducting" and "noncombustible" are somewhat superfluous since those requirements are generally part of listing standards for nonmetallic faceplates and covered in (c) and Section 410-56(d).

PANEL ACTION: Accept in Part.

1. The panel accepts the proposed change to the title of Section 380-9.
2. The panel accepts all of the changes in 380-9(a) as submitted.
3. The panel accepts the words "earth, grade," in the proposed Exception which would modify the existing code text to add "earth, grade," after "within reach of" and before "conducting floors".
4. The panel rejects the remainder of the proposal.

PANEL STATEMENT: The remainder of the proposal is rejected because it would allow snap switches to be installed in a manner that would not assure the grounding of a metal faceplate. The proposed action would directly counteract the intent of Code-Making Panel 9 in making the changes to this section in the 1999 code cycle.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #287)

9- 82 - (380-9(b)): Reject

SUBMITTER: J. Michael Scott, Three Forks, MT

RECOMMENDATION: Delete the following:

~~380-9.(b) Grounding. Snap switches, including dimmer switches shall be effectively grounded and shall provide a means to ground metal faceplates, whether or not a metal faceplate is installed. Snap switches shall be considered effectively grounded if either of the following conditions are met.~~

~~(1) Delete~~

~~(2) Delete~~

~~Exception 4 to (b): Delete.~~

SUBSTANTIATION: This provision is not required for safety.

PANEL ACTION: Reject.

PANEL STATEMENT: The provisions were fully substantiated during the 1999 cycle. The proposal lacks any technical substantiation to remove them.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4330)

9- 83 - (380-9(b)): Accept in Principle

SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services

RECOMMENDATION: In the first line after dimmer switches add fan speed control switches. Revise the last sentence to read as follows: Snap switches, dimmer switches, and fan speed control switches...

SUBSTANTIATION: The same potential hazard exists with installations of fan speed control switches. These devices should also be effectively grounded.

PANEL ACTION: Accept in Principle.

Revise existing Section 380-9(b) to read as follows:

"Snap switches, including dimmer and similiar control switches, shall be...".

PANEL STATEMENT: This change satisifies the intent of the submitter and includes other similiar control switches.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3324)

9- 84 - (380-9(b)(2)): Reject

SUBMITTER: Paul E. Phelan, Rep. New Hampshire Electrical Contractors Assn.

RECOMMENDATION: Revise as follows:

(2) An equipment grounding conductor or equipment bonding jumper is connected to an equipment grounding termination of the snap switch. The grounding conductor shall not be required to be larger than No. 14.

SUBSTANTIATION: The use of No. 12 or No. 10 for a grounding conductor for a faceplate (flush plate) is absurd.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal violates Section 250-122.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4460)

9- 85 - (380-9(c)): Reject

SUBMITTER: David E. Shapiro, Safety First Electrical Contracting Consulting, and Safety Education

RECOMMENDATION: Delete this subdivision of the section.

SUBSTANTIATION: This material addresses a factory standard, not field selection, construction, or installation. With the code as lengthy as it is, such material should be left to ANSI and NRTLs, and addressed by Sections 110-2 and 110-3.

PANEL ACTION: Reject.

PANEL STATEMENT: The approach is consistent with the provisions of Sections 370-40 and 370-41. The panel believes some construction rules must remain within reach of a consensus based standard, and chooses to leave this material in the code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #286)

9- 86 - (380-12): Reject

SUBMITTER: J. Michael Scott, Three Forks, MT

RECOMMENDATION: Revise text:

"Metal boxes for switches shall be effectively grounded. ~~Nonmetallic boxes for switches shall be installed with a wiring method that provides or includes an equipment ground.~~"

SUBSTANTIATION: Provision not required for safety.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirement for a wiring method that provides or includes an equipment gound is necessary to meet the requirements of Section 380-9 for grounding of snap switches and metal faceplates.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP907)

9- 86a - (380-12): Accept
SUBMITTER: CMP 9
RECOMMENDATION: Revise Section 380-12 to read as follows:
"Metal enclosures for switches or circuit breakers shall be grounded as specified in Article 250. Where nonmetallic enclosures are used with metal raceways or metal-armored cables, provision shall be made for grounding continuity. Except as covered in Section 380-9(b) Exception, nonmetallic boxes for switches shall be installed with a wiring method that provides or includes an equipment ground."
SUBSTANTIATION: This wording eliminates a redundant sentence and corrects a correlation difficulty with the existing allowance in Section 380-9(b) Exception.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #304)

9- 87 - (380-14): Reject
SUBMITTER: Bruce Wardell, Jr., Belway Electric
RECOMMENDATION: Add new text to 380-14 to read as follows:
Installation of an insulating, nonconductive, protective (rubber) device shall be required over the termination screws of the switch.
SUBSTANTIATION: This will prevent accidental short circuit or shock to the electrician or others when removing or aligning energized switches.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action and statement on Proposal 9-72. The code is not intended to reduce the risk of people working in an unsafe manner.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP906)

9- 87a - (380-14(d)(1) and 380-14(d)(2)): Accept
SUBMITTER: CMP 9
RECOMMENDATION: Add a title to Section 380-14(d)(1) to read as follows:
"Noninductive Loads."
Add a title to Section 380-14(d)(2) to read as follows:
"Inductive Loads."
SUBSTANTIATION: To comply with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1920)

9- 88 - (380-14(e) (New)): Accept in Principle
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Add text to read as follows:
(e) Dimmer switches. General use dimmer switch shall only be used to control permanently installed incandescent lighting fixtures unless otherwise listed for control of other loads and stated in the individual listing.
SUBSTANTIATION: Although the listing and installation instructions for general use dimmer switches is specific and information in the UL green book carries this information, this continues to be an issue for many because it does not appear as a mandatory requirement in the NEC. This wording for this proposal was extracted from the UL white book 1998 edition, page 20. The product category is Dimmers, General Use Switch (EOYX). Discussions with both engineers and contractors at construction sites have raised the question when wanting to apply these dimmers in this manner. The comment was something to the effect that it does not appear anywhere in the Code. That is a true statement, however 110-3(b) does cover this indirectly. Inserting this new section in Article 380 should help eliminate these gray areas and improve safety.
PANEL ACTION: Accept in Principle.
Revised the proposed wording to read as follows:
" (e) Dimmer Switches. General use dimmer switches shall only be used to control permanently installed incandescent lighting fixtures unless listed for the control of other loads, and installed accordingly."
PANEL STATEMENT: Editorially revised for clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
CROUSHORE: The action on this proposal should be to reject. The submitter has not provided any technical substantiation of a problem existing in the field and this restriction is unnecessary. This new restriction will eliminate the receptacle-controlled table lamp on a dimmer switch.

(Log #CP901)

9- 88a - (380-15): Accept
SUBMITTER: CMP 9
RECOMMENDATION: Add an additional subsection to 380-15 to read as follows:
"380-15 Marking.
(a) Ratings. Switches shall be marked with the current and voltage and, if horsepower rated, the maximum rating for which they are designed.
(b) Off Indication. Where in the off postion, a switching device with a marked OFF position shall completely disconnect all ungrounded conductors to the load it controls."
SUBSTANTIATION: The panel believes this is a safety consideration, and addresses the issue of the "off" position disconnecting ungrounded conductors. This provides continuity with sections 422-33, 424-19(c), and 424-20(a).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2155)

9- 89 - (380-16): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Auxiliary contacts of a renewable or quick-break type or the equivalent shall be provided on all knife switches rated over 600 volts designed for use in interrupting ~~breaking~~ current over 200 amperes.
SUBSTANTIATION: The phrase "breaking current" should be replaced with the phrase "interrupting current" for consistency. CMP 1 has previously accepted a similar proposal. See A98 ROP 1-98a (Log #CP108).
PANEL ACTION: Reject.
PANEL STATEMENT: The word "breaking" is correct in the context of Section 380-16 and is consistent with auxiliary contacts described as "quick-break" type. The word "break" is also used in product standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 384 — SWITCHBOARDS AND PANELBOARDS

(Log #544)

9- 90 - (384): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: a) Section 384-8(a): Replace "3 ft (914 mm)" with "900 mm (3 ft)".
b) Section 384-10: Replace "3 in. (76 mm)" with "75 mm (3 in.)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #29)

9- 91 - (384-3(a)(3), Exception): Reject
NOTE: The following proposal consists of Comment 9-64 on Proposal 9-103 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 9-103 was:
Revise Section 384-3(a) as shown:
(a) Conductors and Busbars on a Switchboard or Panelboard. Conductors and busbars on a switchboard or panelboard shall comply with (1), (2) and (3) as applicable.
(1) Location. Conductors and busbars shall be located as to be free from physical damage and shall be held firmly in place.
(2) Service Switchboards. In all service switchboards, the arrangement of components and any necessary barriers shall be such that no uninsulated ungrounded service busbar or service terminal will be exposed to inadvertent contact by persons servicing any load terminal. Barriers shall be placed in all service switchboards that will isolate the service busbars and terminals from the remainder of the switchboard.
(3) Same Vertical Section. Other than the required interconnections and control wiring, only those conductors that are intended for termination in a vertical section of a switchboard shall be located in that section.
Exception: Conductors shall be permitted to travel horizontally through vertical sections of switchboards where such conductors are isolated from busbars by a barrier.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in principle revised as following:
(a)(3) Exception: Conductors shall be permitted to ~~travel~~ be run horizontally through vertical sections of switchboards where such conductors are isolated from busbars by a barrier or by factory-installed insulation on the busbars.
SUBSTANTIATION: Insulated bus appears to provide suitable separation.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes the present code text is clear. The concept of factory-installed insulation on busbars has not been substantiated in this application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1503)

9- 92 - (384-3(e)): Reject
SUBMITTER: Larry D. Wendt, State of Idaho/Rep. I.A.E.I.
RECOMMENDATION: Revise text as follows:
384-3. Support and Arrangements of Busbars and Conductors.
(e) High Leg Marking. On a switchboard or panelboard supplied from a 4-wire, delta-connected system, where the midpoint of one phase winding is grounded, that phase busbar or conductor having the higher voltage to ground shall be durably and permanently marked by an outer finish that is orange in color, or by other effective means. See Section 110-15.
SUBSTANTIATION: High leg marking is a requirement that should be in Section 110-15 for requirements for electrical installations where it would apply to all types of installations instead of this location. It would also streamline and simplify the code for easier usage.
Please coordinate with proposals on Sections 110-15, 210-4(d), 215-8, 230-56, and 384-3(f).
PANEL ACTION: Reject.
PANEL STATEMENT: The addition of a cross-reference does not add any clarity to the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1504)

9- 93 - (384-3(f)): Reject
SUBMITTER: Larry D. Wendt, State of Idaho/Rep. I.A.E.I.
RECOMMENDATION: Revise text as follows:
384-3. Support and Arrangement of Busbars and Conductors.
(f) Phase Arrangement. The phase arrangement on 3-phase buses shall be A, B, C from front to back, top to bottom, or left to right, as viewed from the front of the switchboard or panelboard. The B phase shall be that phase having the higher voltage to ground on 3-phase, 4-wire, delta-connected systems. Other busbar arrangements shall be permitted for additions to existing installations and shall be marked.
Exception: Equipment within the same single section or multisection switchboard or panelboard as the meter on 3-phase, 4-wire delta-connected systems shall be permitted to have the same phase configuration as the metering equipment.
See Section 110-15.
SUBSTANTIATION: Phase arrangement is a requirement that should be in Section 110-15 for requirements for electrical installations where it would apply to all types of installations instead of this location. It would also streamline and simplify the code for easier usage.
Please coordinate with proposals on Sections 110-15, 210-4(d), 215-8, 230-56, and 384-3(e).
PANEL ACTION: Reject.
PANEL STATEMENT: The addition of a cross-reference does not add any clarity to the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1823)

9- 94 - (384-4 (New)): Accept in Principle
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, In
RECOMMENDATION: Add new text to read as follows:
384-4. Circuit Directory. All switchboard circuits and circuit modifications shall be legibly identified as to their purpose or use, at each switch on the front of the switchboard.
SUBSTANTIATION: This will provide a new rule that will ensure proper marking of circuits and strengthen the rule found in Section 110-22. This new rule will also make use of the NEC more friendly.
PANEL ACTION: Accept in Principle.
Delete the last sentence of existing Section 384-13.
Delete the existing Fine Print Note in Section 384-4 and revise to read as follows:
"384-4. Circuit Directory. All circuits and circuit modifications shall be legibly identified as to purpose or use on a circuit directory located on the face or inside of the panel door in the case of a panelboard, and at each switch on a switchboard."
PANEL STATEMENT: The revised wording meets the intent of the submitter and provides clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2256)

9- 95 - (384-4, FPN): Accept
SUBMITTER: Dale R. Deming, American Electric (Div of Thomas & Betts)
RECOMMENDATION: Delete the fine print note referring the reader to Section 110-26(f).
SUBSTANTIATION: CMP-9 agreed to put this FPN into the Code for one edition after the material was moved to Section 110-26(f) and Code Making Panel 1 was given jurisdiction over the installation requirements.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2229)

9- 96 - (384-9): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: Flame tested does not mean flame-retardant. Flame-retardant indicates the product has passed a flame test. There are different markings for different flame tests.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2230)

9- 97 - (384-9): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Revise to read:
An insulated conductor used within a switchboard shall ~~be listed, flame-retardant, and shall~~ be rated not less than the voltage applied to it and not less than the voltage applied to other conductors or busbars with which it may come in contact.
SUBSTANTIATION: Applicable requirements for listing and performance for conductors recognized in the Code and suitable for application in switchboard are covered elsewhere in the Code and the product standards for such products.
Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: The performance requirement should remain in the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #545)

9- 98 - (Table 384-10): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 384-10 to add metric conversions as follows:

Table 384-10. Clearance for Conductors Entering Bus Enclosure

Conductor	Minimum Spacing Between Bottom of Enclosure and Busbars, Their Supports, or Other Obstructions mm	in.
Insulated busbars, their supports, or other obstructions	200 ~~203~~	8
Noninsulated busbars	250 ~~254~~	10

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2336)

9- 99 - (384-11 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new section for overcurrent protection of switchboards as follows.
384-11 Overcurrent Protection. Switchboards shall be protected in accordance with Section 230-90.

SUBSTANTIATION: Presently there seem to be no clear rules for the protection of switchboards. Currently panelboards and motor control centers have clearly outlined manners in which they are to be protected, switchboards however, do not. This proposal would give clear guidance for the protection of this type of equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any documented instances of problems. Overcurrent protection requirements for switchboards within the Scope of Article 384 would be additional specific requirements to those in Article 240.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HARTWELL: The proposal should have been accepted in principle, revised to use comparable wording as presently exists in Section 384-13 for panelboards. The submitter correctly points to a gap in code coverage. The rule would be simple, to the effect of "Switchboards shall have a rating not less than the minimum feeder capacity required for the load computed in accordance with Part B or C of Article 220."
The panel would do well to remember that motor control centers are essentially a form of switchboard and Section 430-94 requires not just a board rating but actual overcurrent protection based on the common power bus.

(Log #4456)

9- 100 - (384-13): Reject
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting Consulting, and Safety Education
RECOMMENDATION: Revise as follows:
"... shall be durably marked with voltage and current ratings and number of poles and manufacturer's name or trademark and any installation instructions and restrictions, including both text and schematics used for this purpose, in such a manner as to be visible after installation."
SUBSTANTIATION: I frequently open panels and need to see what circuit breakers can be installed where, so as to comply with manufacturers' instructions and to avoid overloading busbars. Frequently I have had to insert a prying tool between conductors and cabinet wall and push with all my muscle against the wires that are in place in order to gain a glimpse of the schematic. I have nudged bare grounding conductors right up to circuit

breaker terminals, and the least bit of overstripping could have caused a short circuit. It does not matter whether this risk of shorting existed right then, in instances where I was worked live, or subsequently when I restored power in the event that the panel; was dead. Furthermore, when I have to pry I am stressing the terminations.

When panelboard cabinets contain any printed material that may require future legibility, including text, diagrams, and schematics, it needs to be readable. When that material already is not in a normal reading orientation and when it is not in direct line of sight subsequent to installation of the circuiting, if installers block it as they route the wiring, electricians subsequently are placed in far more danger than when they can't see the voltage rating. It does not ask too much of installers that they route wires away from such instructions as much as possible, and that they use wire ties on conductors that need to pass near the instructions -- at least when they are preparing for inspection.

PANEL ACTION: Reject.

PANEL STATEMENT: Required markings, instructions and requirements for visibility are covered in existing product listing standards.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #877)

9- 101 - (384-14): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete this section.

SUBSTANTIATION: A panelboard is a panelboard and the definition appears to cover various construction from small 2-circuit "load center" types to large floor-standing types with compartments for switch and fuse or circuit breaker assemblies. It seems the primary effect of this section is to provide for application of Sections 384-15 and 384-16. The designation of type of panelboard is determined by the number of overcurrent devices protecting specific type circuits. Apparently the same panelboard could be either lighting and appliance or power, dependent on the installed overcurrent devices and circuits. A removal or addition of one circuit can change the classification and application of Section 384-16(a) or (b). If a classification is made based on installed devices and circuits, but spare spaces are available which when used could change the classification, which overcurrent provision of Section 384-16 should be applied? If a panelboard is installed without branch circuit devices or circuits, such as in future tenant spaces in speculation building where occupancy is future and undetermined, how is the panelboard to be classified? How does a mere change in classification effect heating, current capacity, and other factors?

If a panelboard supplies only 30-ampere rated feeders with neutrals it is a power panelboard; if the same circuits are lighting and appliance circuits it is a lighting and appliance panelboard. The same applies dependent on neutral connections. What safety considerations justify this? In many industrial and commercial occupancies frequent circuit changes are made whereby classification based or prior conditions are changed and meaningless.

If a panelboard supplied by a 2-wire feeder, ac or dc, with or without a grounded conductor, supplying circuits rated 30-amperes or less, a lighting and appliance or power panelboard? Since there is technically no neutral it is a power panelboard, though perceived intent, if one conductor is grounded, may result in classification as lighting and appliance panelboard.

This section and Section 384-16 appear to be influenced by considerations of possible future additions or alterations by unqualified persons. Code rule should be governed and based on application by qualified persons. The premise of rules to prevent misuse or safety hazards caused by unqualified persons, if logically extended, would result in more restrictive and stringent requirements for 120-volt systems than for 5kV systems, since the probability of unqualified persons working on 120-volt systems is much greater.

The requirements of Section 384-13 and testing standards for heat rise, circuit limiting, short-circuit rating, etc., for panelboards should be sufficient for safety. This section encourages capricious and subjective interpretation, if applied, but likely has little effect in the real world due to factors noted above.

PANEL ACTION: Reject.

PANEL STATEMENT: The language in the present Code is the result of a code-making panel task group study of Proposal 9-142 for the 1996 NEC. The task group study resulted in Proposal 9-120 for the 1999 code and included revised material for Sections 384-14 and 384-16. The panel reaffirms its action on Proposal 9-120 as recorded in NFPA 70 - A98 ROP concerning definitions of lighting and appliance branch circuit panelboards and power panelboards in Section 384-14, and the addition of requirements for power panelboard protection in Section 384-16.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1765)

9- 102 - (384-14-Lighting and Appliance Branch Circuit (New)): Accept in Principle

SUBMITTER: Andrew T. Crescuillo, Rep. Genesee Chapter IAEI

RECOMMENDATION: Revise as follows:

Definition of a Lighting and Appliance Branch Circuit. A branch circuit that has a connection to the neutral of the panelboard and that has overcurrent protection of 30 amperes or less in one or more conductors.

(a) Lighting and Appliance Branch-Circuit Panelboard. A lighting and appliance branch-circuit panelboard is one having more than 10 percent of its overcurrent devices protecting lighting and appliance branch circuits. ~~A lighting and appliance branch circuit is a branch circuit that has a connection to the neutral of the panelboard and that his overcurrent protection of 30 amperes or less in one or more conductors.~~

SUBSTANTIATION: This makes it more user friendly and easier to read and understand.

Example: As in definition of Motor Control Circuits 430-71.

PANEL ACTION: Accept in Principle.

Revise existing Section 384-14 to read as follows:

"384-14. Classification of Panelboards. Panelboards shall be classified for the purposes of this Article as either lighting and appliance branch-circuit panelboards or power panelboards, based on their content. A lighting and appliance branch circuit is a branch circuit that has a connection to the neutral of the panelboard and that has overcurrent protection of 30 amperes or less in one or more conductors.

(a) Lighting and Appliance Branch-Circuit Panelboard. A lighting and appliance branch-circuit panelboard is one having more than 10 percent of its overcurrent devices protecting lighting and appliance branch circuits.

(b) Power Panelboard. A power panelboard is one having 10 percent or fewer of its overcurrent devices protecting lighting and appliance branch circuits."

PANEL STATEMENT: This change is for editorial clarity and meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #878)

9- 103 - (384-15): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Number of Overcurrent Devices on One Panelboard. Not more than 42 overcurrent devices (other than those provided for in the mains) of a ~~lighting and appliance branch-circuit~~ panelboard shall be installed in any one cabinet or cutout box.

A ~~lighting and appliance branch circuit~~ panelboard shall be provided with physical means to prevent installation of more overcurrent devices than that number for which the panelboard was designed, rated, and listed. ~~approved.~~

For the purposes of this section ~~article, a 2-pole circuit breaker shall be considered two overcurrent devices; a 3-pole circuit breaker shall be considered three overcurrent devices~~ each fuse and each pole of a circuit breaker shall be considered an overcurrent device.

SUBSTANTIATION: If the limit of 42 overcurrent devices has been established due to heat considerations, it should apply regardless of panelboard classification. One circuit or overcurrent device can determine such classification. The limit of 42 is generally standard practice, since final determination of classification may not be known.

The UL "white book" indicates the circuit-limiting provision also applies to fusible panelboards; each fuse should be noted also as is each pole of circuit breakers.

"Listed" is proposed in lieu of "approved" as the number of overcurrent devices is best determined by a NRTL, not the authority having jurisdiction. "Section" is more appropriate than "article".

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 9-101.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #879)

9- 104 - (384-16(a), (b)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(a) ~~Lighting and Appliance Branch Circuit~~ Panelboard Individually Protected. Each ~~lighting and appliance branch circuit~~ panelboard shall be individually protected on the supply side by not more than two main circuit breakers or two sets of fuses. ~~having a combined rating~~ Each main circuit breaker or set of fuses shall have an ampere rating not greater than ~~that of~~ the panelboard bus it protects.

Exception No. 1: Individual protection for a ~~lighting and appliance branch circuit~~ panelboard shall not be required if the panelboard feeder has overcurrent protection not greater than the ampere rating of the panelboard.

Exception No. 2: ~~For existing installations, individual protection for lighting and appliance branch circuit panelboards shall not be required where such panelboards are used as service equipment in supplying an individual residential occupancy.~~ Individual protection shall not be required for a panelboard used as service equipment, with multiple sets of overcurrent devices as permitted in Section 230-90(a) Exception No. 3.

Exception No. 3: The rating of the panelboard protective device(s) shall be permitted in accordance with the provisions of Sections 430-62 and 430-63 for motor loads and motor and lighting or appliance loads, and Sections 630-12(b) and 630-32(b) for electric welder supply conductors.

(b) Delete.

SUBSTANTIATION: The rationale for classification of panelboards as lighting and appliance or power is not clear. What are the safety reasons for permitting two sets of overcurrent devices for one but not the other?

Present Exception No. 1 for (a) is unnecessary as the code is not purported to be retroactive to change a previous code compliant installation. Such exceptions are not provided for all previous compliant installations which may not conform to present code. Moreover, it is limited to residential occupancies; is this intended to infer that existing split-bus panels in commercial or industrial occupancies are to be replaced?

In (b) the described power panelboard becomes the lighting and appliance branch-circuit panelboard of (a) if the circuits are connected to the neutral. It doesn't address the condition where the panel supplies branches which are feeders.

The exception for (b) relates to deletion of overcurrent protection based on multiple service disconnects which per se, are not overcurrent protection.

Proposed Exception No. 3 is for correlation with other code sections which permit overcurrent protection with ratings higher than conductor ampacities. Since the maximum overcurrent protection for conductors in Articles 430 and 630 are permissive values it may be concluded they don't apply if a panelboard bus constitutes part of the supply conductors.

If a feeder with an ampacity of 400 is enclosed in a gutter from which fused switches or circuit breakers are tapped to supply motor or welder load, the feeder overcurrent device may exceed the feeder ampacity. The same feeder supplying a 400 ampere panelboard with the same load is required to have overcurrent protection not to exceed 400 amperes if the panelboard includes a neutral and 10 percent of the circuits are rated 30-amperes or less. Electrically, what is the difference.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and statement on Proposal 9-101.

With regard to Exception No. 2, the phrase "for existing installations" means the existing panelboard. It is not intended that a split-bus panelboard used in an individual dwelling occupancy be replaced if a circuit is added to the existing panelboard. It does mean, however, that for installations of new panelboards in new or existing residential occupancies, a split-bus, six-disconnect panelboard (with more than two circuit breakers or sets of fuses protecting the panelboard) is not permitted for the service equipment.

The panel reaffirms its decision during the 1999 Code cycle not to allow increased sizing of protective devices per Sections 430-62(a) and 430-63. The clarifications in Sections 384-14 and 384-16 were added because of the likelihood of abuse under the previous rules. It would be inconsistent to now allow the same panels to have overcurrent protection calculated according to a section of the NEC that requires a sophisticated analysis and inspection to be sure that it is properly applied.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #640)

9- 105 - (384-16(b)): Reject

SUBMITTER: Vohn N. Peeler, Faith, NC

RECOMMENDATION: Delete entire Section 384-16(b) and exception.

SUBSTANTIATION: The panelboard described in this section meets the definition of a lighting and appliance branch circuit panelboard as defined in 384-14(a). A panelboard that meets this definition cannot also be a power panel. The rules for providing overcurrent protection for a lighting and appliance branch circuit panelboard are covered in 384-16(a).

PANEL ACTION: Reject.

PANEL STATEMENT: The panelboard descriped in Section 384-16(b) is a power panelboard when the branch circuits rated 30 amperes or less are not connected to the neutral. These circuits could be fed by 30 ampere or less multi-pole breakers with no neutral connection.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #4221)

9- 106 - (384-16(b)): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

Power Panelboard Protection. In addition to the requirements of Section 384-13, a power panelboard with supply conductors that include a neutral and having more than 10 percent of its overcurrent devices protecting branch circuits rated 30 amperes or less shall be protected ~~on the supply side~~ by an overcurrent protective device having a rating not greater than that of the panelboard. The overcurrent protective device shall be located at any point on the supply side of the panelboard.

SUBSTANTIATION: As I travel nationally presenting 1999 NEC changes seminars, one question that comes up repeatedly is "Why can't we use the feeder protection to protect the panelboard, assuming it has the appropriate rating?" I point out that since the feeder protection is "on the supply side" there isn't any problem, and a close reading of the Code clearly supports that conclusion. Nevertheless, people look for a comparable exception to Section 384-16(a), Exception No. 1, and not finding it, assume they have to use a panelboard with a main.

The reason for the exception in 384-16(a) is that there the principle rule allows for a double main, and the exception has to be independently stated since it inherently covers a single device. That isn't true in 384-16(b), however, I think some editorial clarification is in order, and this proposal does just that.

PANEL ACTION: Accept in Principle.

Revise the last sentence of the proposed wording to read as follows:

"The overcurrent protective device shall be located within, or at any point on the supply side of the panelboard."

PANEL STATEMENT: The revised wording meets the intent of the submitter and provides clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #880)

9- 107 - (384-16(c)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete this section.
SUBSTANTIATION: This section is superfluous as it is already covered in Sections 210-19(a), 210-20(a), and 215-3 in a clearer fashion and not limited to panelboards. It may also be somewhat misleading since the requirement is not in Part B Switchboards, nor Article 380 for circuit breakers and fused switches. The requirements of the above noted sections apply without distinction as to enclosure types and correlate with UL maximum load restrictions which generally apply to circuit breakers, fused switches, and switchboards. The present wording may be confusing if a total load consists of both continuous load and noncontinuous load. For example, a 20-amepre circuit supplying ten general use receptacles (computed 15-ampere noncontinuous load) and 3-amperes continuous lighting load; total load exceeds 80 percent of the overcurrent device rating and violates this section as written. However, per Sections 210-19(a) and 210-20(a) the overcurrent device is not less than the 15-ampere noncontinuous load plus 125 percent of the continuous load (3.75 amperes), or 18.75-amperes, and complies with those sections.
PANEL ACTION: Accept.
Delete Section 384-16(d) and the Exception.
PANEL STATEMENT: The panel assumes that the submitter is referring to Section 384-16(d).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
REED: Section 384-16(d) correctly limits the load on any overcurrent devices in the panelboard, including the main, which is not covered by the referenced Articles 210 and 215. In addition, Section 210-19 covers the conductor sizing, not the size of the overcurrent devices. Having the present "(d)" adds clarity to the requirements for panelboards.
COMMENT ON AFFIRMATIVE:
DEMING: I agree with the panel action. However, if 384-16(d) and the Exception are to be deleted then the present paragraphs need to be renumbered as follows:
(e) should become (d)
(f) should become (e)
(g) should become (f).

(Log #2201)

9- 108 - (384-16(d)): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
The total load on any overcurrent device located in a panelboard shall not exceed 80 percent of its rating where, in normal operation, the load is a continuous load ~~will continue for three hours or more.~~
SUBSTANTIATION: "Standard terms have been established through accepted use or by definition and are to be used...". [NEC Style Manual 3.2.4 Standard Terms].
Continuous Load is defined in Article 100; therefore, the definition should not be repeated here. This is the only instance in the code where three hours or more is used instead of continuous load.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 9-107.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1452)

9- 109 - (384-16(h) (New)): Reject
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Please add the following new text:
(h) Overcurrent protection of branch circuit grounded conductors and equipment grounding conductors. Overcurrent protection of branch circuit grounded conductors and equipment grounding conductors of the panelboard shall be provided where the following conditions exist: The panelboard is supplied by one or more ungrounded conductors, a grounded conductor, and an equipment grounding conductor, and no interconnection is permitted between the grounded circuit conductors and the equipment grounding conductors. The overcurrent protection shall interrupt ungrounded conductors, but never interrupt the continuity of any grounding conductor. Overcurrent shall be detected and interrupted by use of one of the following means:
1. Ground-fault type circuit breakers located on each branch circuit of the panelboard.
2. A single ground-fault device installed as the main circuit breaker in the panelboard.
3. A single ground-fault device installed within the branch circuit of another panelboard that supplies this panelboard.
Where a single ground-fault type device is used as permitted in 2 and 3 above, it shall be designed so that the ground-fault trip setting does not exceed 1 ampere.
SUBSTANTIATION: The purpose of this change is to prevent fires caused by "open neutrals" in mobile homes and buildings with subpanels. We all know about the dangers of short circuits, but we have been ignoring a much more serious problem. An open neutral feeding a four-wire 240/120V subpanel can start a fire if there is an interconnection between any branch circuit grounded neutral conductor and a grounding conductor. Open neutrals are a very common problem on mobile homes and buildings with subpanels, and accidental interconnections between a grounded conductor and a grounding conductor are even more common. Any such interconnection causes the grounded conductor and the grounding conductor to be in parallel with each other. A typical overload occurs as follows: The neutral conductor (may be rated at 100 amperes) becomes open, but instead of disconnecting the power, there is an alternate path for the circuit because the grounding conductor is accidentally connected in parallel with it. The neutral bus for the entire panelboard will be back fed through that alternate path (perhaps through no. 14 conductors in device box). There is no overcurrent protection on the grounded conductor or the grounding conductor, so there is no warning until the fire starts. There are several ways in which a grounded neutral conductor can be made parallel with an equipment grounding conductor. The equipment grounding conductor may be in contact with the grounded conductor inside a device box. Any defective appliance in which the neutral conductor is grounded to the case can burn down a building (if the neutral becomes open). Someone could have an appliance with a grounded neutral plugged in for many years and not know that they have any problem. Then one day their neutral becomes open and a fire starts. They had no warning and they had no way of knowing that the appliance was defective. Of course, this is only a problem on a 4-wire subpanels and mobile homes. Now we have changed the requirements for ranges and dryers to require a 4-wire plug on all new homes. I agree that this is the proper wiring method. Unfortunately we have increased the fire hazard while decreasing the electrocution hazard. I think that more people die from house fires than from electrocution - thousands more each year. With a 3-wire range, there was a shock hazard if the neutral became open. A person could complete the 120V path to ground by touching the case of the range. With a 4-wire range fed from a subpanel or mobile home, there is a fire hazard if the neutral becomes open and the bonding jumper on the back of the range is still attached. Most pigtails on ranges and dryers are installed by appliance delivery persons - not electricians. This proposal is the only way to protect the grounded circuit conductors and the equipment grounding conductors from overload where they are supplied from subpanels. Manufacturers could develop 2-pole GFCIs with a 1 ampere ground fault trip setting for this.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel disagrees with the submitter's technical substantiation. The panel does not understand how providing overcurrent protection in the branch-circuit grounded conductors and equipment grounding conductors would solve the problems discussed by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #384)

9- 110 - (384-20): Reject
SUBMITTER: Larry T. Smith, Nat'l Electrical Seminars
RECOMMENDATION: Revise as follows:
Panelboard cabinets and panelboard frames, if of metal, shall be in physical contact with each other and shall be grounded.

Where the panelboard is used with nonmetallic raceway or cable or where separate grounding conductors are provided, a terminal bar for the grounding conductors shall be secured inside the cabinet. The terminal bar shall be bonded to the cabinet and panelboard frame, if of metal, otherwise it shall be connected to the grounding conductor that is run with the conductors feeding the panelboard.

Grounding conductors shall not be connected to a terminal bar provided for grounded conductors.

Exception No. 1: Grounding conductors shall be permitted to be connected to a terminal bar provided for grounded conductors (may be a neutral) when the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Article 250.

Exception No. 2: Where an isolated equipment grounding conductor is provided as permitted by Section 250-146(d), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar.

~~Grounding conductors shall not be connected to a terminal bar provided for grounded conductors (may be a neutral) unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Article 250.~~

SUBSTANTIATION: The first paragraph demands the installation of a terminal bar for the connection of grounding conductors whenever a panelboard is used with nonmetallic raceway or cable, or where separate grounding conductors are installed. I recently inspected a new panelboard that was labeled when used as service equipment all unused neutral terminals may be used for terminating equipment ground wires. The panelboard did not contain a terminal bar for grounding conductors. This is according to paragraph two and in direct conflict with the first paragraph.

I am getting reports that many inspectors are reading the first paragraph and requiring the installation of a terminal bar for grounding conductors in all panelboards used with nonmetallic raceway or cable, or where separate grounding conductors are installed, virtually all panelboards. They are simply doing their job; that is exactly what the first paragraph of this section requires.

The best solution is to (1) restate the first sentence of paragraph two immediately following paragraph one, (2) create Exception No. 1 from the remainder of the second paragraph, and (3) renumber the existing exception as Exception No. 2.

PANEL ACTION: Reject.

PANEL STATEMENT: The exception in the present code is to the requirements in paragraph one of Section 384-20, and is correctly located. Paragraph one sets requirements for terminal bars in panelboards for connection of grounding conductors. The exception allows an isolated equipment grounding conductor used for the reduction of electrical noise to pass through the panelboard without connection to the terminal bar.

Paragraph two of Section 384-20 sets requirements for interconnection between grounded and grounding conductors, as permitted or required by Article 250. The proposed change would restate the requirement as an exception.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11COMMENT ON AFFIRMATIVE:

HARTWELL: In addition to the panel statement, the proposal submitter and other readers should understand that a terminal bar nonimally for grounded condutors, but bonded to the cabinet where so permitted, such as at a service entrance, thereby becomes a terminal bar for grounding conductors as well. As such, it then complies with the express terms of the first paragraph. The inspectors requiring otherwise are incorrect.

(Log #2904)

9- 111 - (384-20): Reject

SUBMITTER: Joseph E. Csenteri, Robbinsville, NJ

RECOMMENDATION: Added to 384-20:

All panelboards not classified as service equipment should have factory installed ground bus. (bars) Bars must be bonded to cabinet.

SUBSTANTIATION: This proposal will eliminate improvised grounding terminal bars.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's concern is covered by Section 110-3(b).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3883)

9- 112 - (384-20, Exception): Reject

SUBMITTER: J. Philip Simmons, Simmons Electrical Services

RECOMMENDATION: Revise text as follows:

384-20. Grounding of Panelboards. Panelboard cabinets and panelboard frames, if of metal, shall be in physical contact with each other and shall be grounded. Where the panelboard is used with nonmetallic raceway or cable or where separate grounding conductors are provided, a terminal bar for the grounding conductors shall be secured inside the cabinet. The terminal bar shall be bonded to the cabinet and panelboard frame, if of metal, otherwise it shall be connected to the grounding conductor that is run with the conductors feeding the panelboard.

Exception: Where an isolated equipment grounding conductor is provided as permitted by Section 250-146(d), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar unless the panelboard is part of a separately derived system, is used as the building or structure disconnecting means, or is the service equipment.

Equipment grounding conductors shall not be connected to a terminal bar provided for grounded conductors (may be a neutral) unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Article 250.

SUBSTANTIATION: These changes will bring this section into compliance with Section 250-146(d). As presently worded, this section does not require that the isolated ground equipment grounding conductor terminate at the nearest of the separately derived system, building disconnecting means or the service.

PANEL ACTION: Reject.

PANEL STATEMENT: The first part of the Exception already says the installation needs to comply with Section 250-146(d) and the building disconnect rules need not be repeated here.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3287)

9- 113 - (384-21 (New)): Accept

SUBMITTER: James T. Pauley, Square D Co.

RECOMMENDATION: Add a new 384-21 to read as follows:

384-21. Grounded Conductor Terminations. Each grounded conductor shall terminate within the panelboard in an individual terminal that is not also used for another conductor.

Exception: Grounded conductors of circuits with parallel parallel shall be permitted to terminate in a single terminal if the terminal is identified for connection of more than one conductor.

SUBSTANTIATION: This revision is needed to coordinate the installation requirements with a long standing product standard requirement. Clause 12.3.10 of UL 67 (Panelboards) states “An individual terminal shall be provided for the connection of each branch-circuit neutral conductor.” The requirement has been enforced in the past by a close review of the manufacturers markings and by NEC 110-3(b). However, since it is a rule that specifically effects how the installer can make connections, it is important that it be in the NEC.

Even with the manufacturers markings, inspectors still indicate that they see a number of panelboards installed with two (or more) branch circuit neutrals under one terminal or they see an equipment grounding conductor and neutral under the same terminal.

There is very good rationale for the requirement in the product standards. Doubling up on the neutrals creates a significant problem when the circuit needs to be isolated. In order to isolate the circuit, the branch breaker is turned off and the neutral is disconnected by removing it from the terminal. If the terminal is shared with another circuit, the connection on the other (still energized) circuit will be loosened as well. This can

wreak havoc, particularly if the neutral is part of a 120/240V multi-wire branch circuit. Also, the neutral assemblies are not evaluated with doubled-up neutrals in the terminals.

The connection of a neutral and equipment grounding conductor creates a similar issue. One of the objectives of the particular arrangement of bonding jumpers, neutrals and equipment grounds is to allow circuit isolation while keeping the equipment grounding conductor still connected to the grounding electrode (see UL 896A - Reference standard for Service Equipment). When the neutral is disconnected, the objective is to still have the equipment ground solidly connected to the grounding electrode. If both the neutral and grounded conductor are under the same terminal, this cannot be accomplished.

This addition to the NEC does not change any product or permitted wiring arrangement from what it is today. It will however, it will help installers to avoid wiring the panel in violation of 110-3(b) and then have to contend with a red-tag from the inspector.

The code language is proposed in a fashion to allow consistent enforcement of the provision the the AHJ. Although the UL wording is adequate for the product standard, it is important that the NEC language is as clear an unambiguous as possible. This is the reason for specifically noting that the terminal cannot be used for another conductor. Furthermore, the code requirement has been worded to make sure that both branch circuit and feeder neutrals are covered since it is not uncommon to have feeder breakers as well as branch breakers in the panelboard (the issue for the neutral is the same regardless of branch or feeder). Also, the term "grounded conductor" is used to be consistent with the code terminology and to recognize that not all grounded conductors are neutrals.

An exception has been proposed to avoid any confusion relative to parallel circuit arrangements. In these instances, multiple neutrals could be in a single terminal if the terminal has been identified as acceptable for multiple conductors.

PANEL ACTION: Accept.

In the proposed exception, change the second instance of the word "parallel" to "conductors".

PANEL STATEMENT: The correction of the typographical error meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #881)

9- 114 - (384-34): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete.

SUBSTANTIATION: This requirement is already covered by the preceding Section 384-33, which encompasses Section 380-6(c). Since the FPN is not an exception, the reference to Section 380-6(c) Exception is somewhat confusing. Does this section or the referenced section have precedence? Unless the switch is wired by the manufacturer a construction specification cannot control (field) connections. The requirement of this section and the exception for Section 380-6(c) can lead to an inference that this section applies to switches which are part of a panelboard, switchboard, or motor control center and factory-wired and the exception for Section 380-6(c) applies to separately installed switches.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1145)

9- 115 - (384-36): Reject

SUBMITTER: Michael Gregory Owen, Electrical Training & Consulting Service

RECOMMENDATION: Revise second paragraph to read:

"Where ~~close~~ proximity...".

SUBSTANTIATION: This is a redundant statement. "Proximity" means - close - near - adjacent to.

PANEL ACTION: Reject.

PANEL STATEMENT: "Close" is a legitimate adjective for promixity in this case.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #546)

9- 116 - (Table 384-36): Accept in Principle

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Table 384-36 to add metric conversions as follows:

(Table shown below)

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.

Table 384-36. Minimum Spacings Between Bare Metal Parts

Voltage	Opposite Polarity Where Mounted on the Same Surface		Opposite Polarity Where Held Free in Air		Live Parts to Ground*	
	mm	in.	mm	in.	mm	in.
Not over 125 volts, nominal	19	3/4	13	1/2	13	1/2
Not over 250 volts, nominal	32	1 1/4	19	3/4	13	1/2
Not over 600 volts, nominal	50	2	25	1	25	1

~~Note: For SI units, 1 in. = 25.4 mm.~~

* For spacing between live parts and doors of cabinets, see Sections 373-11(a)(1), (2), and (3).

PANEL ACTION: Accept in Principle.

Use soft conversions throughout, as follows:

Voltage	Opposite Polarity Where Mounted on the Same Surface		Opposite Polarity Where Held Free in Air		Live Parts to Ground*	
	mm	in.	mm	in.	mm	in.
Not over 125 volts, nominal	19.1	3/4	12.7	1/2	12.7	1/2
Not over 250 volts, nominal	31.8	1 1/4	19.1	3/4	12.7	1/2
Not over 600 volts, nominal	50.8	2	25.4	1	25.4	1

PANEL STATEMENT: The dimensions in this table are minimum safety requirements, reflected in relevant standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 400 — FLEXIBLE CORDS AND CABLES

(Log #1077)

6- 146 - (400): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 400 as follows:
Table 400-4, Note 5 - change "No. 20" to "20 AWG" in two places
Table 400-4, Note 8 - change "Nos. 10" to "10 AWG"
Table 400-4, Note 10 - change "No. 20 through 14" to "20 through 14 AWG" and "No. 12" to "12 AWG"
400-9 - change "No. 14" to "14 AWG"
400-12, Exception - change "No. 10" to "10 AWG"
400-13 - change "No. 18" to "18 AWG"
400-21, Exception - change "No. 8" to "8 AWG" and "No. 10" to "10 AWG"
400-31, Exception - change "No. 10" to "10 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3 or Article 400.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement on Proposal 6-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2933b)

6- 147 - (400, 402): Accept in Principle in Part
NOTE: The Technical Correlating Committee understands that the panel has accepted those portions of the Proposal which fall under its Scope. The Technical Correlating Committee directs that the term "luminaire" be accepted as shown by the panel, but be followed by the existing term in parenthesis. This action is intended to provide consistency throughout the code.
The Technical Correlating Committee refers this Proposal to Code-Making Panels 1 and 18 for action on Items (b) and (c) of the Recommendation. This action will be considered by Panels 1 and 18 as a Public Comment.
SUBMITTER: Bernard J. Mezger, American Lighting Association
RECOMMENDATION: Incorporate "luminaire" into the 2002 NEC:
(a) To incorporate the use of the inclusive wording "luminaire" throughout the Code wherever the ambiguous wording "fixture" or "lighting fixture" is used and the intent and meaning is a complete lighting unit consisting of a fixture and the lamp(s), called a "luminaire".
(b) Add the definition of "luminaire" to Article 100-1 as follows:
Luminaire. A complete lighting unit consisting of a lamp, or lamps, and a ballast (when applicable), together with the parts designed to distribute the light, to position the lamp(s), and connect the lamp(s) to the power supply.
(c) Delete the FPN from Section 410-1 (an identical definition).
SUBSTANTIATION: Clarify the true meaning and intent of the item described as a "fixture", or a "lighting fixture", by providing the proper wording for a complete lighting unit. A luminaire consists of a fixture plus lamp(s). The definition and use proposed is consistent with that published and used by IESNA and NEMA.
PANEL ACTION: Accept in Principle in Part.
Part A of the recommendation is accepted. Parts B and C are not being acted on.
PANEL STATEMENT: Parts B and C are outside of the scope Panel 6. See panel statement on Proposal 6-1.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #340)

6- 148 - (Table 400-4): Accept
SUBMITTER: Siegfried A. Schauffele, Essex Group Inc.
RECOMMENDATION: Increase the number of permitted circuit conductors for Type G-GC from 3 to 6, the same as Type G, and change "plus 2 grounding conductors" to "grounding conductors", the same as Type G, there is no need to specify number of grounds.
SUBSTANTIATION: User requests for Type G-GC cable with more than 3 circuit conductors. Since Type G-GC is nothing more than a Type G plus an insulated ground-check conductor, there is no technical or safety reason to limit G-GC to 3 circuit conductors.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #341)

6- 149 - (Table 400-4): Reject
SUBMITTER: Siegfried A. Schauffele, Essex Group Inc.
RECOMMENDATION: Increase the maximum conductor size for single conductor Type W to 1000 kcmil.
SUBSTANTIATION: Users require larger cables. Present maximum size is 500 kcmil. ICEA S-75-381, the Canadian Electrical Code and CSA Standard C22.2 No. 96 have sizes to 1000 kcmil. A supplementary proposal to add ampacities to Table 400-5(b) will be made.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation is not complete in regard to the required changes in Table 400-4.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
POST: I vote to accept. See my Explanation of Negative on Proposal 6-61 - future problems with harmonization of ampacity tables could be avoided.

(Log #1247)

6- 150 - (Table 400-4): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add SI units for insulation thicknesses using the following conversion table.
Under "Nominal Insulation Thickness" add a new column entitled "mm" between "AWG" and "Mils" and insert the SI equivalents for the nominal insulation thickness based on the following table.
Change the footnotes to Table 400-4 as follows:
Note 2: Change "8 ft (2.44 m)" to read "2.5 m (8 ft)".
Note 8: Change "45 mils" to read "1.14 mm (45 mil)".
Note 10: Change "30 mil-insulation thickness" to read "0.76 mm (30 mil insulation thickness".
Note 10: Change "45-mil insulation thickness" to read "1.14 mm (45 mil) insulation thickness".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice and applicable product standards.
PANEL ACTION: Accept.
A bracket must be added after 30 mil on note 10.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2126)

6- 151 - (Table 400-4): Reject
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for comment.
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Replace "nonhazardous" with "unclassified".
SUBSTANTIATION: This is a companion proposal to other proposals which provide a definition of unclassified in Articles 100, 500, and 505, and provides correlation. The term "Classified" refers to the type of material/hazard potential involved, i.e., Class I, Division 1, Class II, Division 2, etc. Terms such as nonhazardous and unclassified are used in both the NEC, the Uniform Building Code (UBC) and other NFPA documents. The term nonhazardous infers that the area has "no" hazards while the term "unclassified" more clearly correlates with the condition of being reviewed but found not to need classification. This action provides needed correlation with other NFPA documents, such as NFPA 497. Additionally the term "nonhazardous" is used 7 times within various parts of the NEC and in at least one place in the NEC the meaning of nonhazardous applies to voltages and not classification. A companion proposal has been made to change the term "nonhazardous" to "unclassified" as appropriate elsewhere in the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: Code terminology is a Code-wide issue. Panel 6 requests guidance from the TCC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
MCCLUNG: The term "unclassified" is more specific to indicate that such areas are just the opposite of classified areas. The NEC electrical hazardous (classified) areas are further designated with Class, Division, and Group Classifications rather than Class, Division, and Group Hazards.
PETTIGREW: I disagree with the Panel Action. The issue is just being avoided. The term "unclassified" provides a much clearer description of an area that has been examined and found to be suitable for general purpose equipment, than the term "nonhazardous", which could imply a false sense of security that other nonelectrical related hazards also do not exist. The Code is intended to make electrical installations safe, and the clear interpretation of the wording and definitions in the Code are necessary to meet that intent. "Unclassified" is the logical converse to the definition of "classified" areas as used throughout the Code.

(Log #2242)

6- 152 - (Table 400-4): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: In Table 400-4: change the phrase "flame-retardant" (or "flame retardant") to "flame tested" in three (3) places in column titled "Outer Covering" and in two (2) places in notes: "Note 5" and "Note 9."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: Cables are listed for their flame retardant properties and some of their applications are referenced in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GANATRA: See my Explanation of Negative Vote on Proposal 6-3.

(Log #3063)

6- 153 - (Table 400-4): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add the voltage ratings to Table 400-4 next to each wire type.

Table 400-4. Flexible Cords and Cables
(See Section 400-4)

Trade Name	Type Letter	Voltage	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness[1]		Braid on Each Conductor	Outer Covering	Use		
						AWG	Mils					
Lamp Cord	C	300	18-16	2 or More	Thermoset or Thermoplastic	18-16	30	Cotton	None	Pendant or Portable	Dry Locations	Not Hard Usage
		600	14-10			14-10	45					
Elevator Cable	E See Note 5. See Note 9. See Note 10.	300 or 600	20-2	2 or More	Thermoset	20-16 14-12 12-10 8-2	20 30 45 60	Cotton	Three Cotton, Outer One Flame-Retardant & Moisture-Resistant. See Note 3.	Elevator Lighting and Control	Nonhazardous Locations	
						20-16 14-12 12-10 8-2	20 30 45 60	Flexible Nylon Jacket				
Elevator Cable	EO See Note 5. See Note 10.	300 or 600	20-2	2 or More	Thermoset	20-16 14-12 12-10 8-2	20 30 45 60	Cotton	Three Cotton, Outer one Flame-Retardant & Moisture-Resistant. See Note 3.	Elevator Lighting and Control	Nonhazardous Locations	
									One Cotton and a Neoprene Jacket See Note 3.		Hazardous (Classified) Locations	
Elevator Cable	ET See Note 5. See Note 10.	300 or 600	20-2	2 or More	Thermoplastic	20-16 14-12 12-10 8-2	20 30 45 60	Rayon	Three Cotton or equivalent, Outer one Flame-Retardant & Moisture-Resistant See Note 3.	Nonhazardous Locations		
	ETLB See Note 5. See Note 10.	300 or 600						None				
	ETP See Note 5. See Note 10.	300 or 600						Rayon	Thermoplastic	Hazardous (Classified) Locations		
	ETT See Note 5. See Note 10.	300 or 600						None	One Cotton or equivalent and a Thermoplastic Jacket	Hazardous (Classified) Locations		
Portable Power Cable	G	2000	8-500 kcmil	2-6 plus Grounding Conductor(s)	Thermoset	8-2 1-4/0 250 kcmil--500 kcmil	60 80 95		Oil Resistant Thermoset	Portable and Extra Hard Usage		
Portable Power Cable	G-GC	2000	8-500 kcmil	3 plus 2 grounding Conductors and 1 ground check conductor	Thermoset	8-2 1-4/0 250 kcmil 500 kcmil	60 80 95		Oil Resistant Thermoset	Portable and Extra Hard Usage		
Heater Cord	HPD	300	18-12	2, 3, or 4	Thermoset	Thermoset 18-16 14-12	15 30	None	Cotton or Rayon	Portable Heaters	Dry Locations	Not Hard Usage
Parallel Heater Cord	HPN See Note 6.	300	18-12	2 or 3	Oil Resistant Thermoset	18-16 14 12	45 60 95	None	Oil Resistant Thermoset	Portable	Damp Locations	Not Hard Usage

Table 400-4. Flexible Cords and Cables (continued)

Trade Name	Type Letter	Voltage	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness[1]		Braid on Each Conductor	Outer Covering	Use		
						AWG	Mils					
Thermoset Jacketed Heater Cords	HS	300	14-12	2, 3, or 4	Thermoset	18-16	30	None	Cotton and Thermoset	Portable or Portable Heater	Damp	Extra Hard Usage
	HSJ	300	18-12									Hard Usage
	HSO	300	14-12						Cotton and Oil-Resistant Thermoset			Extra Hard Usage
	HSJO	300	18-12		Oil-Resistant Thermoset	14-12	45					Hard Usage
	HSOO	300	14-12									Extra Hard Usage
	HSJOO	300	18-12									Hard Usage
Twisted Portable Cord	PD	300	18-16	2 or More	Thermoset or Thermoplastic	18-16 14-10	30 45	Cotton	Cotton or Rayon	Pendant or Portable	Dry Locations	Not Hard Usage
		600	14-10									
Portable Power Cable	PPE	2000	8-500 kcmil	1-6 plus Optional Grounding Conductor(s)	Thermoplastic Elastomer	8-2 1-4/0 250 kcmil-500 kcmil	60 80 95		Oil-Resistant Thermoplastic Elastomer	Portable, Extra Hard Usage		
Hard Service Cord	S See Note 4.	600	18-12	2 or More	Thermoset	18-16 14-10 8-2	30 45 60	None	Thermoset	Pendant or Portable	Damp Locations	Extra Hard Usage
Flexible Stage and Lighting Power Cable	SC	600	8-250 kcmil	1 or More	Thermoset	8-2 1-4/0 250 kcmil	60 80 95		Thermoset[2]	Portable, Extra Hard Usage		
Flexible Stage and Lighting Power Cable	SCE	600	8-250 kcmil	1 or More	Thermoplastic Elastomer	8-2 1-4/0 250 kcmil	60 80 95		Thermoplastic Elastomer[2]	Portable, Extra Hard Usage		
Flexible Stage and Lighting Power Cable	SCT	600	8-250 kcmil	1 or More	Thermoplastic	8-2 1-4/0 250 kcmil	60 80 95		Thermoplastic[2]	Portable, Extra Hard Usage		
Hard Service Cord	SE See Note 4.	600	18-2	2 or More	Thermoplastic Elastomer	18-16 14-10 8-2	30 45 60	None	Thermoplastic Elastomer	Pendant or Portable	Damp Locations	Extra Hard Usage
	SEO See Note 4.	600							Oil-Resistant Thermoplastic Elastomer			
	SEOO See Note 4.	600			Oil-Resistant Thermoplastic Elastomer							

Table 400-4. Flexible Cords and Cables (continued)

Trade Name	Type Letter	Voltage	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness [1]		Braid on Each Conductor	Outer Covering	Use		
						AWG	Mils					
Junior Hard Service Cord	SJ	300	18-10	2, 3, 4, or 5	Thermoset	18-12	30	None	Thermoset	Pendant or Portable	Damp Locations	Hard Usage
	SJE	300			Thermoplastic Elastomer				Thermoplastic Elastomer			
	SJEO	300							Oil-Resistant Thermoplastic Elastomer			
	SJEOO	300			Oil-Resistant Thermoplastic Elastomer							
	SJO	300			Thermoset				Oil-Resistant Thermoset			
	SJOO	300			Oil-Resistant Thermoset				Oil-Resistant Thermoset			
	SJT	300			Thermoplastic	10	45		Thermoplastic			
	SJTO	300			Thermoplastic	18-12	30		Oil-Resistant Thermoplastic			
	SJTOO	300			Oil-Resistant Thermoplastic	10	45		Oil-Resistant Thermoplastic			
Hard Service Cord	SO See Note 4.	600	18-2	2 or more	Thermoset	18-16	30		Oil-Resistant Thermoset	Pendant or Portable	Damp Locations	Extra Hard Usage
	SOO See Note 4.	600			Oil-Resistant Thermoset	14-10 8-2	45 60		Oil-Resistant Thermoset			
All Thermoset Parallel Cord	SP-1 See Note 6.	300	20-18	2 or 3	Thermoset	20-18	30	None	Thermoset	Pendant or Portable	Damp Locations	Not Hard Usage
	SP-2 See Note 6.	300	18-16			18-16	45					
	SP-3 See Note 6.	300	18-10		Thermoset	18-16 14 12 10	60 80 95 110	None	Thermoset	Refrigerators, Room Air Conditioners, and as permitted in Section 422-16(b)	Damp Locations	Not Hard Usage
All Elastomer (Thermo-plastic) Parallel Cord	SPE-1 See Note 6.	300	20-18	2 or 3	Thermoplastic Elastomer	20-18	30	None	Thermoplastic Elastomer	Pendant or Portable	Damp Locations	Not Hard Usage
	SPE-2 See Note 6.	300	18-16			18-16	45					
	SPE-3 See Note 6.	300	18-10			18-16 14 12 10	60 80 95 110	None	Thermoplastic Elastomer	Refrigerators, Room Air Conditioners, and as permitted in Section 422-16(b)	Damp Locations	Not Hard Usage

Table 400-4. Flexible Cords and Cables (continued)

Trade Name	Type Letter	Voltage	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness [1]		Braid on Each Conductor	Outer Covering	Use		
						AWG	Mils					
All Plastic Parallel Cord	SPT-1 See Note 6.	300	20-18	2 or 3	Thermoplastic	20-18	30	None	Thermoplastic	Pendant or Portable	Damp Locations	Not Hard Usage
	SPT-2 See Note 6.	300	18-16			18-16	45					
	SPT-3 See Note 6.	300	18-10		Thermoplastic	18-16 14 12 10	60 80 95 110	None	Thermoplastic	Refrigerators, Room Air Conditioners, and as permitted in Section 422-16(b).	Damp Locations	Not Hard Usage
Range, Dryer Cable	SRD	300	10-4	3 or 4	Thermoset	10-4	45	None	Thermoset	Portable	Damp Locations	Ranges, Dryers
	SRDE	300	10-4	3 or 4	Thermoplastic Elastomer			None	Thermoplastic Elastomer	Portable	Damp Locations	Ranges, Dryers
	SRDT	300	10-4	3 or 4	Thermoplastic			None	Thermoplastic	Portable	Damp Locations	Ranges, Dryers
Hard Service Cord	ST See Note 4.	600	18-2	2 or More	Thermoplastic	18-16 14-10 8-2	30 45 60	None	Thermoplastic	Pendant or Portable	Damp Locations	Extra Hard Usage
	STO See Note 4.	600							Oil-Resistant Thermoplastic			
	STOO See Note 4.	600			Oil-Resistant Thermoplastic							
Vacuum Cleaner Cord	SV See Note 6.	300	18-16	2 or 3	Thermoset	18-16	15	None	Thermoset	Pendant or Portable	Damp Locations	Not Hard Usage
	SVE See Note 6.	300			Thermoplastic Elastomer				Thermoplastic Elastomer			
	SVEO See Note 6.	300							Oil-Resistant Thermoplastic Elastomer			
	SVEOO See Note 6.	300			Oil-Resistant Thermoplastic Elastomer							
	SVO	300			Thermoset				Oil-Resistant Thermoset			
	SVOO	300			Oil-Resistant Thermoset				Oil-Resistant Thermoset			
	SVT See Note 6.	300			Thermoplastic				Thermoplastic			
	SVTO See Note 6.	300			Thermoplastic				Oil-Resistant Thermoplastic			
	SVTOO	300			Oil-Resistant Thermoplastic							

Table 400-4. Flexible Cords and Cables (continued)

Trade Name	Type Letter	Voltage	Size AWG	No. of Conductors	Insulation	Nominal Insulation Thickness [1]		Braid on Each Conductor	Outer Covering	Use		
						AWG	Mils					
Parallel Tinsel Cord	TPT See Note 2.	300	27	2	Thermoplastic	27	30	None	Thermoplastic	Attached to an Appliance	Damp Locations	Not Hard Usage
Jacketed Tinsel Cord	TS See Note 2.	300	27	2	Thermoset	27	15	None	Thermoset	Attached to an Appliance	Damp Locations	Not Hard Usage
	TST See Note 2.	300	27	2	Thermoplastic			None	Thermoplastic	Attached to an Appliance	Damp Locations	Not Hard Usage
Portable Power Cable	W	2000	8-500 kcmil	1-6	Thermoset	8-2 1-4/0 250 kcmil-500 kcmil	60 80 95		Oil-Resistant Thermoset	Portable, Extra Hard Usage		
Electric Vehicle Cable	EV	600	18-500 kcmil See Note 11.	2 or more plus Grounding Conductor(s), plus optional hybrid data, signal communications, and optical fiber cables	Thermoset with optional nylon See Note 12.	18-16 14-10 8-2 1-4/0 250 kcmil-500 kcmil	30 (20) 45 (30) 60 (45) 80 (60) 95 (75) See Note 12.	Optional	Thermoset	Electric Vehicle Charging	Wet Locations	Extra Hard Usage
	EVJ	300	18-12 See Note 11.			18-12	30 (20) See Note 12.					Hard Usage
	EVE	600	18-500 kcmil See Note 11.	2 or more plus Grounding Conductor(s), plus optional hybrid data, signal, communications, and optical fiber cables	Thermoplastic Elastomer with optional nylon See Note 12.	18-16 14-10 8-2 1-4/0 250 kcmil-500 kcmil	30 (20) 45 (30) 60 (45) 80 (60) 95 (75) See Note 12.	Optional	Thermoplastic Elastomer	Electric Vehicle Charging	Wet Locations	Extra Hard Usage
	EVJE	300	18-12 See Note 11.			18-12	30 (20) See Note 12.					Hard Usage
	EVT	600	18-500 kcmil See Note 11.	2 or more plus Grounding Conductor(s), plus optional hybrid data, signal, communications, and optical fiber cables	Thermoplastic with optional nylon See Note 12.	18-16 14-10 8-2 1-4/0 250 kcmil-500 kcmil	30 (20) 45 (30) 60 (45) 80 (60) 95 (75) See Note 12.	Optional	Thermoplastic	Electric Vehicle Charging	Wet Locations	Extra Hard Usage
	EVJT	300	18-12 See Note 11.			18-12	30 (20) See Note 12.					Hard Usage

[1]**See Note 8.**

[2]**The required outer covering on some single conductor cables may be integral with the insulation.**

Notes:

1. Except for Types HPN, SP-1, SP-2, SP-3, SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, SPT-3, TPT, and three-conductor parallel versions of SRD, SRDE, SRDT, individual conductors are twisted together.

2. Types TPT, TS, and TST shall be permitted in lengths not exceeding 8 ft (2.44 m) where attached directly, or by means of a special type of plug, to a portable appliance rated at 50 watts or less and of such nature that extreme flexibility of the cord is essential.

3. Rubber-filled or varnished cambric tapes shall be permitted as a substitute for the inner braids.

4. Types G, G-GC, S, SC, SCE, SCT, SE, SEO, SEOO, SO, SOO, ST, STO, STOO, PPE, and W shall be permitted for use on theater stages, in garages, and elsewhere where flexible cords are permitted by this Code.

5. Elevator traveling cables for operating control and signal circuits shall contain nonmetallic fillers as necessary to maintain concentricity. Cables shall have steel supporting members as required for suspension by Section 620-41. In locations subject to excessive moisture or corrosive vapors or gases, supporting members of other materials shall be permitted. Where steel supporting members are used, they shall run straight through the center of the cable assembly and shall not be cabled with the copper strands of any conductor.

In addition to conductors used for control and signaling circuits, Types E, EO, ET, ETLB, ETP, and ETT elevator cables shall be permitted to incorporate in the construction, one or more No. 20 telephone conductor pairs, one or more coaxial cables, or one or more optical fibers. The No. 20 conductor pairs shall be permitted to be covered with suitable shielding for telephone, audio, or higher frequency communications circuits; the coaxial cables consist of a center conductor, insulation, and shield for use in video or other radio frequency communications circuits. The optical fiber shall be suitably covered with flame-retardant thermoplastic. The insulation of the conductors shall be rubber or thermoplastic of thickness not less than specified for the other conductors of the particular type of cable. Metallic shields shall have their own protective covering. Where used, these components shall be permitted to be incorporated in any layer of the cable assembly but shall not run straight through the center.

6. The third conductor in these cables shall be used for equipment grounding purposes only. The insulation of the grounding conductor for Types SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, AND SPT-3 shall be permitted to be thermoset polymer.

7. The individual conductors of all cords, except those of heat-resistant cords, shall have a thermoset or thermoplastic insulation, except that the equipment grounding conductor where used shall be in accordance with Section 400-23(b).

8. Where the voltage between any two conductors exceeds 300, but does not exceed 600, flexible cord of Nos. 10 and smaller shall have thermoset or thermoplastic insulation on the individual conductors at least 45 mils in thickness, unless Type S, SE, SEO, SEOO, SO, SOO, ST, STO, or STOO cord is used.

9. Insulations and outer coverings that meet the requirements as flame retardant, limited smoke, and are so listed, shall be permitted to be designated limited smoke with the suffix *LS* after the code type designation.

10. Elevator cables in sizes No. 20 through 14 are rated 300-volts, and sizes 10 through 2 are rated 600 volts. No. 12 is rated 300 volts with a 30 mil-insulation thickness and 600 volts with a 45 mil-insulation thickness.

11. Conductor size for Types EV, EVJ, EVE, EVJE, EVT, and EVJT cables apply to nonpower-limited circuits only. Conductors of power-limited (data, signal, or communications) circuits may extend beyond the stated AWG size range. All conductors shall be insulated for the same cable voltage rating.

12. Insulation thickness for Types EV, EVJ, EVE, EVJE, EVT, and EVJT cables of nylon construction is indicated in parentheses.

SUBSTANTIATION: There is no indication as to the voltage ratings of flexible cords and cables in Table 400-4 per se. It is only an optional marking on the surface print of the cord. The CEC Part I lists voltage ratings in Table 11. The NEC should also.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3064)

6- 154 - (Table 400-4): Reject
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Extend the range of sizes of SPT-2 to 14 AWG. Nominal insulation thickness to be 45 mils.
SUBSTANTIATION: There is a need in the industry for a #14 AWG SPT-2 cord for higher ampacity applications and reduced voltage drops in cord sets. The only available parallel cord in this conductor size is an SPT-3, which is intended for refrigerators and air conditioners.
PANEL ACTION: Reject.
PANEL STATEMENT: For the required application SPT-3 can be used. Also, no data has been submitted to support the proposed insulation thickness.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1EXPLANATION OF NEGATIVE:
POST: I vote to accept, if this cord is manufactured and is available why not add it to table.
COMMENT ON AFFIRMATIVE:
FRIEDMAN: Affirm the Panel Action to reject with the following comment:
"Understand rejection due to the insufficient technical support, however, this proposal should be accepted once the information is provided."

(Log #3065)

6- 155 - (Table 400-4): Reject
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Extend the range of sizes on multi-conductor Types W and G to include 12 AWG and 10 AWG and adopt the CEC Part I Table 12A ampacities for those sizes.
SUBSTANTIATION: The CEC Part I lists multi-conductor Types W and G down to 12 AWG in Table 11, along with their respective ampacities in Table 12A. These cables are needed for stage cable and other applications where the larger sizes are not practical.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not include all of the table data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11COMMENT ON AFFIRMATIVE:
FRIEDMAN: See my Comment on Affirmative on Proposal 6-154.

(Log #3337)

6 - 156 - (Table 400-4): Reject
SUBMITTER: Samuel B. Friedman, BICCGeneral/Rep. CANENA Flexible Cord Harmonization Committee
RECOMMENDATION: Add <u>see note 13</u> in Table 400-4 to type letter column for following products: SE, SEO, SEOO, ST, STO, STOO, SO, SOO, SJE, SJT, SJO, SJEO, SJTO, SJOO, SJEOO, SJTOO, SPT-1, SPT-2.
Add note 13 to notes for Table 400-4 to read as follows:
"<u>Cords that comply with the requirements for outdoor cords and are so listed shall be permitted to be designated as weather and water resistant with the suffix "W" after the code type designation. Cords with the "W" suffix are suitable for use in wet locations.</u>"
SUBSTANTIATION: The "W" suffix has been incorporated in UL flexible cord standard to designate cords that are suitable for use in outdoor and wet locations. The products on which this suffix can be used and an explanation of this designation is needed in the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's data is incomplete. Other requirements for proposed Type designations need to be identified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11COMMENT ON AFFIRMATIVE:
FRIEDMAN: See my Comment on Affirmative on Proposal 6-154.

(Log #3338)

6- 157 - (Table 400-4 and 400-5(A)): Accept in Principle
SUBMITTER: Samuel B. Friedman, BICCGeneral/Rep. CANENA Flexible Cord Harmonization Committee
RECOMMENDATION: Remove TS, HS, HSO and HSOO products from Tables 400-4 and 400-5(A).
SUBSTANTIATION: Survey conducted by UL has indicated that TS, HS, HSO, and HSOO cords are no longer in use nor manufactured. These products will not appear in the new tri-national harmonized flexible cord standard.
PANEL ACTION: Accept in Principle.
Remove TS, HS, HSO and HSOO products from the Code.
PANEL STATEMENT: In addition to the recommendation, reference to these products is being deleted throughout the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3339)

6- 158 - (Table 400-4): Accept in Principle
SUBMITTER: Samuel B. Friedman, BICCGeneral/Rep. CANENA Flexible Cord Harmonization Committee
RECOMMENDATION: Revise number of conductors column for junior hard service cord from 2, 3, 4, or 5 to <u>2-6 with or without grounding conductor.</u>
SUBSTANTIATION: Presently UL permits up to five (5) conductors plus one grounding conductor. Canadian standard permits up to 6 conductors (with or without grounding conductor) and the mexican standard permits two (2) or more conductors for junior hard service cords. The Canena flexible cord harmonization committee decided to permit six (6) conductors with or without grounding conductors, which will be incorporated into the harmonized standard.
PANEL ACTION: Accept in Principle.
Revise number of conductors column for junior hard service cord from 2, 3, 4, or 5 to <u>2-6.</u>
PANEL STATEMENT: This requirement for six conductors is with or without grounding conductor(s) if used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3341)

6- 159 - (Table 400-4): Accept in Principle
SUBMITTER: Samuel B. Friedman, BICCGeneral/Rep. CANENA Flexible Cord Harmonization Committee
RECOMMENDATION: Add NISP-1, NISP-2, NISPT-1, NISPT-2, NISPE-1, and NISPE-2 to Table 400-4. The -1 products will have an insulation thickness of 0.015 in. and a size range of #20 AWG to #18 AWG. The -2 products will have an insulation thickness of 0.030 in. and a size range of #18 AWG to #16 AWG. See suggested revision to Table 400-4. This revision should be inserted before twisted portable cord in Table 400-4. In addition, change outer covering column in Table 400-4 for SP-1, SP-2, SP-3, SPE-1, SPE-2, SPE-3, SPT-1, SPT-2 and SPT-3 to read "None" since these can no longer be nonintegral cords.
SUBSTANTIATION: Several appliances, such as televisions are now required by UL to employ the nonintegral, jacketed version of parallel cord. Since the fittings used with these cords can be different than those used with the integral versions a new type designation was necessary. These new types need to be incorporated in Table 400-4.
Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle.
In addition to the recommendation, modify Notes 1 and 6 to Table 400-4 as follows:
1. All Types listed in Table 400-4 shall have individual conductors twisted together except for Types HPN, SP-1, SP-2, SP-3, SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, SPT-3, TPT, NISP-1, NISP-2, NISPT-1, NISPT-2, NISPE-1, NISPE-2, and three-conductor parallel versions of SRD, SRDE, and SRDT.
6. The third conductor in these cables shall be used for equipment grounding purposes only. The insulation of the grounding conductor for Types SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, SPT-3, NISPT-1, NISPT-2, NISPE-1, and NISPE-2 shall be permitted to be thermoset polymer.
PANEL STATEMENT: These products previously existed under different nomenclature, i.e. SPT-1, non-integral.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3997)

6- 160 - (Table 400-4): Reject
SUBMITTER: Samuel B. Friedman, BICCGeneral
RECOMMENDATION: Add see note 13 in Table 400-4 to type letter column for following products; SE, SEO, SEOO, ST, STO, STOO, SO, SOO, SJE, SJT, SJO, SJEO, SJTO, SJOO, SJEOO, SJTOO, SPT-1, SPT-2.
Add note 13 to notes for Table 400-4 to read as follows:
"Cords that comply with the requirements for outdoor cords and are so listed shall be permitted to be designated as weather and water resistant with the suffix "W" after the code type designation. Cords with the "W" suffix are suitable for use in wet locations."
SUBSTANTIATION: The "W" suffix has been incorporated in UL flexible cord standard to designate cords that are suitable for use in outdoor and wet locations. The products on which this suffix can be used and an explanation of this designation is needed in the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is the same as Proposal 6-156.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
FRIEDMAN: See my Comment on Affirmative on Proposal 6-154.

(Log #3998)

6- 161 - (Tables 400-4 and 400-5(A)): Accept in Principle
SUBMITTER: Samuel B. Friedman, BICCGeneral
RECOMMENDATION: Remove TS, HS, HSO, and HSOO products from Tables 400-4 and 400-5(a).
SUBSTANTIATION: Survey conducted by UL has indicated that TS, HS, HSO, and HSOO cords are no longer in use nor manufactured. These products will not appear in the new tri-national harmonized flexible cord standard.
PANEL ACTION: Accept in Principle.
See panel action for Proposal 6-157.
PANEL STATEMENT: This is a duplicate proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3999)

6- 162 - (Table 400-4): Accept in Principle
SUBMITTER: Samuel B. Friedman, BICCGeneral
RECOMMENDATION: Revise number of conductors column for junior hard service cord from 2, 3, 4, or 5 to 2-6 with or without grounding conductor.
SUBSTANTIATION: Presently UL permits up to five (5) conductors plus one grounding conductor. Canadian standard permits up to 6 conductors (with or without grounding conductor) and the Mexican standard permits two (2) or more conductors for junior hard service cords. The Canena flexible cord harmonization committee decided to permit six (6) conductors with or without grounding conductors, which will be incorporated in the harmonized standard.
PANEL ACTION: Accept in Principle.
See panel action and statement on Proposal 6-158.
PANEL STATEMENT: This is a duplicate proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4001)

6- 163 - (Table 400-4): Accept in Principle
SUBMITTER: Samuel B. Friedman, BICCGeneral
RECOMMENDATION: Add NISP-1, NISP-2, NISPT-1, NISPT-2, NISPE-1, and NISPE-2 to Table 400-4. The -1 products will have an insulation thickness of 0.015 in. and size range of #20 AWG to #18 AWG. The -2 products will have an insulation thickness of 0.030 in. and a size range of #18 AWG to #16 AWG. See suggested revision to Table 400-4. This revision should be inserted before twisted portable cord in Table 400-4. In addition, change outer covering column in Table 400-4 for SP-1, SP-2, SP-3, SPE-1, SPE-2, SPE-3, SPT-1, SPT-2 and SPT-3 to read "None" since these can no longer be nonintegral cords.
(Table shown on following page)
SUBSTANTIATION: Several appliances, such as televisions, are now required by UL to employ the nonintegral, jacketed version of parallel cord. Since the fittings used with these cords can be different than those used with the integral versions, a new type designation was necessary. These new types need to be incorporated into Table 400-4.
PANEL ACTION: Accept in Principle.
See panel statement for Proposal 6-159.
PANEL STATEMENT: This is a duplicate proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2831)

6- 164 - (Table 400-4 Note 9): Accept
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise the Footnote 9 to the Table 400-4 as follows:
9. Insulations and outer coverings that meet the requirements as flame retardant, limited smoke, and are so listed, shall be permitted to be marked for ~~designated~~ limited smoke ~~with the suffix LS~~ after the code type designation.
SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).
Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.
Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.
The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

Trade Name	Type Letter	Size (AWG)	Number of Conductors	Insulation	Nominal Insulation Thickness AWG	Nominal Insulation Thickness Mils	Braid On Each Conductor	Outer Covering	Use		
Non-Integral Parallel Cords	NISP-1 See Note 6	20-18	2 or 3	Thermoset	20-18	15	None	Thermoset	Pendant or Portable	Damp Locations	Not Hard Usage
	NISP-2 See Note 6	18-16			18-16	30					
	NISPE-1 See Note 6	20-18		Thermoplastic Elastomer	20-18	15		Thermoplastic Elastomer			
	NISPE-2 See Note 6	18-16			18-16	30					
	NISPT-1 See Note 6	20-18		Thermoplastic	20-18	15		Thermoplastic			
	NISPT-2 See Note 6	18-16			18-16	30					

(Log #4222)

6- 165 - (400-5): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise the table to read as follows:

Number of Current-Carrying Conductors	Percent of Values in Tables 400-5A and 400-5B
4 through 6	80
7 through 24	70
25 through 42	60
43 and above	50

FPN: Overheating may occur where continuous, fully loaded conductor diversity is less than 50 percent and the number of current-carrying conductors exceeds nine. See Section 310-10.
SUBSTANTIATION: This is a companion proposal to a similar one on Section 310-15(b)(2)(a). Electricians are not installing conductors so as not to energize them, or load them to only half of their normal ampacity. From the 1993 NEC forward the NEC has effectively disallowed any cord make-up with 10 or more conductors. The data on which the panel relied does not translate well into real world experience. A circuit is never 100 percent loaded for continuous periods due to listing restrictions on overcurrent protective devices. Because conductor heating is proportional to the current squared, a very small reduction from maximum current values produces a great reduction in heating. This is why no loss experience has ever been produced stemming from the 50 or more years the 1984 language was in the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-61.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3340)

6- 166 - (Table 400-5(A)): Accept
SUBMITTER: Samuel B. Friedman, BICCGeneral/Rep. CANENA Flexible Cord Harmonization Committee
RECOMMENDATION: Add 13 under heater cord ampacity (5th column) for #17 AWG product.
SUBSTANTIATION: No. 17 AWG HPN product has been requested and will be included in new Tri-national Harmonized Flexible Cord Standard. The 13 Amp rating is found in the Canadian Electrical Code and is in line with 18 and 16 AWG values.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4000)

6- 167 - (Table 400-5(A)): Accept in Principle
SUBMITTER: Samuel B. Friedman, BICCGeneral
RECOMMENDATION: Add 13 under heater cord ampacity (5th column) for #17 AWG product.
SUBSTANTIATION: #17 AWG HPN product has been requested and will be included in new Tri-national Harmonized Flexible Cord Standard. The 13 amp rating is found in the Canadian Electrical Code and is in line with 18 and 16 AWG values.
PANEL ACTION: Accept in Principle.
See panel action for Proposal 6-166.
PANEL STATEMENT: This is a duplicate proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4449)

6- 168 - (Table 400-5(A)): Reject
SUBMITTER: Scott Siefker, Rep. Showmen Supplies, Inc.
RECOMMENDATION: Add subheading "C" to table for ampacities of cable types C, E, EO, PD, S, SJ, SJO, SJOO, SO, SOO, SP-1, SP-2, SP-3, SRD, SV, SVO, SVOO and others for 4-conductor cables and other multiconductor cables connected to utilization equipment so that only 4 conductors are current carrying.
SUBSTANTIATION: In many applications, such as those covered by Article 525, these types of portable cords are used in 3 phase/5 wire systems where 4 of the 5 conductors in a multiconductor cable are current carrying. Adding an additional subheading would alleviate the need for authorities having jurisdiction to frequently perform a mathematical calculation while in the field to verify proper wire sizing.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal is already addressed in the derating requirements in 400-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #342)

6- 169 - (Table 400-5(B)): Reject
SUBMITTER: Siegfried A. Schauffele, Essex Group Inc.
RECOMMENDATION: Add ampacities for single conductor Type W in sizes 600, 700, 750, 800, 900, and 1000 kcmil. These ampacities were taken from Table 310-17.
SUBSTANTIATION: This proposal supplements my proposal to add single conductor Type W sizes 501-1000 kcmil to Table 400-4.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement and action on Proposal 6-149.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
POST: See my Explanation of Negative Vote on Proposal 6-149.

(Log #1248)

6- 170 - (Table 400-5(B)): Accept
SUBMITTER: Technical Correlating Committee National Electrical
RECOMMENDATION: In superscript Note 1 to Table 400-5(B) change "24 in. (610 mm)" to "600 mm (24 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4450)

6- 171 - (Table 400-5(B)): Reject
SUBMITTER: Scott Siefker, Rep. Showmen Supplies, Inc.
RECOMMENDATION: Add subheading "G" to table for ampacities of cable types SC, SCE, SCT, PPE, G and W for 4-conductor cables and other multiconductor cables connected to utilization equipment so that only 4 conductors are current carrying.
SUBSTANTIATION: In many applications, such as those covered by Article 525, these types of portable cords are used in 3 phase/5 wire systems where 4 of the 5 conductors in a multiconductor cable are current carrying. Adding an additional subheading would alleviate the need for authorities having jurisdiction to frequently perform a mathematical calculation while in the field to verify proper wire sizing.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-168.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1249)

6- 172 - (400-6(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "24 in. (610 mm)" to "610 mm (24 in.)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice for 610 mm (24 in.) requirement. The SI units for "610 mm (24 in.)" are not rounded since the measurement is product specific and 610 mm may be required to complete the legend, 600 mm may be too short.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2828)

6- 173 - (400-6(b), FPN): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise the FPN to 400-6(b) as follows:
FPN: Examples of these markings include, but are not limited to, markings suitable for limited smoke, sunlight resistant, etc. ~~"LS" for limited smoke and markings such as "sunlight resistant."~~
SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).
Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.
Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.
The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.
PANEL ACTION: Accept in Principle.
Add the following text to 400-6(b).
"These markings include, but are not limited to, markings for limited smoke, sunlight resistance, etc."
Delete FPN.
PANEL STATEMENT: The panel is implementing a requirement of the NEC Style Manual to delete FPNs and make them Code text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #22)

6- 174 - (400-7(a)): Reject
NOTE: The following proposal consists of Comment 6-74 on Proposal 6-122 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-122 was:
Modify to read:
Flexible cords and cables shall be used only for (1) pendants; (2) wiring of fixtures and signs; (3) connection of portable lamps, portable and mobile signs or appliances; (4) elevator cables; (5) wiring of cranes and hoists; (6) connection of stationary equipment to facilitate their frequent interchange; (7) prevention of the transmission of noise or vibration; (8) appliances where the fastening means and mechanical connections are specifically designed to permit ready removal for maintenance and repair, and the appliance is intended or identified for flexible cord connection; (9) data processing cables as permitted by Section 645-5; (10) connection of moving parts; or (11) temporary wiring as permitted in Sections 305-4(b) and 305-4(c).
SUBMITTER: Tom Dunn, Butler Amusements/Rep. Outdoor Amusement Bus. Assn.
RECOMMENDATION: Add to end of last sentence:
(12) Portable wiring as permitted in Section 525-13.
SUBSTANTIATION: Section 525-13 permits the use of flexible cords and cables and provides direction for their use.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2855)

6- 175 - (400-7(a)(5)): Reject
SUBMITTER: Bill F. Neitzel, Madison, WI
RECOMMENDATION: Add new text after cranes and hoists:
"as permitted in Sections 610-11(c), 610-11(d), and 610-13(c)."
SUBSTANTIATION: Without the added wording, it appears to permit cord connection of cranes and hoists even if the crane/hoist does not require flexibility. This text addition would clarify when cords can be used for cranes/hoists.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2145)

6- 176 - (400-7(a)(6)): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise text to read as follows:
"Connection of stationary, portable or mobile utilization equipment to facilitate their frequent interchange."
SUBSTANTIATION: Within most companies there are manufacturing machines that produce more than one product. To produce so many products on one machine, it must be reconfigured each time during the "process changeover" to produce a different product. This usually entails electrically disconnecting and connecting flexible cords of the mobile or portable utilization equipment. Once the new configuration is done, the machine may run hours to days until it's time to reconfigure and run another product.
PANEL ACTION: Reject.
PANEL STATEMENT: Uses already permitted address the application described in the substantiation, 400-7(a)(6). Proposed text alone would imply an alternate for hard wiring.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PETTIGREW: Although the Panel believes that use outlined in the substantiation is already permitted, there is much confusion in the field over this issue. Stationary equipment is not clearly defined in the NEC and there is not a general understanding of what it means. Equipment described in the substantiation is not considered as stationary equipment in the field. The equipment described in the substantiation can be skid mounted and moved by a forklift or it can be equipment mounted on wheels and can be rolled into place. This equipment is often defined as mobile equipment or sometimes defined as portable equipment, although you cannot pick it up without mechanical assistance. Adding the proposed wording would clarify what the Panel says is already permitted.

(Log #882)

6- 177 - (400-7(a)(12) (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add a new paragraph (12) to read as follows:
(12) feeders as permitted in Sections 550-5, 553-7, and 555-6.
SUBSTANTIATION: Since chapters other than 1 through 4 are referenced, the proposed sections should be included, for user friendliness.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3690)

6- 178 - (400-7(e)(12) (New)): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add text to read:
(12) Portable wiring as permitted in Section 525.13.
SUBSTANTIATION: Section 400-8 prohibits the use of flexible cords or cables as the permanent wiring of a structure. This forces the use of THHN wires run through same wireway for the permanent wiring on portable amusement rides. As these rides move, either during their operation or during their transportation from one location to another, this (THHN) type of wiring is subjected to wear which it wouldn't be subjected to as the wiring of an immovable building or structure. There are situations where, within one circuit, the wiring switches from flexible cable to wires within wireway and back to flexible cable again. By allowing the use of flexible cable, in one continuous run, these splices can be eliminated.
There have been no problems encountered with the use of flexible cords or cables as the permanent wiring on portable rides. Flexible cords or cables have been installed along the steel structural members, as well as within structural members and wireways successfully.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4384)

6- 179 - (400-8): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add text to read:
"For the purpose of this section ventilated, non-acoustical type ceiling panels such as eggcrate type shall be considered as dropped or suspended ceilings."
SUBSTANTIATION: Ceiling panels are sometimes used in dropped or suspended ceilings that are not completely solid, such as used for aesthetic or ventilation purposes or where light fixtures are located directly above them. In these applications if flexible cord is installed above the ceiling tile, it is not visible unless standing directly beneath it. Where other equipment is located below the cord and above the ceiling panel, the cord is not visible at all. There are many other readily available wiring methods that can be used in these situations. Flexible cord should not be permitted above ceilings of any type.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation is covered by 400-8(5). See the definition of "concealed" for additional clarification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #23)

6- 180 - (400-8 Exceptions No. 1 and No. 2 (New)): Reject
NOTE: The following proposal consists of Comment 6-76 on Proposal 6-127 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-127 was:
Revise and designate the existing exception as Exception No. 1 and add a second exception as follows:
Exception No. 1: Flexible cord and cable shall be permitted to have one connection to the building surface for a suitable tension take-up device. Length of the cord or cable from the supply termination to the take-up device shall be limited to 8 ft (2.44 m).
Exception No. 2: Flexible cord shall be permitted to be installed in raceways where its calculated ampacity has been further derated by a factor of 0.8, or where its ampacity has been calculated under Section 310-15(b).
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in Principle revise proposed Exception No. 2:
Listed flexible cord lighting strings with integral (molded) lampholders and means for attachment of support shall be permitted to be attached to building or structure surfaces, where installed in conformance with Article 305.
SUBSTANTIATION: These assemblies are commonly supported overhead during building construction. Many have molded tabs for support attachment. This comment would correlate with Proposal 3-167.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #883)

6- 181 - (400-8 Exception No. 2 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception No. 2: Listed flexible cord lighting strings with integral (molded) lampholders and means for attachment of supports shall be permitted to be attached to building, or other structure surfaces where installed in conformance with Article 305.
SUBSTANTIATION: Listed flexible cord lighting strings are commonly supported overhead during building construction, which is practical and safe. Many have molded tabs at intervals for support purposes.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is a redundant reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #884)

6- 182 - (400-8(2) and (5)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(2) Where run through holes in walls, structural ceilings or floors, suspended ceilings, or dropped ceilings.
(5) Where concealed behind building walls, structural ceilings or floors, or installed above suspended or dropped ceilings. ~~or floors.~~
SUBSTANTIATION: Editorial. The definition of concealed indicates a flexible cord above a suspended or dropped ceiling with lift-out titles or access panel is not concealed, especially if the ceiling is not a structural component. Designating the floor as structural would correlate with Section 645-5(d).
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation does not further clarify the existing text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4223)

6- 183 - (400-8(4), Exception): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
"Flexible cord and cable shall be permitted to be attached to building surfaces in accordance with the provisions of Section 364-8. For other applications, where the length of the cord from the supply termination to a suitable tension take-up device is limited to 8 feet (2.44 m), flexible cord shall be permitted to have one connection to the building surface."

SUBSTANTIATION: This proposal allows for traditional cord extensions from other, non-busway sources such as overhead wireways. The present NEC isn't clear whether or not that entire family of cord use dropped out of the 1999 Code. The 1999 rule only mentions Section 364-8, and the scope of that section only covers extensions from busways (naturally, since that's what Article 364 covers.) One theory holds that "the provisions" involved here are the installation rules for similar applications, such as that the vertical drop be vertical and so on. The other, more literal theory, holds that no cords can extend to a take-up device unless they originate at a busway.

The latter view represents an enormous change in standard installation practice, and there wasn't a shred of technical substantiation in the last Code cycle to support such a preposterous restriction. This proposal, by covering other non-busway applications in a separate sentence, clearly allows those other applications to continue.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any technical substantiation to support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3638)

6- 184 - (400-8(4) Exception No. 1 (New)): Reject
SUBMITTER: Will Dockham, Gilmanton Iron Works, NH
RECOMMENDATION: Change the existing Exception to Exception No. 2, and add the following new Exception No. 1:

Exception No. 1: Flexible cord and cable shall be permitted to have one connection to the building surface for a suitable tension take-up device. Length of the cord or cable from the supply termination to the tension take-up device shall be limited to 6 ft (1.83 m).

Exception No. 2: Flexible cord and cable run from busways shall be permitted to be attached to building surfaces in accordance with the provisions of Section 364-8.
SUBSTANTIATION: Changes to Section 400-8(4) Exception, in the 1999 NEC, have caused considerable confusion because of the reference to Section 364-8. Many inspectors have interpreted the exception to allow connection to building surface only when cord or cable is run from busway. That certainly was not the intent of Proposal 6-127 (Proposals to the 1999 NEC, Log #3205). Also, the panel gave no substantiation for limiting the connection of cord or cable to building surfaces via a tension take-up device, to busway installations only.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-183.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2501)

6- 185 - (400-8(5)): Reject
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
RECOMMENDATION: Revise as follows:

(5) Where ~~concealed~~ located behind building walls, structural ceilings, suspended ceilings, dropped ceilings, or floors.
SUBSTANTIATION: As now written there is a conflict with the panel intent since the word "concealed" as used in this section would permit cords in these locations based on the definition of "concealed" in Article 100.
PANEL ACTION: Reject.
PANEL STATEMENT: Existing code text and the definition of "concealed" adequately address this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3364)

6- 186 - (400-8(5)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise 400-8(5) to read as follows:

5. Where ~~concealed~~ located behind building walls, structural ceilings, suspended ceilings, dropped ceilings, or floors.
SUBSTANTIATION: As presently worded the argument can be made that the wiring behind a suspended (accessible) ceiling may not be considered concealed especially when reviewing the definitions for concealed and exposed. Other sections such as 410-30(c)(1)(b) require that cords are continuously visible for their entire length. Flexible cord located out of site such as behind suspended ceiling panels is subject to damage or fatigue which would not be readily detected. Various flexible wiring methods are readily available for connecting equipment in these locations.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-185.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3067)

6- 187 - (400-8(6), Exception (New)): Reject
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add an exception to 400-8(b) as follows:

"Exception: Flexible cord and cable shall be permitted to be installed in raceways where its calculated ampacity has been further derated by a factor of 0.8, or where its ampacity has been calculated under Section 310-15(b)."
SUBSTANTIATION: Flexible cords and cables are typically used in exposed locations where ambient air circulates. In applications where these cords and cables are installed in raceways, an additional factor must be incorporated into the formula to make an allowance for the heat generated.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed recommendation would permit the use of flexible cord for permanent wiring which is presently limited in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3675)

6- 188 - (400-8(d)(4)): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for action in Article 410. This action will be considered by Code-Making Panel 18 as a Public Comment.
SUBMITTER: George Ferguson, Eastern Michigan Univ.
RECOMMENDATION: Revise text to read as follows:

"410.8(d)(4) Recessed fluorescent fixtures installed in the wall or ~~on~~ the ceiling...".
SUBSTANTIATION: If the fixture were installed "on" the ceiling it would be surface mounted, not recessed. Omitting the word "on" would keep it a recessed fixture.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal should be referred to Panel 18.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2039)

6- 189 - (400-9): Reject
SUBMITTER: Mark O. Wise, Merritt Island, FL
RECOMMENDATION: Revise text to read as follows:

400-9. Splices. Flexible cord shall be used only in continuous lengths without splice or tap where initially installed in applications permitted by Section 400-7(a). The repair of hard-service cord and junior hard-service cord (See Trade Name column in Table 400-4) No. ~~14~~ 12 and larger shall be permitted if conductors are spliced in accordance with Section 110-14(b) and the completed splice retains the insulation, outer sheath properties, and usage characteristics of the cord being spliced.

SUBSTANTIATION: If left unrevised, this Article is in conflict with OSHA 1910.305(g).
PANEL ACTION: Reject.
PANEL STATEMENT: There may be other uses for No. 14 so by deleting its use it would eliminate its use in other applications.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2042)

6- 190 - (400-9): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Revise text to read as follows:
"The repair of hard-service and junior hard-service cord No. 12 and larger shall be permitted."
SUBSTANTIATION: To correlate with OSHA 29 CFR Part 1910.305.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 6-189.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1246)

6- 191 - (400-21, Exception): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "45 mils" to "1.14 mm (45 mil)" and "30 mils" to "0.76 mm (30 mil)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4298)

6- 192 - (400-22): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 5 and 15 for information.
SUBMITTER: Charles F. Mello, Milwaukie, OR
RECOMMENDATION: Revise text to read as follows:
400.22. Grounded-Conductor Identification. One conductor of flexible cords that is intended to be used as a grounded circuit conductor shall have a continuous marker that readily distinguishes it from the other conductor or conductors. The identification shall consist of one of the methods indicated in (a) through (f).
(a) Colored Braid. A braid finished to show a white or ~~natural~~ gray color and the braid on the other conductor or conductors finished to show a readily distinguishable solid color or colors.
(b) Tracer in Braid. A tracer in a braid of any color contrasting with that of the braid and no tracer in the braid of the other conductor or conductors. No tracer shall be used in the braid of any conductor of a flexible cord that contains a conductor having a braid finished to show white or ~~natural~~ gray.
Exception: In the case of Types C and PD and cords having the braids on the individual conductors finished to show white or ~~natural~~ gray. In such cords, the identifying marker shall be permitted to consist of the solid white or ~~natural~~ gray finish on one conductor provided there is a colored tracer in the braid of each other conductor.
(c) Colored Insulation. A white or ~~natural~~ gray insulation on one conductor and insulation of a readily distinguishable color or colors on the other conductor or conductors for cords having no braids on the individual conductors.
For jacketed cords furnished with appliances, one conductor having its insulation colored light blue, with the other conductors having their insulation of a readily distinguishable color other than white or ~~natural~~ gray.
Exception: Cords that have insulation on the individual conductors integral with the jacket. The insulation shall be permitted to be covered with an outer finish to provide the desired color.
(d) Colored Separator. A white or ~~natural~~ gray separator on one conductor and a separator of a readily distinguishable solid color on the other conductor or conductors of cords having insulation on the individual conductors integral with the jacket.
SUBSTANTIATION: Delete the word natural since the color natural gray is not defined and in fact does not exist as a specified color for wire insulation. This proposal goes with the definition of gray within a specified range of color per the Munsell color system as used by industry for wire color coding. The definition of the gray is provided in another proposal.
PANEL ACTION: Accept.
PANEL STATEMENT: This change may effect other parts of the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2518)

6- 193 - (400-22(a) through (f)): Accept in Principle
SUBMITTER: Richard E. Loyd, Perryville, AR
RECOMMENDATION: Revise as follows:
(a) Colored Braid. A braid finished to show a white ~~or natural gray color~~ and the braid on the other conductor or conductors finished to show a readily distinguishable solid color or colors.
(b) Tracer in Braid. A tracer in a braid of any color contrasting with that of the braid and no tracer in the braid of the other conductor or conductors. No tracer shall be used in the braid of any conductor of a flexible cord that contains a conductor having a braid finished to show white ~~or natural gray.~~
Exception: In the case of Types C and PD and cords having the braids on the individual conductors finished to show white or natural gray. In such cords, the identifying marker shall be permitted to consist of the solid white ~~or natural gray finish~~ on one conductor provided there is a colored tracer in a braid of each other conductor.
(c) Colored Insulation. A white ~~or natural gray~~ insulation on one conductor and insulation of a readily distinguishable color or colors on the other conductor or conductors for cords having no braids on the individual conductors.
For jacketed cords furnished with appliances, one conductor having its insulation colored light blue with the other conductors having their insulation of a readily distinguishable color other than white ~~or natural gray.~~
Exception: Cords that have insulation on the individual conductors integral with the jacket. The insulation shall be permitted to be covered with an outer finish to provide the desired color.
(d) Colored Separator. A white ~~or natural gray~~ separator on one conductor and a separator of a readily distinguishable solid color on the other conductor or conductors of cords having insulation on the individual conductors integral with the jacket.
(e) Tinned Conductors. One conductor having the individual strands untined for cords having insulation on the individual conductors integral with the jacket.
(f) Surface Marking. One or more stripes, ridges, or grooves located on the exterior of the cord so as to identify one conductor for cords having insulation on the individual conductors integral with the jacket.
SUBSTANTIATION: This term is undefined. The past Chairman of CMP 5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.
There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufactures use various shades of each color and often two or three different manufactures wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.

PANEL ACTION: Accept in Principle.
Do not delete the word "gray".
PANEL STATEMENT: See panel action on Proposal 6-192.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3434)

6- 194 - (400-22(a)): Accept
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text to read as follows:
(a) Colored Braid. A braid finished to show a white or ~~natural~~ gray color and the braid on the other conductor or conductors finished to show a readily distinguishable solid color or colors.
SUBSTANTIATION: The term "natural gray" specifies a particular shade of gray which few electricians actually know what the color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3435)

6- 195 - (400-22(b)): Accept
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text to read as follows:
(b) Tracer in Braid. A tracer in a braid of any color contrasting with that of the braid and no tracer in the braid of the other conductor or conductors. No tracer shall be used in the braid of any conductor of a flexible cord that contains a conductor having a braid finished to show white or ~~natural~~ gray.
SUBSTANTIATION: The term "natural gray" specifies a particular shade of gray which few electricians actually know what the color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3436)

6- 196 - (400-22(c)): Accept
SUBMITTER: Patrick White, Pompano Beach, FL
RECOMMENDATION: Revise text to read as follows:
(c) Colored Insulation. A white or ~~natural~~ gray insulation on one conductor and insulation of a readily distinguishable color or colors on the other conductor or conductors for cords having no braids on the individual conductors.
For jacketed cords furnished with appliances, one conductor having its insulation colored light blue, with the other conductors having their insulation of a readily distinguishable color other than white or ~~natural~~ gray.
SUBSTANTIATION: The term "natural gray" specifies a particular shade of gray which few electricians actually know what the color is. In practice gray (no specific shade) is used as a neutral conductor and this change would accept a common practice. There are various shades of white and this section does not specify any particular shade of white.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1495)

6- 197 - (400-25 (New)): Accept
SUBMITTER: Siegfried A. Schauffele, Essex Group Inc.
RECOMMENDATION: Add the following new section:
400-25. The outer covering of flexible cords and cables shall be flame retardant.
SUBSTANTIATION: Flexible cords and cables are used without the protection of raceways, and are directly exposed to many external fire hazards. Current (UL) requirements for some portable power cables such as type W, G, G-GC do not require a flame test.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PETTIGREW: I disagree with the Panel Action because there is insufficient data in the substantiation to warrant this change in the Code. If there is a need for flame retardant flexible cords or cables in specific applications, there are existing types (elevator cable, for example) which can be used. The submitter presented no backup documentation to support the general nature of the proposal, such as statistical data on the frequency of fires where flexible cords or cables were involved. The Panel Action could result in the requirement that these cables now be listed, which may not be the result intended by the submitter. In the field, flexible cords and cables are often used over and over. If not marked or identified in accordance with this proposal, would all the existing cables in use have to be replaced at significant costs to the owners?
COMMENT ON AFFIRMATIVE:
GALAN: The submitter's intent is that all portable cables comply with a flame test. The proposed new paragraph states that the outer covering is flame retardant. We believe the proper wording should be:
"400-25. Flexible cords and cables shall be flame retardant."

(Log #885)

6- 198 - (400-30, FPN (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add a fine print note to read as follows:
FPN: See Section 90-2(b) for installations not covered by this code.
SUBSTANTIATION: Editorial. Code users may easily overlook provisions of Section 90-2(b).
PANEL ACTION: Reject.
PANEL STATEMENT: This FPN does not add any additional information to the requirements in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1494)

6- 199 - (400-37 (New)): Accept
NOTE: The Technical Correlating Committee directs the panel to add a title to the new section 400-37 in accordance with the Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Siegfried A. Schauffele, Essex Group Inc.
RECOMMENDATION: Add the following new section:
400-37. The outer covering of portable cables shall be flame retardant.
SUBSTANTIATION: Portable cables are used without the protection of raceways and are directly exposed to many external fire hazards. Current (UL) requirements for some portable power cables such as type W, G, G-GC, do not require a flame test.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PETTIGREW: See my Explanation of Negative Vote on Proposal 6-197.

ARTICLE 402 — FIXTURE WIRES

(Log #536)

6- 200 - (402): Reject
SUBMITTER: Paul Petit, American Insulated Wire Corp.
RECOMMENDATION: Create four new 60°C wet-rated fixture wires Types TFW, TFFW, TFWN and TFFWN

Additions to Table 402-3

Thermoplastic Covered Fixture Wire-Solid or 7-Strand	TFW	Thermoplastic	18-16 30	None	60°C 140°F Wet or Dry	Fixture Wiring
Thermoplastic Covered Fixture Wire-Flexible Stranding	TFFW	Thermoplastic	18-16 30	None	60°C 140°F Wet or Dry	Fixture Wiring
Heat-resistant Thermoplastic Covered Fixture Wire-Solid or 7-Strand	TFWN	Thermoplastic	18-16 15	Nylon-jacketed or Equivalent	90°C 194°F Dry 60°C 140°F Wet	Fixture Wiring
Heat-resistant Thermoplastic Covered Fixture Wire-Flexible Stranded	TFFWN	Thermoplastic	18-16 15	Nylon-jacketed or Equivalent	90°C 194°F Dry 60°C 140°F Wet	Fixture Wiring

SUBSTANTIATION: There is a need for wet rated 18 AWG and 16 AWG Fixture Wires. Authorities having jurisdiction want assurances that the fixture wires being used have some kind of wet rating, as in similarly constructed Appliance Wires, such as Style 1408 which has a 60°C wet rating. Water can enter in the raceways where these products are used, (in fire alarm or gasoline pump applications.) which is cause for removal when the wire doesn't have a wet rating.
PANEL ACTION: Reject.
PANEL STATEMENT: No fact finding report has been submitted for a new product type.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1250)

6- 201 - (Table 402-3): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add SI units for insulation thicknesses using the following conversion table.
Under "Thickness of Insulation" add a new column entitled "mm" before "Mils" and insert the SI equivalents for the nominal insulation thickness based on the table.

Conversion Table for Insulation Thickness Values in Table 402-3 of 1999 NEC

mm	Mils
0.14	5.5
0.21	8.4
0.25	10
0.36	14
0.38	15
0.51	20
0.76	30
1.02	40
1.14	45

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2028)

6- 202 - (Table 402-3): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 8 for correlation in its respective articles and annexes.
This action will be considered by the Panel as a Public Comment.
SUBMITTER: Siegfried A. Schauffele, Superior Essex
RECOMMENDATION: Delete Type AF wire in its entirety.
SUBSTANTIATION: This asbestos insulated wire is no longer manufactured. It is not listed in UL Standard 62 and the 1999 UL Electrical Construction Equipment Directory (the green book) does not show any manufacturers.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2243)

6- 203 - (Table 402-3): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" (or "flame retardant") to "flame tested" in "*" note at the end of the Table 402-3.
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement for Proposal 6-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1EXPLANATION OF NEGATIVE:
GANATRA: See my Explanation of Negative Vote on Proposal 6-3.

(Log #3066)

6- 204 - (Table 402-3): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Extend the range of sizes on Types SF-2 and SFF-2 to include 12 AWG and 10 AWG. Nominal insulation thickness to be 30 mils on 12 AWG and 45 mils on 10 AWG.
SUBSTANTIATION: Customers are presently purchasing larger sizes of "SF-2" and "SFF-2" under AWM Styles 3074, 3075, 3070, and 3101. Larger sizes of fixture wire are currently allowed on Type XFF, including 12 and 10 AWG.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2832)

6- 205 - (Table 402-3 Note): Accept
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise the Footnote to Table 402-3 as follows:
*Insulations and outer coverings that meet the requirements of flame retardant, limited smoke and are so listed shall be permitted to be marked for ~~designated~~ limited smoke ~~with the suffix LS~~ after the code type designation.
SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).
Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.
Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.
The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1078)

6- 206 - (402-6): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 18" to "18 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3 or in Table 402-3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement Proposal on 6-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #886)

6- 207 - (402-8): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
~~One conductor of~~ Fixture A fixture wire~~s~~ that is intended to be used as a grounded conductor shall be identified by means of continuous white stripes or by the means described in Sections 400-22(a) through (e).
SUBSTANTIATION: Editorial. More than one conductor of fixture wires may be a grounded conductor (multiple sets in a raceway, fixtures with multiple pairs of conductors).
The proposal specifies the stripe(s) to be continuous and white.
PANEL ACTION: Reject.
PANEL STATEMENT: Requirements for conductor marking are already covered.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1865)

6- 208 - (402-9(a)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 402-9(a) in its entirety and reidentify (b) and (c) to (a) and (b) respectively.
SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3 and 4 apply generally.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1251)

6- 209 - (402-9(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "24 in. (610 mm)" to "610 mm (24 in.)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. industry practice for 610 mm (24 in.) requirement. The SI units for "610 mm (24 in.)" are not rounded since the measurement is product specific and 610 mm may be required to complete the legend, 600 mm may be too short.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2829)

6- 210 - (402-9(c), FPN): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA T Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise the FPN to 402-9(c) as follows:
FPN: Examples of these markings include~~,~~ but are not limited to~~,~~ markings suitable for limited smoke, sunlight resistant, etc. ~~"LS" for limited smoke and markings such as "sunlight resistant."~~
SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).

Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.

Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.

The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.

PANEL ACTION: Accept in Principle.

Add the following text to 402-9(c).

"These markings include, but are not limited to, markings for limited smoke, sunlight resistance, etc."

Delete FPN.

PANEL STATEMENT: The panel is implementing a requirement of the NEC Style Manual to delete FPNs and make them Code text.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #887)

6- 211 - (402-11, Exception): Accept in Principle

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Exception: ~~As~~ Fixture wires shall be permitted in accordance with Section 620-11 for elevators and dumbwaiters, Section 725-27 for Class 1 circuits, Section 725-52 for Class 2 and Class 3 circuits, and Section 760-27 for fire alarm circuits.

SUBSTANTIATION: Revised to sentence form with additional sections where use is permitted. Section 620-11 does not limit use to Class 1 circuits. Section 725-52 only requires an insulation rating which fixture wires comply with, and if suitable for Class 1 use should be suitable for Class 2 and 3.

PANEL ACTION: Accept in Principle.

Delete the existing exception.

PANEL STATEMENT: See first sentence of the substantion for Proposal 6-208.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

ARTICLE 410 — LIGHTING FIXTURES, LAMPHOLDERS, LAMPS, AND RECEPTACLES

(Log #547)

18- 3 - (410): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: a) Section 410-3 Exception: Replace "8 ft (2.44 m)" with "2.5 m (8 ft)".

b) Section 410-4(d): Replace "3 ft (914 mm)" with "900 mm (3 ft)"; Replace "8 ft (2.44 m)" with "2.5 m (8 ft)".

c) Section 410-6: Replace "8 ft (2.44 m)" with "2.5 m (8 ft)".

d) Section 410-8(a): Replace "6 ft (1.83 m)" with "1.8 m (6 ft)"; Replace "24 in. (610 mm)" with "600 mm (24 in.)"; Replace "12 in. (305 mm)" with "300 mm (12 in.)" in 2 locations.

e) Section 410-8(d): Replace "12 in. (305 mm)" with "300 mm (12 in.)"; Replace "6 in. (152 mm)" with "150 mm (6 in.)" in 3 locations.

f) Section 410-15(a): Replace "6 lb (2.72 kg)" with "3 kg (6 lb)"; Replace "16 in. (406 mm)" with "400 mm (16 in.)".

g) Section 410-15(b)(1): Replace "2 in. x 4 in. (50.8 mm x 102 mm)" with "50 mm x 100 mm (2 in. x 4 in.)".

h) Section 410-15(b)(1) Exception No. 1: Replace "8 ft (2.44 m)" with "2.5 m (8 ft)".

i) Section 410-15(b)(1) Exception No. 2: Replace "20 ft (6.10 m)" with "6.0 m (20 ft)".

j) Section 410-15(b)(3) Exception: Replace "8 ft (2.44 m)" with "2.5 m (8 ft)".

k) Section 410-16(a): Replace "50 lb (22.7 kg)" with "23 kg (50 lb)" in 2 locations.

l) Section 410-18(a): Replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)".

m) Section 410-27(c): Replace "3 ft (914 mm)" with "900 mm (3 ft)".

n) Section 410-29(c): Replace "2 in. (50.8 mm)" with "50 mm (2 in.)"; Replace "12 in. (305 mm)" with "300 mm (12 in.)".

o) Section 410-30(a): Replace "3/8-in." with "12 (3/8)"; Replace "9/32 in. (7.14 mm)" with "7 mm (9/32 in.)"; Replace "13/32 in. (10.3 mm)" with "11 mm (13/32 in.)".

p) Section 410-31: Replace "3 in. (76 mm)" with "75 mm (3 in.)".

q) Section 410-35(a): Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".

r) Section 410-38(a): Replace "0.040 in. (1.016 mm)" with "1.02 mm (0.040 in.)"; Replace "0.025 in. (0.635 mm)" with "0.64 mm (0.025 in.)".

s) Section 410-38(b): Replace "8 lb (3.63 kg)" with "4 kg (8 lb)"; Replace "0.020 in. (0.508 mm)" with "0.51 mm (0.020 in.)" in 2 locations; Replace "0.016 in. (0.4064 mm)" with "0.41 mm (0.016 in.)".

t) Section 410-38(c): Replace "0.025 in. (0.635 mm)" with "0.64 mm (0.025 in.)"; Replace "3 1/2 in. (89 mm)" with "90 mm (3 1/2 in.)".

u) Section 410-46: Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".

v) Section 410-50: Replace "1/8 in. (3.18 mm)" with "3 mm (1/8 in.)".

w) Section 410-56(d): Replace "0.030 in. (0.762 mm)" with "0.76 mm (0.030 in.)"; Replace "0.040 in. (1.016 mm)" with "1.02 mm (0.040 in.)"; Replace "0.010 in. (2.54 mm)" with "2.54 mm (0.010 in.)" in 2 locations.

x) Section 410-56(e): Replace "0.015 in. (0.381 mm)" with "0.4 mm (0.015 in.)".

y) Section 410-66(a)(1): Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".

z) Section 410-66(b): Replace "3 in. (76 mm)" with "75 mm (3 in.)".

aa) Section 410-67(c): Replace "1 ft (305 mm)" with "300 mm (1 ft)"; Replace "18 in. (450 mm)" with "450 mm (18 in.)"; Replace "6 ft (1.83 m)" with "1.8 m (6 ft)".

bb) Section 410-70: Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".

cc) Section 410-76(b): Replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)".

dd) Section 410-76(b) FPN: Replace "20 lb/ft^3 (320.36 kg/m^3)" with "320 kg/m^3 (20 lb/ft^3)" in 2 locations.

ee) Section 410-77(c): Replace "3/8-in." with "12 (3/8) trade size"; Replace "25 ft (7.62 m)" with "7.5 m (25 ft)".

ff) Section 410-91: Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".

gg) Section 410-101(c): Replace "5 ft (1.52 m)" with "1.5 m (5 ft)"; Replace "3 ft (914 mm)" with "900 mm (3 ft)"; Replace "8 ft (2.44 m)" with "2.5 m (8 ft)".

hh) Section 410-104: Replace "4 ft (1.22 m)" with "1.2 m (4 ft)" in 2 locations.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #633)

18- 4 - (410): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts as modified by Proposal 18-5.

SUBMITTER: Jack Wells, Pass & Seymour/Legrand

RECOMMENDATION: Revise Article 410 for receptacles, cord connectors and attachment plugs (cord caps) as proposed below:

ARTICLE 410 -- Lighting Fixtures, Lampholders, and Lamps~~, and Receptacles~~

A. General

410-1. Scope

This article covers lighting fixtures, lampholders, pendants, ~~receptacles,~~ incandescent filament lamps, arc lamps, electric-discharge lamps, the wiring and equipment forming part of such lamps, fixtures, and lighting installations.

FPN: The international term for a lighting fixture is luminaire and is defined as a complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply.

410-2. Application of Other Articles

Equipment for use in hazardous (classified) locations shall conform to Articles 500 through 517. Lighting systems operating at 30 volts or less shall conform to Article 411. Arc lamps used in theaters shall comply with Section 520-61, and arc lamps used in projection machines shall comply with Section 540-20. Arc lamps used on constant-current systems shall comply with the general requirements of Article 490.

410-3. Live Parts

Fixtures, lampholders, and lamps~~, and receptacles~~ shall have no live parts normally exposed to contact. Exposed accessible terminals in lampholders, ~~receptacles,~~ and switches shall not be installed in metal fixture canopies or in open bases of portable table or floor lamps.

Exception: Cleat-type lampholders ~~and receptacles~~ located at least 8 ft (2.44 m) above the floor shall be permitted to have exposed terminals.

B. Fixture Locations

410-4. Fixtures in Specific Locations

(a) Wet and Damp Locations. Fixtures installed in wet or damp locations shall be installed so that water cannot enter or accumulate in wiring compartments, lampholders, or other electrical parts. All fixtures installed in wet locations shall be marked, "Suitable for Wet Locations." All fixtures installed in damp locations shall be marked, "Suitable for Wet Locations" or "Suitable for Damp Locations."

(b) Corrosive Locations. Fixtures installed in corrosive locations shall be of a type suitable for such locations.

(c) In Ducts or Hoods. Fixtures shall be permitted to be installed in commercial cooking hoods where all of the following conditions are met.

1. The fixture shall be identified for use within commercial cooking hoods and installed so that the temperature limits of the materials used are not exceeded.

2. The fixture shall be constructed so that all exhaust vapors, grease, oil, or cooking vapors are excluded from the lamp and wiring compartment. Diffusers shall be resistant to thermal shock.

3. Parts of the fixture exposed within the hood shall be corrosion resistant or protected against corrosion, and the surface shall be smooth so as not to collect deposits and facilitate cleaning.

4. Wiring methods and materials supplying the fixture(s) shall not be exposed within the cooking hood.

FPN: See Section 110-11 for conductors and equipment exposed to deteriorating agents.

(d) Bathtub and Shower Areas. No parts of cord-connected fixtures, hanging fixtures, lighting track, pendants, or ceiling-suspended (paddle) fans shall be located within a zone measured 3 ft (914 mm) horizontally and 8 ft (2.44 m) vertically from the top of the bathtub rim or shower stall threshold. This zone is all encompassing and includes the zone directly over the tub or shower stall.

410-5. Fixtures Near Combustible Material

Fixtures shall be constructed, or installed, or equipped with shades or guards so that combustible material will not be subjected to temperatures in excess of 90°C (194°F).

410-6. Fixtures Over Combustible Material

Lampholders installed over highly combustible material shall be of the unswitched type. Unless an individual switch is provided for each fixture, lampholders shall be located at least 8 ft (2.44 m) above the floor, or shall be located or guarded so that the lamps cannot be readily removed or damaged.

410-7. Fixtures in Show Windows

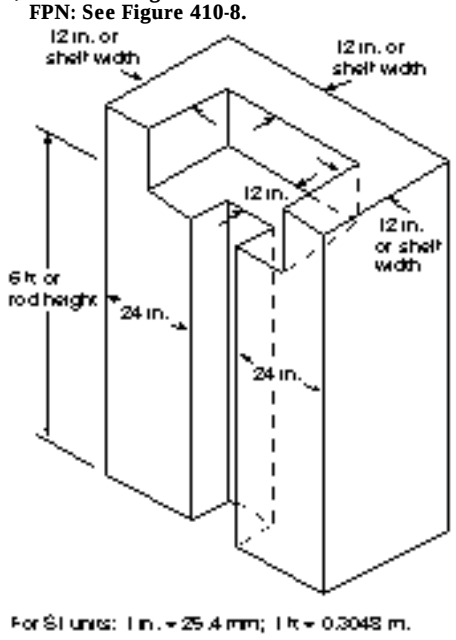
Chain-supported fixtures used in a show window shall be permitted to be externally wired. No other externally wired fixtures shall be used.

410-8. Fixtures in Clothes Closets

(a) Definition.

Storage Space. Storage space shall be defined as a volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height of 6 ft (1.83 m) or the highest clothes-hanging rod and parallel to the walls at a horizontal distance of 24 in. (610 mm) from the sides and back of the closet walls respectively, and continuing vertically to the closet ceiling parallel to the walls at a horizontal distance of 12 in. (305 mm) or the width of the shelf, whichever is greater.

FPN: See Figure 410-8.



For SI units: 1 in. = 25.4 mm; 1 ft = 0.3048 m.

Figure 410-8 Closet storage space.

For a closet that permits access to both sides of a hanging rod, the storage space shall include the volume below the highest rod extending 12 in. (305 mm) on either side of the rod on a plane horizontal to the floor extending the entire length of the rod.

(b) Fixture Types Permitted. Listed fixtures of the following types shall be permitted to be installed in a closet:

1. A surface-mounted or recessed incandescent fixture with a completely enclosed lamp

2. A surface-mounted or recessed fluorescent fixture

(c) Fixture Types Not Permitted. Incandescent fixtures with open or partially enclosed lamps and pendant fixtures or lampholders shall not be permitted.

(d) Location. Fixtures in clothes closets shall be permitted to be installed as follows.

1. Surface-mounted incandescent fixtures installed on the wall above the door or on the ceiling, provided there is a minimum clearance of 12 in. (305 mm) between the fixture and the nearest point of a storage space.

2. Surface-mounted fluorescent fixtures installed on the wall above the door or on the ceiling, provided there is a minimum clearance of 6 in. (152 mm) between the fixture and the nearest point of a storage space.

3. Recessed incandescent fixtures with a completely enclosed lamp installed in the wall or the ceiling, provided there is a minimum clearance of 6 in. (152 mm) between the fixture and the nearest point of a storage space.

4. Recessed fluorescent fixtures installed in the wall or on the ceiling, provided there is a minimum clearance of 6 in. (152 mm) between the fixture and the nearest point of a storage space.

410-9. Space for Cove Lighting

Coves shall have adequate space and shall be located so that lamps and equipment can be properly installed and maintained.

C. Provisions at Fixture Outlet Boxes, Canopies, and Pans

410-10. Space for Conductors
Canopies and outlet boxes taken together shall provide adequate space so that fixture conductors and their connecting devices can be properly installed.
410-11. Temperature Limit of Conductors in Outlet Boxes
Fixtures shall be of such construction or installed so that the conductors in outlet boxes shall not be subjected to temperatures greater than that for which the conductors are rated.
Branch-circuit wiring, other than 2-wire or multiwire branch-circuits supplying power to fixtures connected together, shall not be passed through an outlet box that is an integral part of a fixture unless the fixture is identified for through-wiring.
FPN: See Section 410-31, Exceptions No. 2 and 3 for circuits supplying power to fixtures connected together.
410-12. Outlet Boxes to Be Covered
In a completed installation, each outlet box shall be provided with a cover unless covered by means of a fixture canopy, lampholder, receptacle, or similar device.
410-13. Covering of Combustible Material at Outlet Boxes
Any combustible wall or ceiling finish exposed between the edge of a fixture canopy or pan and an outlet box shall be covered with noncombustible material.
410-14. Connection of Electric-Discharge Lighting Fixtures
(a) Independent of the Outlet Box. Electric-discharge lighting fixtures supported independent of the outlet box shall be connected to the branch circuit through metal raceway, nonmetallic raceway, Type MC cable, Type AC cable, Type MI cable, nonmetallic sheathed cable, or by flexible cord as permitted in Section 410-30(b) or (c).
(b) Access to Boxes. Electric-discharge lighting fixtures surface mounted over concealed outlet, pull, or junction boxes shall be installed with suitable openings in back of the fixture to provide access to the boxes.
D. Fixture Supports
410-15. Supports
(a) General. Fixtures~~,~~ and lampholders~~, and receptacles~~ shall be securely supported. A fixture that weighs more than 6 lb (2.72 kg) or exceeds 16 in. (406 mm) in any dimension shall not be supported by the screw shell of a lampholder.
(b) Metal Poles Supporting Lighting Fixtures. Metal poles shall be permitted to be used to support lighting fixtures and as a raceway to enclose supply conductors, provided the following conditions are met.
1. A metal pole shall have a handhole not less than 2 in. x 4 in. (50.8 mm x 102 mm) with a raintight cover to provide access to the supply terminations within the pole or pole base.
Exception No. 1: No handhole shall be required in a pole 8 ft (2.44 m) or less in height above grade where the supply wiring method continues without splice or pull point, and where the interior of the pole and any splices are accessible by removing the fixture.
Exception No. 2: No handhole shall be required in a metal pole 20 ft (6.10 m) or less in height above grade that is provided with a hinged base.
2. Where raceway risers or cable is not installed within the pole, a threaded fitting or nipple shall be brazed or welded to the pole opposite the handhole for the supply connection.
3. A metal pole shall be provided with a grounding terminal.
a. A pole with a handhole shall have the grounding terminal accessible from the handhole.
b. A pole with a hinged base shall have the grounding terminal accessible within the base.
Exception: No grounding terminal shall be required in a pole 8 ft (2.44 m) or less in height above grade where the supply wiring method continues without splice or pull, and where the interior of the pole and any splices are accessible by removing the fixture.
4. A pole with a hinged base shall have the hinged base and pole bonded together.
5. Metal raceways or other equipment grounding conductors shall be bonded to the pole with an equipment grounding conductor recognized by Section 250-118 and sized in accordance with Section 250-122.
6. Conductors in vertical metal poles used as raceway shall be supported as provided in Section 300-19.
410-16. Means of Support
(a) Outlet Boxes. Outlet boxes or fittings installed as required by Section 370-23 shall be permitted to support fixtures weighing 50 lb (22.7 kg) or less. A fixture that weighs more than 50 lb (22.7 kg) shall be supported independent of the outlet box unless the outlet box is listed for the weight to be supported.
(b) Inspection. Fixtures shall be installed so that the connections between the fixture conductors and the circuit conductors can be inspected without requiring the disconnection of any part of the wiring unless the fixtures are connected by attachment plugs and receptacles.
(c) Suspended Ceilings. Framing members of suspended ceiling systems used to support fixtures shall be securely fastened to each other and shall be securely attached to the building structure at appropriate intervals. Fixtures shall be securely fastened to the ceiling framing member by mechanical means such as bolts, screws, or rivets. Listed clips identified for use with the type of ceiling framing member(s) and fixture(s) shall also be permitted.
(d) Fixture Studs. Fixture studs that are not a part of outlet boxes, hickeys, tripods, and crowfeet shall be made of steel, malleable iron, or other material suitable for the application.
(e) Insulating Joints. Insulating joints that are not designed to be mounted with screws or bolts shall have an exterior metal casing, insulated from both screw connections.
(f) Raceway Fittings. Raceway fittings used to support a lighting fixture(s) shall be capable of supporting the weight of the complete fixture assembly and lamp(s).
(g) Busways. Fixtures shall be permitted to be connected to busways in accordance with Section 364-12.
(h) Trees. Outdoor lighting fixtures and associated equipment shall be permitted to be supported by trees.
FPN No. 1: See Section 225-26 for restrictions for support of overhead conductors.
FPN No. 2: See Section 300-5(d) for protection of conductors.
E. Grounding
410-17. General
Fixtures and lighting equipment shall be grounded as required in Article 250 and Part E of this article.
410-18. Exposed Fixture Parts
(a) Exposed Conductive Parts. Exposed metal parts shall be grounded or insulated from ground and other conducting surfaces or inaccessible to unqualified personnel. Lamp tie wires, mounting screws, clips, and decorative bands on glass spaced at least 1 1/2 in. (38 mm) from lamp terminals shall not be required to be grounded.
(b) Made of Insulating Material. Fixtures directly wired or attached to outlets supplied by a wiring method that does not provide a ready means for grounding shall be made of insulating material and shall have no exposed conductive parts.
410-20. Equipment Grounding Conductor Attachment
Fixtures with exposed metal parts shall be provided with a means for connecting an equipment grounding conductor for such fixtures.
410-21. Methods of Grounding
Fixtures and equipment shall be considered grounded where mechanically connected to an equipment grounding conductor as specified in Section 250-118 and sized in accordance with Section 250-122.
F. Wiring of Fixtures
410-22. Fixture Wiring — General
Wiring on or within fixtures shall be neatly arranged and shall not be exposed to physical damage. Excess wiring shall be avoided. Conductors shall be arranged so that they shall not be subjected to temperatures above those for which they are rated.
410-23. Polarization of Fixtures
Fixtures shall be wired so that the screw shells of lampholders will be connected to the same fixture or circuit conductor or terminal. The grounded conductor, where connected to a screw-shell lampholder, shall be connected to the screw shell.
410-24. Conductor Insulation
Fixtures shall be wired with conductors having insulation suitable for the environmental conditions, current, voltage, and temperature to which the conductors will be subjected.
FPN: For ampacity of fixture wire, maximum operating temperature, voltage limitations, minimum wire size, etc., see Article 402.
410-27. Pendant Conductors for Incandescent Filament Lamps
(a) Support. Pendant lampholders with permanently attached leads, where used for other than festoon wiring, shall be hung from separate stranded rubber-covered conductors that are soldered directly to the circuit conductors but supported independently thereof.
(b) Size. Unless part of listed decorative lighting assemblies, pendant conductors shall not be smaller than No. 14 for mogul-base or medium-base screw-shell lampholders, nor smaller than No. 18 for intermediate or candelabra-base lampholders.

(c) Twisted or Cabled. Pendant conductors longer than 3 ft (914 mm) shall be twisted together where not cabled in a listed assembly.

410-28. Protection of Conductors and Insulation

(a) Properly Secured. Conductors shall be secured in a manner that will not tend to cut or abrade the insulation.

(b) Protection Through Metal. Conductor insulation shall be protected from abrasion where it passes through metal.

(c) Fixture Stems. Splices and taps shall not be located within fixture arms or stems.

(d) Splices and Taps. No unnecessary splices or taps shall be made within or on a fixture.

FPN: For approved means of making connections, see Section 110-14.

(e) Stranding. Stranded conductors shall be used for wiring on fixture chains and on other movable or flexible parts.

(f) Tension. Conductors shall be arranged so that the weight of the fixture or movable parts will not put a tension on the conductors.

410-29. Cord-Connected Showcases

Individual showcases, other than fixed, shall be permitted to be connected by flexible cord to permanently installed receptacles, and groups of not more than six such showcases shall be permitted to be coupled together by flexible cord and separable locking-type connectors with one of the group connected by flexible cord to a permanently installed receptacle.

The installation shall comply with (a) through (e) of this section.

(a) Cord Requirements. Flexible cord shall be of the hard-service type, having conductors not smaller than the branch-circuit conductors, having ampacity at least equal to the branch-circuit overcurrent device, and having an equipment grounding conductor.

FPN: See Table 250-122 for size of equipment grounding conductor.

(b) Receptacles, Connectors, and Attachment Plugs. Receptacles, connectors, and attachment plugs shall be of a listed grounding type rated 15 or 20 amperes.

(c) Support. Flexible cords shall be secured to the undersides of showcases so that (1) wiring will not be exposed to mechanical damage; (2) a separation between cases not in excess of 2 in. (50.8 mm), nor more than 12 in. (305 mm) between the first case and the supply receptacle, will be ensured; and (3) the free lead at the end of a group of showcases will have a female fitting not extending beyond the case.

(d) No Other Equipment. Equipment other than showcases shall not be electrically connected to showcases.

(e) Secondary Circuit(s). Where showcases are cord-connected, the secondary circuit(s) of each electric-discharge lighting ballast shall be limited to one showcase.

410-30. Cord-Connected Lampholders and Fixtures

(a) Lampholders. Where a metal lampholder is attached to a flexible cord, the inlet shall be equipped with an insulating bushing that, if threaded, shall not be smaller than nominal 3/8-in. pipe size. The cord hole shall be of a size appropriate for the cord, and all burrs and fins shall be removed in order to provide a smooth bearing surface for the cord.

Bushing having holes 9/32 in. (7.14 mm) in diameter shall be permitted for use with plain pendant cord and holes 13/32 in. (10.3 mm) in diameter with reinforced cord.

(b) Adjustable Fixtures. Fixtures that require adjusting or aiming after installation shall not be required to be equipped with an attachment plug or cord connector provided the exposed cord is of the hard usage or extra-hard usage type and is not longer than that required for maximum adjustment. The cord shall not be subject to strain or physical damage.

(c) Electric-Discharge Fixtures.

1. A listed fixture or a listed assembly shall be permitted to be cord connected if

a. The fixture is located directly below the outlet box or busway, and

b. The flexible cord is

1. Visible for its entire length outside the fixture,

2. Not subject to strain or physical damage, and

3. Terminated in a grounding-type attachment plug cap, busway plug or have a fixture assembly with a strain relief and canopy.

2. Electric-discharge lighting fixtures provided with mogul-base, screw-shell lampholders shall be permitted to be connected to branch circuits of 50 amperes or less by cords complying with Section 240-4. Receptacles and attachment plugs shall be permitted to be of lower ampere rating than the branch circuit but not less than 125 percent of the fixture full-load current.

3. Electric-discharge lighting fixtures equipped with a flanged surface inlet shall be permitted to be supplied by cord pendants equipped with cord connectors. Inlets and connectors shall be permitted to be of lower ampere rating than the branch circuit but not less than 125 percent of the fixture load current.

410-31. Fixtures as Raceways

Fixtures shall not be used as a raceway for circuit conductors.

Exception No. 1: Fixtures listed for use as a raceway.

Exception No. 2: Fixtures designed for end-to-end assembly to form a continuous raceway or fixtures connected together by recognized wiring methods shall be permitted to carry through conductors of a 2-wire or multiwire branch circuit supplying the fixtures.

Exception No. 3: One additional 2-wire branch circuit separately supplying one or more of the connected fixtures described in Exception No. 2 shall be permitted to be carried through the fixtures.

FPN: See Article 100 for definition of "Multiwire Branch Circuits."

Branch-circuit conductors within 3 in. (76 mm) of a ballast within the ballast compartment shall have an insulation temperature rating not lower than 90°C (194°F), such as Types RHH, THW, THHN, THHW, FEP, FEPB, SA, and XHHW.

G. Construction of Fixtures

410-34. Combustible Shades and Enclosures

Adequate airspace shall be provided between lamps and shades or other enclosures of combustible material.

410-35. Fixture Rating

(a) Marking. All fixtures shall be marked with the maximum lamp wattage or electrical rating, manufacturer's name, trademark, or other suitable means of identification. A fixture requiring supply wire rated higher than 60°C (140°F) shall be marked in letters not smaller than 1/4 in. (6.35 mm) high, prominently displayed on the fixture and shipping carton or equivalent.

(b) Electrical Rating. The electrical rating shall include the voltage and frequency and shall indicate the current rating of the unit, including the ballast, transformer, or autotransformer.

410-36. Design and Material

Fixtures shall be constructed of metal, wood, or other material suitable for the application and shall be designed and assembled so as to secure requisite mechanical strength and rigidity. Wiring compartments, including their entrances, shall be such that conductors may be drawn in and withdrawn without physical damage.

410-37. Nonmetallic Fixtures

When fixture wiring compartments are constructed from combustible material, armored or lead-covered conductors with suitable fittings shall be used or the wiring compartment shall be lined with metal.

410-38. Mechanical Strength

(a) Tubing for Arms. Tubing used for arms and stems where provided with cut threads shall not be less than 0.040 in. (1.016 mm) in thickness and where provided with rolled (pressed) threads shall not be less than 0.025 in. (0.635 mm) in thickness. Arms and other parts shall be fastened to prevent turning.

(b) Metal Canopies. Metal canopies supporting lampholders, shades, etc., exceeding 8 lb (3.63 kg), or incorporating attachment-plug receptacles, shall not be less than 0.020 in. (0.508 mm) in thickness. Other canopies shall not be less than 0.016 in. (0.4064 mm) if made of steel and not less than 0.020 in. (0.508 mm) if of other metals.

(c) Canopy Switches. Pull-type canopy switches shall not be inserted in the rims of metal canopies that are less than 0.025 in. (0.635 mm) in thickness unless the rims are reinforced by the turning of a bead or the equivalent. Pull-type canopy switches, whether mounted in the rims or elsewhere in sheet metal canopies, shall not be located more than 3 1/2 in. (89 mm) from the center of the canopy.

Double set-screws, double canopy rings, a screw ring, or equal method shall be used where the canopy supports a pull-type switch or pendant receptacle.

The above thickness requirements shall apply to measurements made on finished (formed) canopies.

410-39. Wiring Space

Bodies of fixtures, including portable lamps, shall provide ample space for splices and taps and for the installation of devices, if any. Splice compartments shall be of nonabsorbent, noncombustible material.

410-42. Portable Lamps

(a) General. Portable lamps shall be wired with flexible cord recognized by Section 400-4 and an attachment plug of the polarized

or grounding type. Where used with Edison-base lampholders, the grounded conductor shall be identified and attached to the screw shell and the identified blade of the attachment plug.
(b) Portable Handlamps. In addition to the provisions of Section 410-42(a), portable handlamps shall comply with the following.
1. Metal shell, paper-lined lampholders shall not be used.
2. Handlamps shall be equipped with a handle of molded composition or other insulating material.
3. Handlamps shall be equipped with a substantial guard attached to the lampholder or handle.
4. Metallic guards shall be grounded by the means of an equipment grounding conductor run with circuit conductors within the power-supply cord.
5. Portable handlamps shall not be required to be grounded where supplied through an isolating transformer with an ungrounded secondary of not over 50 volts.

410-44. Cord Bushings
A bushing or the equivalent shall be provided where flexible cord enters the base or stem of a portable lamp. The bushing shall be of insulating material unless a jacketed type of cord is used.

410-45. Tests
All wiring shall be free from short circuits and grounds and shall be tested for these defects prior to being connected to the circuit.

410-46. Live Parts
Exposed live parts within porcelain fixtures shall be suitably recessed and located so as to make it improbable that wires will come in contact with them. There shall be a spacing of at least 1/2 in. (12.7 mm) between live parts and the mounting plane of the fixture.

H. Installation of Lampholders

410-47. Screw-Shell Type
Lampholders of the screw-shell type shall be installed for use as lampholders only. Where supplied by a circuit having a grounded conductor, the grounded conductor shall be connected to the screw shell.

410-48. Double-Pole Switched Lampholders
Where supplied by the ungrounded conductors of a circuit, the switching device of lampholders of the switched type shall simultaneously disconnect both conductors of the circuit.

410-49. Lampholders in Wet or Damp Locations
Lampholders installed in wet or damp locations shall be of the weatherproof type.

J. Construction of Lampholders

410-50. Insulation
The outer metal shell and the cap shall be lined with insulating material that shall prevent the shell and cap from becoming a part of the circuit. The lining shall not extend beyond the metal shell more than 1/8 in. (3.17 mm) but shall prevent any current-carrying part of the lamp base from being exposed when a lamp is in the lampholding device.

410-52. Switched Lampholders
Switched lampholders shall be of such construction that the switching mechanism interrupts the electrical connection to the center contact. The switching mechanism shall also be permitted to interrupt the electrical connection to the screw shell if the connection to the center contact is simultaneously interrupted.

K. Lamps and Auxiliary Equipment

410-53. Bases, Incandescent Lamps
An incandescent lamp for general use on lighting branch circuits shall not be equipped with a medium base if rated over 300 watts, nor with a mogul base if rated over 1500 watts. Special bases or other devices shall be used for over 1500 watts.

410-54. Electric-Discharge Lamp Auxiliary Equipment
(a) Enclosures. Auxiliary equipment for electric-discharge lamps shall be enclosed in noncombustible cases and treated as sources of heat.
(b) Switching. Where supplied by the ungrounded conductors of a circuit, the switching device of auxiliary equipment shall simultaneously disconnect all conductors.

~~L. Receptacles, Cord Connectors, and Attachment Plugs (Caps)~~

~~410-56. Rating and Type~~

~~(a) Receptacles. Receptacles installed for the attachment of portable cords shall be rated at not less than 15 amperes, 125 volts, or 15 amperes, 250 volts, and shall be of a type not suitable for use as lampholders.~~

~~(b) CO/ALR Receptacles. Receptacles rated 20 amperes or less and directly connected to aluminum conductors shall be marked CO/ALR.~~

~~(c) Isolated Ground Receptacles. Receptacles intended for the reduction of electrical noise (electromagnetic interference) as permitted in Section 250-146(d) shall be identified by an orange triangle located on the face of the receptacle. Receptacles so identified shall be used only with grounding conductors that are isolated in accordance with Section 250-146(d). Isolated ground receptacles installed in nonmetallic boxes shall be covered with a nonmetallic faceplate.~~

~~Exception: Where an isolated ground receptacle is installed in a nonmetallic box, a metal faceplate shall be permitted if the box contains a feature or accessory that permits the effective grounding of the faceplate.~~

~~(d) Faceplates. Metal faceplates shall be of ferrous metal not less than 0.030 in. (0.762 mm) in thickness or of nonferrous metal not less than 0.040 in. (1.016 mm) in thickness. Metal faceplates shall be grounded. Faceplates of insulating material shall be noncombustible and not less than 0.10 in. (2.54 mm) in thickness but shall be permitted to be less than 0.10 in. (2.54 mm) in thickness if formed or reinforced to provide adequate mechanical strength.~~

~~(e) Position of Receptacle Faces. After installation, receptacle faces shall be flush with or project from faceplates of insulating material and shall project a minimum of 0.015 in. (0.381 mm) from metal faceplates. Faceplates shall be installed so as to completely cover the opening and seat against the mounting surface.~~

~~(f) Receptacle Mounting.~~

~~1. Receptacles mounted in boxes that are set back of the wall surface, as permitted in Section 370-20, shall be installed so that the mounting yoke or strap of the receptacle is held rigidly at the surface of the wall.~~

~~2. Receptacles mounted in boxes that are flush with the wall surface or project therefrom shall be installed so that the mounting yoke or strap of the receptacle is seated against the box or raised box cover.~~

~~3. Receptacles Mounted on Covers. Receptacles mounted to and supported by a cover shall be secured by more than one screw or shall be a device assembly or box cover listed and identified for securing by a single screw.~~

~~(g) Attachment Plugs. All 15- and 20-ampere attachment plugs and connectors shall be constructed so that there are no exposed current-carrying parts except the prongs, blades, or pins. The cover for wire terminations shall be a part, which is essential for the operation of an attachment plug or connector (dead-front construction). Attachment plugs shall be installed so that their prongs, blades, or pins are not energized unless inserted into an energized receptacle. No receptacle shall be installed so as to require an energized attachment plug as its source of supply.~~

~~(h) Attachment Plug Ejector Mechanisms. Attachment plug ejector mechanisms shall not adversely affect engagement of the blades of the attachment plug with the contacts of the receptacle.~~

~~(i) Noninterchangeability. Receptacles, cord connectors, and attachment plugs shall be constructed so that receptacle or cord connectors will not accept an attachment plug with a different voltage or current rating than that for which the device is intended; however, a 20-ampere T-slot receptacle or cord connector shall be permitted to accept a 15-ampere attachment plug of the same voltage rating. Nongrounding type receptacles and connectors shall not accept grounding type attachment plugs.~~

~~410-57. Receptacles in Damp or Wet Locations~~

~~(a) Damp Locations. A receptacle installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure for the receptacle that is weatherproof when the receptacle is covered (attachment plug cap not inserted and receptacle covers closed).~~

~~An installation suitable for wet locations shall also be considered suitable for damp locations.~~

~~A receptacle shall be considered to be in a location protected from the weather where located under roofed open porches, canopies, marquees, and the like, and will not be subjected to a beating rain or water runoff.~~

~~(b) Wet Locations.~~

~~1. A receptacle installed in a wet location where the product intended to be plugged into it is not attended while in use (e.g., sprinkler system controllers, landscape lighting, holiday lights, etc.) shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.~~

~~2. A receptacle installed in a wet location where the product intended to be plugged into it will be attended while in use (e.g., portable tools, etc.) shall have an enclosure that is weatherproof when the attachment plug cap is removed.~~

~~(c) Bathtub and Shower Space. A receptacle shall not be installed within a bathtub or shower space.~~

~~(d) Protection for Floor Receptacles. Standpipes of floor receptacles shall allow floor cleaning equipment to be operated without damage to receptacles.~~
~~(e) Flush Mounting with Faceplate. The enclosure for a receptacle installed in an outlet box flush-mounted on a wall surface shall be made weatherproof by means of a weatherproof faceplate assembly that provides a watertight connection between the plate and the wall surface.~~
~~(f) Installation. A receptacle outlet installed outdoors shall be located so that water accumulation is not likely to touch the outlet cover or plate.~~
~~410-58. Grounding-Type Receptacles, Adapters, Cord Connectors, and Attachment Plugs~~
~~(a) Grounding Poles. Grounding-type receptacles, cord connectors, and attachment plugs shall be provided with one fixed grounding pole in addition to the circuit poles. The grounding contacting pole of grounding-type plug-in ground-fault circuit interrupters shall be permitted to be of the movable, self-restoring type on circuits operating at not over 150 volts between and to conductors nor over 150 volts between any conductor and ground.~~
~~(b) Grounding Pole Identification. Grounding-type receptacles, adapters, cord connections, and attachment plugs shall have a means for connection of a grounding conductor to the grounding pole.~~
~~A terminal for connection to the grounding pole shall be designated by one of the following.~~
~~1. A green-colored hexagonal-headed or shaped terminal screw or nut, not readily removable.~~
~~2. A green-colored pressure wire connector body (a wire barrel).~~
~~3. A similar green-colored connection device, in the case of adapters. The grounding terminal of a grounding adapter shall be a green-colored rigid ear, lug, or similar device. The grounding connection shall be designed so that it cannot make contact with current-carrying parts of the receptacle, adapter, or attachment plug. The adapter shall be polarized.~~
~~4. If the terminal for the equipment grounding conductor is not visible, the conductor entrance hole shall be marked with the word "green" or "ground," the letters "G" or "GR" or the grounding symbol, as shown in Figure 410-58(b)(4), or otherwise identified by a distinctive green color. If the terminal for the equipment grounding conductor is readily removable, the area adjacent to the terminal shall be similarly marked. Figure 410-58(b)(4) Grounding symbol.~~
~~(c) Grounding Terminal Use. A grounding terminal or grounding-type device shall not be used for purposes other than grounding.~~
~~(d) Grounding Pole Requirements. Grounding-type attachment plugs and mating cord connectors and receptacles shall be designed so that the grounding connection is made before the current-carrying connections. Grounding-type devices shall be designed so grounding poles of attachment plugs cannot be brought into contact with current-carrying parts of receptacles or cord connectors.~~
~~(e) Use. Grounding-type attachment plugs shall be used only with a cord having an equipment grounding conductor.~~

M. Special Provisions for Flush and Recessed Fixtures

410-64. General

Fixtures installed in recessed cavities in walls or ceilings shall comply with Sections 410-65 through 410-72.

410-65. Temperature

(a) Combustible Material. Fixtures shall be installed so that adjacent combustible material will not be subjected to temperatures in excess of 90°C (194°F).

(b) Fire-Resistant Construction. Where a fixture is recessed in fire-resistant material in a building of fire-resistant construction, a temperature higher than 90°C (194°F) but not higher than 150°C (302°F), shall be considered acceptable if the fixture is plainly marked that it is listed for that service.

(c) Recessed Incandescent Fixtures. Incandescent fixtures shall have thermal protection and shall be identified as thermally protected.

Exception No. 1: Thermal protection shall not be required in a recessed fixture identified for use and installed in poured concrete.

Exception No. 2: Thermal protection shall not be required in a recessed fixture whose design, construction, and thermal performance characteristics are equivalent to a thermally protected fixture, and are identified as inherently protected.

410-66. Clearance and Installation

(a) Clearance.

1. A recessed fixture that is not identified for contact with insulation shall have all recessed parts spaced at least 1/2 in. (12.7 mm) from combustible materials. The points of support and the trim finishing off the opening in the ceiling or wall surface shall be permitted to be in contact with combustible materials.

2. A recessed fixture that is identified for contact with insulation, Type IC, shall be permitted to be in contact with combustible materials at recessed parts, points of support, and portions passing through or finishing off the opening in the building structure.

(b) Installation. Thermal insulation shall not be installed above a recessed fixture or within 3 in. (76 mm) of the recessed fixture"s enclosure, wiring compartment, or ballast unless it is identified for contact with insulation, Type IC.

410-67. Wiring

(a) General. Conductors that have insulation suitable for the temperature encountered shall be used.

(b) Circuit Conductors. Branch-circuit conductors that have an insulation suitable for the temperature encountered shall be permitted to terminate in the fixture.

(c) Tap Conductors. Tap conductors of a type suitable for the temperature encountered shall be permitted to run from the fixture terminal connection to an outlet box placed at least 1 ft (305 mm) from the fixture. Such tap conductors shall be in suitable raceway or Type AC or MC cable of at least 18 in. (450 mm) but not more than 6 ft (1.83 m) in length.

N. Construction of Flush and Recessed Fixtures

410-68. Temperature

Fixtures shall be constructed so that adjacent combustible material will not be subject to temperatures in excess of 90°C (194°F).

410-70. Lamp Wattage Marking

Incandescent lamp fixtures shall be marked to indicate the maximum allowable wattage of lamps. The markings shall be permanently installed, in letters at least 1/4 in. (6.35 mm) high, and shall be located where visible during relamping.

410-71. Solder Prohibited

No solder shall be used in the construction of a fixture box.

410-72. Lampholders

Lampholders of the screw-shell type shall be of porcelain or other suitable insulating materials. Where used, cements shall be of the high-heat type.

P. Special Provisions for Electric-Discharge Lighting Systems of 1000 Volts or Less

410-73. General

(a) Open-Circuit Voltage of 1000 Volts or Less. Equipment for use with electric-discharge lighting systems and designed for an open-circuit voltage of 1000 volts or less shall be of a type intended for such service.

(b) Considered as Energized. The terminals of an electric-discharge lamp shall be considered as energized where any lamp terminal is connected to a circuit of over 300 volts.

(c) Transformers of the Oil-Filled Type. Transformers of the oil-filled type shall not be used.

(d) Additional Requirements. In addition to complying with the general requirements for lighting fixtures, such equipment shall comply with Part P of this article.

(e) Thermal Protection.

1. The ballast of a fluorescent fixture installed indoors shall have integral thermal protection. Replacement ballasts shall also have thermal protection integral with the ballast.

2. A simple reactance ballast in a fluorescent fixture with straight tubular lamps shall not be required to be thermally protected.

3. A ballast in a fluorescent exit fixture shall not have thermal protection.

4. A ballast in a fluorescent fixture that is used for egress lighting and energized only during an emergency shall not have thermal protection.

(f) High-Intensity Discharge Fixtures.

1. Recessed high-intensity fixtures designed to be installed in wall or ceiling cavities shall have thermal protection and be identified as thermally protected.

2. Thermal protection shall not be required in a recessed high-intensity fixture whose design, construction, and thermal performance characteristics are equivalent to a thermally protected fixture and are identified as inherently protected.

3. Thermal protection shall not be required in a recessed high-intensity discharge fixture identified for use and installed in poured concrete.

4. A recessed remote ballast for a high-intensity discharge fixture shall have thermal protection that is integral with the ballast and be identified as thermally protected.

410-74. Direct-Current Equipment

Fixtures installed on dc circuits shall be equipped with auxiliary equipment and resistors especially designed and for dc operation, and the fixtures shall be so marked.

410-75. Open-Circuit Voltage Exceeding 300 Volts

Equipment having an open-circuit voltage exceeding 300 volts shall not be installed in dwelling occupancies unless such equipment is designed so that there will be no exposed live parts when lamps are being inserted, are in place, or are being removed.

410-76. Fixture Mounting

(a) Exposed Ballasts. Fixtures that have exposed ballasts or transformers shall be installed so that such ballasts or transformers will not be in contact with combustible material.

(b) Combustible Low-Density Cellulose Fiberboard. Where a surface-mounted fixture containing a ballast is to be installed on combustible low-density cellulose fiberboard, it shall be listed for this condition or shall be spaced not less than 1 1/2 in. (38 mm) from the surface of the fiberboard. Where such fixtures are partially or wholly recessed, the provisions of Sections 410-64 through 410-72 shall apply.

FPN: Combustible low-density cellulose fiberboard includes sheets, panels, and tiles that have a density of 20 lb/ft^3 (320.36 kg/m^3) or less, and that are formed of bonded plant fiber material but does not include solid or laminated wood, nor fiberboard that has a density in excess of 20 lb/ft^3 (320.36 kg/m^3) or is a material that has been integrally treated with fire-retarding chemicals to the degree that the flame spread in any plane of the material will not exceed 25, determined in accordance with tests for surface burning characteristics of building materials. See Test Method for Surface Burning Characteristics of Building Materials, ANSI/ASTM E84-1997.

410-77. Equipment Not Integral with Fixture

(a) Metal Cabinets. Auxiliary equipment, including reactors, capacitors, resistors, and similar equipment, where not installed as part of a lighting fixture assembly, shall be enclosed in accessible, permanently installed metal cabinets.

(b) Separate Mounting. Separately mounted ballasts that are intended for direct connection to a wiring system shall not be required to be separately enclosed.

(c) Wired Fixture Sections. Wired fixture sections are paired, with a ballast(s) supplying a lamp or lamps in both. For interconnection between paired units, it shall be permissible to use 3/8-in. flexible metal conduit in lengths not exceeding 25 ft (7.62 m) in conformance with Article 350. Fixture wire operating at line voltage, supplying only the ballast(s) of one of the paired fixtures, shall be permitted in the same raceway as the lamp supply wires of the paired fixtures.

410-78. Autotransformers

An autotransformer that is used to raise the voltage to more than 300 volts, as part of a ballast for supplying lighting units, shall be supplied only by a grounded system.

410-79. Switches

Snap switches shall comply with Section 380-14.

Q. Special Provisions for Electric-Discharge Lighting Systems of More than 1000 Volts

410-80. General

(a) Open-Circuit Voltage Exceeding 1000 Volts. Equipment for use with electric-discharge lighting systems and designed for an open-circuit voltage exceeding 1000 volts shall be of a type intended for such service.

(b) Dwelling Occupancies. Equipment that has an open-circuit voltage exceeding 1000 volts shall not be installed in or on dwelling occupancies.

(c) Live Parts. The terminal of an electric-discharge lamp shall be considered as a live part where any lamp terminal is connected to a circuit of over 300 volts.

(d) Additional Requirements. In addition to complying with the general requirements for lighting fixtures, such equipment shall comply with Part Q of this article.

FPN: For signs and outline lighting, see Article 600.

410-81. Control

(a) Disconnection. Fixtures or lamp installations shall be controlled either singly or in groups by an externally operable switch or circuit breaker that opens all ungrounded primary conductors.

(b) Within Sight or Locked Type. The switch or circuit breaker shall be located within sight from the fixtures or lamps, or it shall be permitted elsewhere if it is provided with a means for locking in the open position.

410-82. Lamp Terminals and Lampholders

Parts that must be removed for lamp replacement shall be hinged or held captive. Lamps or lampholders will be designed so that there shall be no exposed live parts when lamps are being inserted or are being removed.

410-83. Transformer Ratings

Transformers and ballasts shall have a secondary open-circuit voltage of not over 15,000 volts with an allowance on test of 1000 volts additional. The secondary-current rating shall not be more than 120 milliamperes if the open-circuit voltage is over 7500 volts, and not more than 240 milliamperes if the open-circuit voltage is 7500 volts or less.

410-84. Transformer Type

Transformers shall be enclosed and listed.

410-85. Transformers and Secondary Connections

The high-voltage windings of transformers shall not be connected in series or parallel.

410-86. Transformer Locations

(a) Accessible. Transformers shall be accessible after installation.

(b) Secondary Conductors. Transformers shall be installed as near to the lamps as practicable to keep the secondary conductors as short as possible.

(c) Adjacent to Combustible Materials. Transformers shall be located so that adjacent combustible materials will not be subjected to temperatures in excess of 90°C (194°F).

410-87. Transformer Loading

The lamps connected to any transformer shall be of such length and characteristics so as not to cause a condition of continuous overvoltage on the transformer.

410-88. Wiring Method — Secondary Conductors

Conductors shall be installed in accordance with Section 600-32.

410-89. Lamp Supports

Lamps shall be adequately supported as required in Section 600-41.

410-90. Exposure to Damage

Lamps shall not be located where normally exposed to physical damage.

410-91. Marking

Each fixture or each secondary circuit of tubing having an open-circuit voltage of over 1000 volts shall have a clearly legible marking in letters not less than 1/4 in. (6.35 mm) high reading: "Caution . . . volts." The voltage indicated shall be the rated open-circuit voltage.

410-92. Switches

Snap switches shall comply with Section 380-14.

R. Lighting Track

410-100. Definition

Lighting track is a manufactured assembly designed to support and energize lighting fixtures that are capable of being readily repositioned on the track. Its length may be altered by the addition or subtraction of sections of track.

410-101. Installation

(a) Lighting Track. Lighting track shall be permanently installed and permanently connected to a branch circuit. Only lighting track fittings shall be installed on lighting track. Lighting track fittings shall not be equipped with general-purpose receptacles.

(b) Connected Load. The connected load on lighting track shall not exceed the rating of the track. Lighting track shall be supplied by a branch circuit having a rating not more than that of the track.

(c) Locations Not Permitted. Lighting track shall not be installed in the following locations:

1. Where likely to be subjected to physical damage
2. In wet or damp locations
3. Where subject to corrosive vapors
4. In storage battery rooms
5. In hazardous (classified) locations
6. Where concealed
7. Where extended through walls or partitions
8. Less than 5 ft (1.52 m) above the finished floor except where protected from physical damage or track operating at less than 30 volts rms open-circuit voltage
9. Within the zone measured 3 ft (914 mm) horizontally and 8 ft (2.44 m) vertically from the top of the bathtub rim

(d) Support. Fittings identified for use on lighting track shall be designed specifically for the track on which they are to be installed. They shall be securely fastened to the track, maintain polarization and grounding, and shall be designed to be suspended directly from the track.

410-103. Heavy-Duty Lighting Track

Heavy-duty lighting track is lighting track identified for use exceeding 20 amperes. Each fitting attached to a heavy-duty lighting track shall have individual overcurrent protection.

410-104. Fastening

Lighting track shall be securely mounted so that each fastening will be suitable for supporting the maximum weight of fixtures that can be installed. Unless identified for supports at greater intervals, a single section 4 ft (1.22 m) or shorter in length shall have two

supports, and, where installed in a continuous row, each individual section of not more than 4 ft (1.22 m) in length shall have one additional support.
410-105. Construction Requirements
(a) Construction. The housing for the lighting track system shall be of substantial construction to maintain rigidity. The conductors shall be installed within the track housing permitting insertion of a fixture, and designed to prevent tampering and accidental contact with live parts. Components of lighting track systems of different voltages shall not be interchangeable. The track conductors shall be a minimum No. 12 or equal, and shall be copper. The track system ends shall be insulated and capped.
(b) Grounding. Lighting track shall be grounded in accordance with Article 250, and the track sections shall be securely coupled to maintain continuity of the circuitry, polarization, and grounding throughout.
SUBSTANTIATION: This proposal was developed by a Task Group of CMP-18 appointed by the chairman to consider separating 1999 NEC Article 410 into two articles, one covering lighting fixtures and the other covering receptacles, attachment plugs and cord connectors. This Task Group was appointed in response to Proposal 18-55 for the revision of the 1996 NEC.
This is a companion proposal to revise Article 410 to reflect the relocation of the requirements for receptacles, cord connectors and attachment plugs to proposed Article 420.
The Task Group believes this is consistent with the objective of the Usability Task Group and will make these requirements easier to find and use.
The Task Group realizes that the NEC Correlating Committee has jurisdiction over number, title and scope of articles and submits the proposed wording for their consideration. PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2933c)

18- 5 - (410): Accept in Principle in Part
SUBMITTER: Bernard J. Mezger, American Lighting Association
RECOMMENDATION: Incorporate "luminaire" into the 2002 NEC:
(a) To incorporate the use of the inclusive wording "luminaire" throughout the Code wherever the ambiguous wording "fixture" or "lighting fixture" is used and the intent and meaning is a complete lighting unit consisting of a fixture and the lamp(s), called a "luminaire".
(b) Add the definition of "luminaire" to Article 100-1 as follows:
Luminaire. A complete lighting unit consisting of a lamp, or lamps, and a ballast (when applicable), together with the parts designed to distribute the light, to position the lamp(s), and connect the lamp(s) to the power supply.
(c) Delete the FPN from Section 410-1 (an identical definition).
SUBSTANTIATION: Clarify the true meaning and intent of the item described as a "fixture", or a "lighting fixture", by providing the proper wording for a complete lighting unit. A luminaire consists of a fixture plus lamp(s). The definition and use proposed is consistent with that published and used by IESNA and NEMA.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the proposal under (a) but limits acceptance to Articles 410, 411, and 600, and refers the proposal to all other appropriate code panels. Refer item(b) to CMP 1. Accept item (c).
PANEL STATEMENT: CMP 18 acted on only those articles under their jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #613)

18- 6 - (410-2): Reject
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Add "Flexible cord and cable installation shall be in adherence to the provisions listed in Article 400" to the end of the section.
SUBSTANTIATION: To promote safety and understanding.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither.
Section 90-3 Code Arrangement makes it clear that "Chapters 1, 2, 3 and 4 apply generally" therefore to add the proposed wording is unnecessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #330)

18- 7 - (410-4): Reject
SUBMITTER: Richard L. Miell, Otero County, CO
RECOMMENDATION: 410-4. Fixtures in Specific Locations
(d) Bathtub and Shower Zone. There shall be no light fixtures, other than those listed for the area, in the Bathtub and Shower Zone.
SUBSTANTIATION: Over the years we have seen additional rules for this area around and above tubs and shower stalls. The current rule listed a few of the types not allowed, and by listing them, it seemed to allow wall mount fixtures in this area. This section also had the definition for the zone, which should be Article 100. This change will prohibit any light fixture from this area, unless listed for the area.
PANEL ACTION: Reject.
PANEL STATEMENT: The current wording is intended to specifically exclude certain types of luminaires. It is not intended to exclude all luminaires. For example recessed or wall mounted luminaires suitable for the environment are acceptable. There is no listing category for "bathtub or shower zone", however, there are luminaires listed for the environmental conditions likely to be found in these areas.
The Scope of Article 100 specifically indicates that it contains definitions generally used in two or more Articles and that definitions used in a single article are contained in that article. Therefore the definition is properly located.
Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. The submitter should provide specific examples of the hazards associated with properly installed wall luminaires suitable for this environment and cite accident data of such installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2258)

18- 8 - (410-4(d)): Reject
SUBMITTER: Stephen E. Ormsby, Ormsby Electric, Inc.
RECOMMENDATION: Revise text as follows:
"Bathtub and shower areas. No parts of cord-connected fixtures, hanging fixtures, <u>wall mounted fixtures,</u> lighting track, pendants, or ceiling-suspended (paddle) fans shall be located within a zone measured 3 ft ...".
SUBSTANTIATION: This change will help to clarify the intent of the article. There are electricians making installations based on this Code who do not get inspections but use the text for a safe installation. This clarification would help to alleviate misinterpretation.
PANEL ACTION: Reject.
PANEL STATEMENT: The current wording is intended to specifically exclude certain types of luminaires. It is not intended to exclude all luminaires. For example recessed or wall mounted luminaires suitable for the environment are acceptable. There are luminaires listed for the environmental conditions likely to be found in these areas.
Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. The submitter should provide specific examples of the hazards associated with properly installed wall luminaires suitable for this environment and cite accident data of such installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2786)

18- 9 - (410-4(d)): Reject
SUBMITTER: Peter R. Hawes, Hawes Electric
RECOMMENDATION: Add to the first sentence "wall mounted lighting fixtures".
SUBSTANTIATION: It is totally absurd that a wall mounted lighting fixture is permitted to be located in a shower or bathtub area. To think that this safety code would prohibit a hanging fixture from being located 7 ft 11 in. about a tub would would permit a wall mounted light fixture to be installed so someone could actually touch the fixture while sitting in the tub is beyond belief. What makes a wall mounted light fixture safer than a hanging fixture. This allowance is a design consideration and it does not belong in a safety code.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. Rather it is justified by an unsubstantiated relational argument. The submitter should provide specific examples of the hazards associated with properly installed wall luminaires suitable for this environment and cite accident data of such installations. Ceiling or wall (surface or recessed) luminaires of the type suitable for the environment are typically well grounded and do not represent a shock hazard
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
KEMPEL: The phrase "typically well grounded" in the second paragraph of the panel statement infers that there are luminaires that my not be well grounded that are suitable to be mounted in this area. To avoid this potential misunderstanding it is suggested that the second paragraph read:
"All accessible conductive parts of ceiling or wall (surface or recessed) luminaires that are likely to become energized are required by 410-18 to be grounded. The product safety standards for luminaires also require metal parts that may become energized to be grounded."

(Log #2787)

18- 10 - (410-4(d)): Reject
SUBMITTER: Peter R. Hawes, Hawes Electric
RECOMMENDATION: Add a new second sentence to read as follows:
The conductors supplying wall mounted lighting fixtures located within this zone shall have Ground Fault Circuit Protection.
SUBSTANTIATION: It may not be practical or even possible to prohibit wall mounted lighting fixtures from this zone, so at the very least GFCI protection for personnel should be required.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. The submitter should provide specific examples of the hazards associated with properly installed wall luminaires suitable for this environment and cite accident data of such installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
KEMPEL: Part of the panel's rationale was omitted in the panel statement. Adding the following paragraph would convey the complete rationale for the panel action:
"All accessible conductive parts of ceiling or wall (surface or recessed) luminaires that are likely to become energized are required by 410-18 to be grounded. The product safety standards for luminaires also require metal parts that may become energized to be grounded."

(Log #298)

18- 11 - (410-8): Reject
SUBMITTER: Vincent Metallo, Sr., Baltimore County, MD
RECOMMENDATION: Revise 410-8 to read as follows:
410-8. Fixtures in ~~clothes~~ closets.
SUBSTANTIATION: Easily ignitable material such as linens are stored in closets that are not considered clothes closets because the lack of a hanging rod. These materials can be stored on shelves and are subject to the same hazards as clothing. This change will coincide with 410-8(b) in which the word clothes is not used. This will make all closet storage subject to required clearances as most material stored on shelves are easily ignitable.
PANEL ACTION: Reject.
PANEL STATEMENT: The absence of the word "clothes" in 410-8(b) should not be construed to mean that this Section applies to all closets. It applies only to clothes closets because it is a part of 410-8 that deals only with clothes closets.
Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. Rather it is justified by an unsubstantiated relational argument.
The current requirements were adopted as a result of incident reports of fires in clothes closets. The proposal should be substantiated with fire or accident data for other types of storage closets. NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2433)

18- 12 - (410-8): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Revise text to read:
410-8. Fixtures in Clothes Closets, Pantries and Storage Spaces.
SUBSTANTIATION: Pantries and storage spaces provide just as likely chances of fire as the closet.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. Rather it is justified by an unsubstantiated relational argument.
The current requirements were adopted as a result of incident reports of fires in clothes closets. The proposal should be substantiated with fire or accident data for other types of storage closets.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3396)

18- 13 - (410-8): Reject
SUBMITTER: Robert Shaughnessy, Denver, CO
RECOMMENDATION: Add new wording to read as follows:
"Clothes closets 120 sq ft or larger, shall have a lighting outlet installed."
SUBSTANTIATION: There is not a requirement for a lighting outlet in large walk-in closets.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither.
Section 90-1(a) states that the purpose of the Code is the practical safeguarding of persons from hazards arising from the use of electricity. Section 90-1(b) states that the Code does not necessarily provide for convenience. The submitter should provide data and information defining the hazard arising from the use of electricity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #548)

18- 14 - (Figure 410-8): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Figure 410-8 as follows:

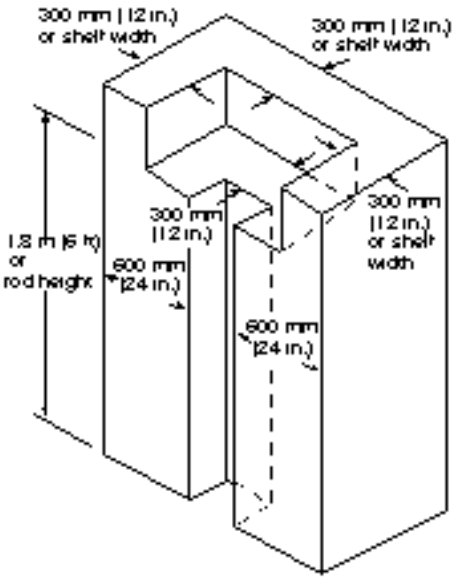


Figure 410-8 Closet storage space.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
The panel corrected an error on the drawing. The "600mm (12in)" should read "600mm (24in)."
PANEL STATEMENT: The panel made editorial revisions to correct dimensions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2194)

18- 15 - (410-8-Storage Space): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(a) Definition.
Storage Space. Storage space is ~~shall be defined as~~ a volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height...
For a closet that permits access to both sides of a hanging rod, the storage space includes ~~shall include~~ the volume below the highest rod extending 12 in. (305 mm) on either side of the rod on a plane horizontal to the floor extending the entire length of the rod.
SUBSTANTIATION: This is a definition. It should be stated in a declarative sentence and should not use mandatory rule language, such as "shall be." Definitions shall not contain requirements. See the NEC Style Manual 2.2.2 and 3.1.
(I have submitted four other proposals on this same concept.)
PANEL ACTION: Accept in Principle.
Modify the text to read as follows:
" (a) Definition. Storage Space. The volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height...; for a closet that permits access to both sides of a hanging rod, this space includes the volume below the highest rod extending 305 mm (12 in.) on either side of the rod on a plane horizontal to the floor extending the entire length of the rod."
PANEL STATEMENT: The panel has editorially revised the text to conform with the Style manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #299)

18- 16 - (410-8(d)): Reject
SUBMITTER: Vincent Metallo, Sr., Baltimore County, MD
RECOMMENDATION: Revise 410-8(d) to read as follows:
(d) Location. Fixtures in ~~clothes~~ closets shall be permitted to be installed as follows.
SUBSTANTIATION: Easily ignitable material can be installed in closets that are not considered clothes closets. This will subject linen and other type of flammable materials that can be stored on shelves to the clearances required in any type of closet. Presently, if a closet does not have a hanging rod it is hard to enforce shelf clearances.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 18-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3674)

18- 17 - (410-8(d)(4)): Accept
SUBMITTER: George Ferguson, Eastern Michigan Univ.
RECOMMENDATION: Revise as follows:
410-8(d)(4) Recessed fluorescent fixtures installed in the wall or ~~on~~ the ceiling...
SUBSTANTIATION: If the fixture were installed "on" the ceiling it would be surface mounted, not recessed. Omitting the word "on" would keep it a recessed fixture.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3740)

18- 18 - (410-11, FPN): Accept
SUBMITTER: Michael S. O'Boyle, Lightolier, Inc./Rep. American Lighting Assn.
RECOMMENDATION: Revise fine print note to read as follows:
FPN: See ~~Section 410-32, Exception No. 2 and 3~~ 410-32 for ~~circuits~~ wiring supplying power to fixtures connected together.
SUBSTANTIATION: This is a companion proposal to a Section 410-31 proposal. This fine print note revision is necessary for correlation if the 410-31 proposal is accepted.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #888)

18- 19 - (410-14(a), (b)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Connection of ~~Electric Discharge~~ Lighting Fixtures.
(a) Independent of the Outlet Box. ~~Electric discharge lighting~~ Lighting fixtures supported independently of the outlet box or fitting, or installed separate from the outlet shall be connected to the branch circuit through ~~metal raceway, nonmetallic~~ raceway, Type MC cable, Type AC cable, Type MI cables, Type NM cable, or for an individual fixture, by flexible cord as ~~permitted~~ covered in Section 410-30(a) or (b).
(b) Access to Boxes. Electric-discharge lighting fixtures mounted over ~~concealed~~ outlet, pull, or junction boxes shall be installed with suitable openings in the back of the fixture to provide access to the boxes.
SUBSTANTIATION: Editorial. There does not seem to be a reason not to apply this section (a) to incandescent fixtures such as independently supported floodlights. Conduit bodies (fittings) are also used at the outlet to supply independently supported fixtures. This section does not appear to cover suspended fixtures which are supported by the outlet box by the use of box covers with provisions (hooks) for field-installed chain supports which are not part of a

fixture canopy assembly with stem or chain support.

Flexible cord use is specifically limited to an individual fixture; apparently some installers and inspectors are not aware a cord/plug should not be used as branch circuit conductors. I have seen a number of supermarkets and other establishments where end-to-end suspended fluorescent fixtures are supplied by a cord and plug connection. There is no literal permission in Section 410-30 (b) for cord use, only as inferred permission.

In (b) concealed boxes are not permitted by Section 370-29. Fixtures may be mounted over flush or surface-mounted boxes and the rules should apply in either case.

PANEL ACTION: Accept in Part.

Delete "electric discharge" from the title and in Section (a).

PANEL STATEMENT: The panel accepts the proposal to delete electric discharge as shown and rejects the balance of the proposal for lack of substantiation that clearly defines the problem.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

KEMPEL: Accepting the panel action will revise 410-14 to include incandescent luminaires mounted independent of the outlet box. While most listed incandescent luminaires may not be impacted by such a change, an incandescent chain suspended luminaire (chandelier) or cable suspended luminaire (pendant) mounted independent of the outlet box that is connected to the branch circuit via flexible cord would be.

In the 1999 NEC, 410-14(a) specifies the wiring methods permitted to connect an electric discharge luminaire mounted independent of the outlet box to the branch circuit. Revising 410-14(a) as specified in the panel action would delete the qualifier "electric discharge" and include all luminaires. This would, for example, result in requiring an incandescent chandelier mounted independent of the outlet box to be connected to the branch circuit through one of the wiring methods specified in 410-14(a). The flexible cord that is intertwined in the chain supporting an incandescent chandelier would not be permitted by 410-14(a) to connect it to the branch circuit.

There may be other incandescent luminaires mounted independent of the outlet box that are similarly affected. The submitter has not defined the problem or justified the need for this change as required by paragraph 3-3.3(d) of the NFPA Regulations Governing Committee Projects.

MEZGER: The reason for my negative vote is that the original limits placed on the clause of only applying to "electric discharge" luminaires was accurate and appropriate. Adding incandescent luminaires as proposed is an expansion of the intent that would create a hardship to many incandescent luminaires installations and not make any contribution to safety. The proposer makes no specific justification for generalizing the application of the clause to all luminaires.

(Log #1460)

18- 20 - (410-14(b)): Reject

SUBMITTER: Joseph E. McCann, City of Coral Springs, FL

RECOMMENDATION: Delete access to boxes in its entirety.

SUBSTANTIATION: Whether the fixture is electric discharge or incandescent should not make a difference, incandescent per Section 410-12 the outlet box can be covered. Testing laboratory should require an opening of sufficient size because many HID fixtures are made of cast aluminum with 3/4 in. or 1/2 in. openings, and are not easily modified in the field. Also, small fluorescent fixtures used in closets do not have an area within the fixture large enough to knock out so that sufficient access would be provided.

PANEL ACTION: Reject.

PANEL STATEMENT: Deleting Section 410-14 (b) would allow electric-discharge luminaires to be manufactured without access holes resulting in uncontrolled field modification of the luminare or no access to concealed boxes. The substantiation provides no information why this should be permitted.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #890)

18- 21 - (410-15(b)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(b) ~~Metal~~ Poles Supporting Lighting Fixtures. ~~Metal poles~~ Poles shall be permitted to be used to support lighting fixtures and as a raceway to enclose supply conductors, provided the following conditions are met.

(1) A metal pole shall have a handhole not less than 2 in. by 4 in. (50.8 mm x 102 mm) with a raintight cover to provide access to the supply terminations within the pole or pole base.

Exception No. 1: No change.

Exception No. 2: No change.

Exception No. 3: No handhole shall be required in a pole where the supply conductors are completely external of the pole or enter a weatherhead near the top of the pole and supply terminations are accessible by means of a removable pole cap or cover.

(2) Except as provided in Exception No. 3, where supply conductors are installed in underground raceway or cable and ~~Where~~ a raceway riser or cable is not installed within the pole, a threaded fitting or nipple ~~shall be~~ brazed or welded to the pole or a suitable threaded opening, opposite to the handhole for the supply connection shall be provided.

(remainder unchanged)

SUBSTANTIATION: Editorial. The requirements should apply to poles made of material other than metal, such as concrete. A handhole is not necessary where supply conductors are completely external of the pole such as a solid wood pole or one not used to enclose conductors, or where tap conductors enter through a weatherhead near the pole top and access is provided through a removable cap or cover. The present (2) literally imposes a requirement where the supply is by open overhead conductors.

PANEL ACTION: Reject.

PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. The substantiation should include a definition of the problems creating hazardous conditions with wood, concrete or other types of poles.

The submitter is referred to the heading for Section 410-15 (b) which clearly states that the requirements apply only to metal poles. To suggest that hand holes are not necessary in wood or concrete poles is inappropriate since this Section does not require them. Further, 410-15 (b) (2) in no way imposes a supply by open overhead conductors.

If conductors are external of the pole, then the pole is not being used as a raceway and Exception No. 3 is unnecessary.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1738)

18- 22 - (410-15(b)): Reject

SUBMITTER: Jamie McNamara, Hastings, MN

RECOMMENDATION: 410-15 (b) add new # (7) after # (6):

7. "Conductors not in a chapter 3 wiring method of different systems (communication circuits and power circuits) inside poles shall be considered in a raceway and meet the separation requirement for conductor in the same raceway as indicated elsewhere in this code."

SUBSTANTIATION: Light poles are not raceways and the current wording in ((b) Metal Poles Supporting Lighting Fixtures. Metal poles shall be permitted to be used to support lighting fixtures and as a raceway to enclose supply conductors, provided the following conditions are met) are not very clear the separation requirement need to be met. The separation from electric light, power, class 1 nonpower limited circuits, nonincendive circuits and intrinsically safe circuits etc.. should be clear. Light poles often have communication circuits (cameras speaker etc..) mounted on them and the power wiring and communication circuits wiring and do not have the same separation requirements as required in article 300-3, 504-30, 725-52, 760-52, 800-52, 820-52 etc.. . The current text is limited to metal poles only. Some light poles are maid of other things than metal.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 90-3 Code Arrangement makes it clear that "Chapters 1, 2, 3 and 4 apply generally". Therefore, the requirements of 300-3 are applicable. 90-3 further states that "Chapters 5, 6, and 7…. Supplement or modify the general rules."

And that Chapter 8 is "independent" of other Chapters. Therefore, the requirements of these later Chapters are applicable when other types of circuits are installed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1756)

18- 23 - (410-15(b)): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise to read as follows:
410-15 (b) I underlined added text. I put a line through deleted text .
410-15. Supports
(a) .....
(b) ~~Metal Poles~~ Supporting Lighting Fixtures. ~~Metal poles~~ Poles shall be permitted to be used to support lighting fixtures and as a raceway to enclose supply conductors, provided the following conditions are met.
1. A ~~metal~~ pole shall have a handhole not less than 2 in. x 4 in. (50.8 mm x 102 mm) with a raintight cover to provide access to the supply terminations within the pole or pole base.
Exception No. 1: No handhole shall be required in a pole 8 ft (2.44 m) or less in height above grade where the supply wiring method continues without splice or pull point, and where the interior of the pole and any splices are accessible by removing the fixture.
Exception No. 2: No handhole shall be required in a ~~metal~~ pole 20 ft (6.10 m) or less in height above grade that is provided with a hinged base.

2. Where raceway risers or cable is not installed within ~~the~~ a metal pole, a threaded fitting or nipple shall be brazed or welded to the pole opposite the handhole for the supply connection.
3. A ~~metal~~ pole shall be provided with a grounding terminal.
a. A metal pole with a handhole shall have the grounding terminal accessible from the handhole.
b. A metal pole with a hinged base shall have the grounding terminal accessible within the base.
Exception: No grounding terminal shall be required in a pole 8 ft (2.44 m) or less in height above grade where the supply wiring method continues without splice or pull, and where the interior of the pole and any splices are accessible by removing the fixture.
4. A metal pole with a metal hinged base shall have the hinged base and pole bonded together.
5. Metal raceways or other equipment grounding conductors shall be bonded to a metal pole with an equipment grounding conductor recognized by Section 250-118 and sized in accordance with Section 250-122.
6. Conductors in vertical ~~metal~~ poles used as raceway shall be supported as provided in Section 300-19.
7. Poles maid out of material other than metal shall be listed or labeled by a qualified testing agency.
SUBSTANTIATION: To include all types of poles including metal, plastic, fiberglass, concrete, composite materials and the like, it may be appropriate to require all poles to be listed or labeled?
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. The substantiation should include a definition of the problems creating hazardous conditions with wood, concrete or other types of poles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3253)

18- 24 - (410-15(b) Exception No. 3 (New)): Reject
SUBMITTER: John O'Bryan, Lockwood Greene
RECOMMENDATION: Add an exception to read as follows:
Exception No. 3: If a pole's size is 1 1/4 in. thru 2 in. and is 10 ft or less in height above grade where the wiring assembly from fixture through pipe is continuous, a handhole or hinged base is not required.
SUBSTANTIATION: Stanchion lighting in the petro-chemical plants, power plants and other industry plants have utilized 1 1/4 in. thru 2 in. conduit @ 10 ft 0 in. or less for mounting a 25° stanchion light on platforms, stairwells, etc., requiring the hand-rail for means of support. Article 410-15(b) does not address this concept or installation.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The code does not prohibit this installation. Conduit is an acceptable raceway as per Chapter 3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1739)

18- 25 - (410-15(c)): Reject
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: New (c) Poles Supporting Lighting Fixtures. Poles not made of metal shall not be used to support lighting fixtures.
SUBSTANTIATION: To clarify that poles made of, plastic, fiberglass, concrete, composite materials and the like cannot be used to support lighting fixtures.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. Poles of other material are commonly used and are not prohibited by 410-15. This section is intentionally limited to the use of metal poles as a support for luminaires and as a "raceway" for circuits supplying the luminaire. Metal poles pose specific shock hazards which are addressed by this section. The substantiation does not contain any documentation or data defining hazards that would cause the panel to extend these requirements to poles constructed of other materials.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3882)

18- 26 - (410-16(a)): Reject
NOTE: The Technical Correlating Committee directs the Panel to "Accept" this Proposal to correlate with the Panel Action on Proposal 9-36. The responsibility for outlet boxes is with Code-Making Panel 9. This action will be considered by the Panel as a Public Comment.
SUBMITTER: J. Philip Simmons, Simmons Electrical Services
RECOMMENDATION: Revise as follows:
(a) Outlet Boxes. Outlet boxes or fittings installed as required by Section 370-23 shall be permitted to support fixtures ~~weighing 50 lb (22.7 kg) or less. A fixture that weighs more than 50 lb (22.7 kg) shall be supported independent of the outlet box unless the outlet box is listed for the weight to be supported.~~
SUBSTANTIATION: The requirements for using outboxes for the support of lighting fixtures should be included with similar requirements in Section 370-27. This will improve the organization of the code and make it more user friendly by consolidating similar requirements in one location.
PANEL ACTION: Reject.
PANEL STATEMENT: The Scope of Article 370 indicates that it covers the installation of outlet boxes, not luminaires. It would appear more appropriate to delete or move the requirements in Article 370 that deal with the installation of luminaires to Article 410. The submitter may want to address this during the comment period.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #417)

18- 27 - (410-16(h)): Reject
SUBMITTER: Ronald E. Soltis, Centre Region Code Admin.
RECOMMENDATION: Revise to read as follows:
(h) Trees. Outdoor lighting fixtures and associated equipment shall (not) be permitted to be supported by trees.
~~(FPN No. 1): See Section 225-6 for restriction for support of overhead conductors.)~~
~~(FPN No. 2): See Section 300-5(d) for protection of conductors.~~
SUBSTANTIATION: Using trees or any live vegetation as supports for permanent lighting fixtures and associated equipment can only cause problems in the future. I have seen instances where the trees have grown around the lighting fixtures and equipment to a point where it is impossible to remove the covers for ordinary repairs. Injuries may occur when the tree is harvested and metal fasteners remain in the lumber. This change would also coincide with Section 225-6 entitled "Vegetation."
PANEL ACTION: Reject.
PANEL STATEMENT: Given the prohibition for installing luminaries with overhead conductors and the protection of conductors specified in Section 300-5, the current requirements are appropriate.
Additional documentation demonstrating a hazard to people or property is necessary to support deletion of an installation method that has been satisfactory and safe for a number of years.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3881)

18- 28 - (410-18(b), Exception (New)): Accept in Principle
NOTE: The Techncial Correlating Committee directs the Code-Making Panel to review the Proposal relative to the word "when". The Techncial Correlating Committee directs this proposal be sent to Code-Making Panel 5 for information. This action will be considered by the Panel as a Public Comment.
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise as follows:
(b) Made of Insulating Material. Fixtures directly wired or attached to outlets supplied by a wiring method that does not provide a ready means for grounding shall be made of insulating material and shall have no exposed conductive parts.
Exception: Where the wiring method does not provide a ready means for grounding the lighting fixture at the lighting outlet, it shall be permitted to connect an equipment grounding conductor from the outlet in compliance with Section 250-130(c). The lighting fixture shall then be grounded in accordance with (a).
SUBSTANTIATION: A serious problem exists with this section at the present time. No satisfactory method is provided for grounding of lighting fixtures where a grounding means does not exist in the box. As a result, some installations may inadvertently violate the provisions of Section 410-18(b) as very few lighting fixtures are made with all insulating materials. Typically, lighting fixtures are selected based on appearance and functionality and not on whether they can be grounded or not. If this proposal is accepted, manufacturer installation instructions can be provided to describe and illustrate proper installation methods. This proposed change will provide a workable solution to a known problem. Section 250-130(c) provides for the grounding of ungrounded receptacles as well as for the extension of br circuits where there is not a grounding means in the outlet. Additional flexibility for connection of this remote equipment grounding conductor was provided during the processing of the 1999 NEC. This same provision should be permitted for grounding of lighting fixtures.
PANEL ACTION: Accept in Principle.
Modify the text to read as follows:
"Exception: When replacing a luminaire, it shall be permitted to connect an equipment grounding conductor from the outlet in compliance with 250-130(c). The lighting fixture shall then be grounded in accordance with 410-18(a) ."
PANEL STATEMENT: The first portion of the sentence is not necessary. The requirement limiting the exception to replacement is necessary to clarify that the exception does not apply to new installations. The implication in the substantiation concerning manufacturer installation instructions is not a code issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP1804)

18- 28a - (410-22): Accept
SUBMITTER: CMP 18
RECOMMENDATION: Modify 410-22 to read as follows:
"410-22. Fixture Wiring — General.
Wiring on or within fixtures shall be neatly arranged and shall not be exposed to physical damage. Excess wiring shall be avoided. Conductors shall be arranged so that they are not subjected to temperatures above those for which they are rated."
SUBSTANTIATION: The text was revised to conform to Style Manual Section 3.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1079)

18- 29 - (410-27(b)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 14" to "14 AWG" and "No. 18" to "18 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3741)

18- 30 - (410-31): Accept
SUBMITTER: Michael S. O'Boyle, Lightolier, Inc./Rep. American Lighting Assn.
RECOMMENDATION: Delete the exceptions and divide the three requirements contained in 410-31 into 410-31, 410-32 and 410-33:
410-31. Fixtures as Raceways. Fixtures shall not be used as a raceway for circuit conductors unless listed and identified for use as a raceway.
410-32. Wiring Supplying Fixtures Connected Together. Fixtures designed for end-to-end connection to form a continuous assembly, or fixtures connected together by recognized wiring methods, shall be permitted to contain the conductors of two 2-wire circuits, or one multiwire branch circuit, supplying the connected fixtures. One additional 2-wire branch circuit separately supplying one or more of the connected fixtures shall also be permitted.
FPN: See Article 100 for definition of "Multiwire Branch Circuit."
410-33 Branch Circuit Conductors and Ballasts. Branch-circuit conductors within 3 in. (76 mm) of a ballast shall have an insulation temperature rating not lower than 90°C (194°F) unless supplying a fixture listed and identified as suitable for a different insulation temperature.
SUBSTANTIATION: The text of 410-31 presently addresses three distinct issues that should be addressed in separate sections. Fixture listings and markings apply to items contained in these requirements and therefore references to them were added as needed. This proposal eliminates an excessive number of exceptions; rearrangement of the section better conveys the objectives. This proposal eliminates redundant statement of maximum operating temperature for specific wire types, which is already clearly stated in Table 310-13. This is a companion proposal to Section 410-11 to revise the fine print note referencing 410-31.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4332)

18- 31 - (410-33 (New)): Reject
SUBMITTER: Curtis Chapel, Resistance Electric
RECOMMENDATION: Add new Section 410-33 to read:
410-33. Surface Mounted Fixtures with Screwshell Type Lampholders. In lighting fixtures with screw-shell type lampholders, the lampholder shall be designed so that it cannot accept a lamp of higher wattage than the fixture is listed and marked to use.
SUBSTANTIATION: I was dramatically convinced of the absolute necessity of this proposal, in this form, when I was called to the home of an elderly woman to find and fix the problem in a surface mounted ceiling light fixture that intermittently worked.

Upon removal of that fixture (which was at that time over-lamped) I found the building wires in the box to which it was attached completely disintegrating, with its remaining cracked insulation falling into my eyes.

I climbed into the ceiling and crawled over and above the box and looked down on the box. There, to my horror, shock, and amazement lay the conductor cabling, with its outer sheath and conductor insulation completely disintegrated (only bare parallel blackened copper wires, up to one foot away). It was only the grace of god, and an occasionally tripping circuit breaker, that prevented a fire up to that point.

And I am not the only person with similar observations.

Consumer Product Safety Commission estimates 14,800 residential structure fires a year 1992-1996 in "installed wiring" (see the copy of 1996 Residential Fire Loss Estimates which I have provided). In addition, 5,200 were probably caused by "light fixtures". Up to 23,200 Fires, 180 civilian deaths (not fire fighters and others), 660 civilian injuries, $359.9 million property loss in 1996 alone.

Obviously citizens/consumers are not seeing (elderly or sight-impaired), understanding (nonenglish speaking and/or nonreading), or heeding the current markings on surface mounted ceiling light fixtures.

Current code protects us from ourselves by the use of rejecting fuse-holders in Section 240-54 (from which the wording in this proposal is patterned). Fluorescent and compact-fluorescent fixtures reject, buy design of fixtures matching bulbs, inappropriate wattages.

The last code cycle had numerous requests for change in this area. Please do not allow three more years of fires and deaths by delaying any further.

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The data provided is not specific enough to identify overlamping as the cause of fires in the report. The proposal is a product requirement that is difficult if not impossible for an AHJ to enforce. Also, as written, it is a prescriptive requirement that provides only one way to accomplish its purpose. Section 90-2 clearly states that the NEC covers the installation of electric conductors and equipment. Since lamps of varying wattages have a common base and envelope, there is no physical means for the lampholder to reject the lamp based on wattage.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #307)

18- 32 - (410-56): Reject
SUBMITTER: Steven Holewinski, Long Electric/Rep. IBEW
RECOMMENDATION: Either receptacles should be mounted with the ground up or down.
SUBSTANTIATION: The ground should be down. Cords with grounds on them are wired with the ground closest to the cord, so when it is plugged in with the ground up, the weight of the cord and/or tripping hazard will make the prongs more accessible to energized prongs.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither. Further, there is no standard as to the direction of the cord in relation to the ground prong as implied in the substantiation. In fact, molded plugs are produced in several forms.

Since the introduction of grounding-type receptacles, they have been installed in both positions (in roughly equal proportions) as well as mounted horizontally, with no significant history of shock or fire hazard supporting a required mounting position.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4370)

18- 33 - (410 Part L): Reject
SUBMITTER: Ed Stubbs, City of Atlanta, GA
RECOMMENDATION: Revise as follows:
410-L. Receptacles, Cord Connections, and Attachment Plugs. (Revised text)

Relocate 410-56, 410-57, 410-58 to Chapter 2 Wiring and Protection. Which will fall under Article 210 Branch Circuits(a) General Provisions.
SUBSTANTIATION: Under Article 210-1 Scope, it states "This article covers branch circuits except for branch circuits that supply only motor loads, which are covered in Article 430, etc." 210-2 said "Other articles for specific purpose branch circuits." When you look down the article and section listed, it doesn't refer you to article 410-L under any circumstances.

If you are at Chapter 4 "Equipment for General Use" with the exception of Article 400 fixture wiring and 410-L for receptacles, everything in Chapter 4 is equipment that utilize (burn) electricity. I've been teaching the NEC since 1990. An electrical inspector since 1988, and an electrician since 1966 and I see no logic in the location of the receptacles in Chapter 4. I try to teach all contractors and inspectors how to find articles. We all agree that this one is out of place, and the fixture wiring, which is a wiring method, is also out of place. Since Article 250 was rearranged to meet the proper applications, so can the receptacles be relocated. I can't tell you how many contractors and inspectors could not find the section on required dome covers (410-57) unless you memorized it. It said this book is not for untrained persons, but even the trained couldn't find it at its location.
PANEL ACTION: Reject.
PANEL STATEMENT: Article 210 contains the rules for branch circuits which, by definition in Article 100, relates only to the "circuit conductors". Article 210 does not cover the installation of other equipment. The list in Section 210-2 covers "..specific purpose branch circuits…" , again, not the installation of other equipment.

See panel action on Proposal 18-70 which establishes a separate article for wiring devices.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4370a)

2- 309 - (410 Part L): Reject

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 18 for information.
SUBMITTER: Ed Stubbs, City of Atlanta, GA
RECOMMENDATION: Revise as follows:
410-L. Receptacles, Cord Connections, and Attachment Plugs. (Revised text)

Relocate 410-56, 410-57, 410-58 to Chapter 2 Wiring and Protection. Which will fall under Article 210 Branch Circuits(a) General Provisions.
SUBSTANTIATION: Under Article 210-1 Scope, it states "This article covers branch circuits except for branch circuits that supply only motor loads, which are covered in Article 430, etc." 210-2 said "Other articles for specific purpose branch circuits." When you look down the article and section listed, it doesn't refer you to article 410-L under any circumstances.

If you are at Chapter 4 "Equipment for General Use" with the exception of Article 400 fixture wiring and 410-L for receptacles, everything in Chapter 4 is equipment that utilize (burn) electricity. I've been teaching the NEC since 1990. An electrical inspector since 1988, and an electrician since 1966 and I see no logic in the location of the receptacles in Chapter 4. I try to teach all contractors and inspectors how to find articles. We all agree that this one is out of place, and the fixture wiring, which is a wiring method, is also out of place. Since Article 250 was rearranged to meet the proper applications, so can the receptacles be relocated. I can't tell you

how many contractors and inspectors could not find the section on required dome covers (410-57) unless you memorized it. It said this book is not for untrained persons, but even the trained couldn't find it at its location.
PANEL ACTION: Reject.
PANEL STATEMENT: This material is appropriate in Chapter 4. Code-Making Panel 18 has been reviewing the issue. The panel recommends to the Technical Correlating Committee that this proposal be forwarded to Code-Making Panel 18 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #889)

18- 34 - (410-56(a)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Receptacles and Cord Connectors. Receptacles installed for the attachment of portable cords, and cord connectors, shall be rated not less than 15 amperes, 125 volts, or 15 amperes, 250 volts, and shall be of a type not suitable for lampholders.
SUBSTANTIATION: No rating is specified for cord connectors which are used for attachment of plugs. Subsection (g) appears to assume ratings of 15- or 20 amperes for connectors since there is no comma after "plugs" in the first sentence.
PANEL ACTION: Accept in Principle.
Revise 420-2(b) to read as follows:
"(b) Rating. Receptacles and cord connectors shall be rated not less than 15 amperes, 125 volts, or 15 amperes, 250 volts, and shall be of a type not suitable for use as lampholders."

PANEL STATEMENT: The panel accepts the intent of the proposal and is incorporating the change into proposed Article 420.
The words "installed for the attachment of portable cords" were deleted because equipment such as night lights may also be plugged into such receptacles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3223)

18- 35 - (410-56(a)): Reject
SUBMITTER: Mike Weitzel, City of Wenatchee, WA
RECOMMENDATION: Add new text to read as follows:
Receptacle devices with push-in connections that do not depend upon the use of pressure terminal screws shall not be used.
SUBSTANTIATION: Many fires have been caused by the failure of these types of receptacle devices due to loose and overheated connections. We have experienced these problems in our city.
PANEL ACTION: Reject.
PANEL STATEMENT: Improperly made terminations of any type (binding terminal screw, twist on wire connector, split bolt, etc.) can produce overheating. Nothing in the substantiation supports "push-in connections" as any more or less susceptible too improper termination than other methods.
The ANSI standard covering receptacles (UL 498) was significantly revised several years ago limiting the conductor size to 14 AWG solid conductors and adding more severe terminal temperature test requirements for push-in type terminals.
The substantiation does not identify whether the receptacles with which he has experience were produced before or after this standard revision.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2081)

18- 36 - (410-56(b)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Revise text to read as follows:
(b) CO/ALR Receptacles. Receptacles ~~rated 20 amperes or less and directly~~ connected to aluminum conductors shall be marked CO/ALR.
SUBSTANTIATION: There are other sizes of receptacles connected to aluminum conductors other than 15-20 ampere sizes.
All these receptacles should be required to comply with this requirement.
This part "L" of the NEC does not limit the size of receptacles just to 15-20 amperes.
Section 410-56(a) just states that receptacles shall be rated not smaller than 15 amperes where attachment of portable cords are utilized.
There is no general statement included in 410-56.
Thereby implying that this section applies to ALL receptacles.
PANEL ACTION: Reject.
PANEL STATEMENT: The "CO/ALR" marking is restricted to 15- and 20- ampere switches and receptacles. The product standards covering other ratings and products generally require "AL/CU" marking. Therefore, the requirement in Section 410-56(b) is correct.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1448)

18- 37 - (410-56(e)): Reject
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Keep the entire paragraph as is.
Add the following sentence at the end:
"The grounding slot of grounding type receptacles shall be permitted to face up, down, left, or right in relation to the other slots."
SUBSTANTIATION: The purpose of this proposal is to clarify a long standing confusion out in the field which has been caused by inaction on the part of the NFPA. See 1995 ROP 2-48.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement for Proposal 18-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2082)

18- 38 - (410-56(e), Exception): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add an Exception to read as Follows:
Exception: Faceplates of insulating materials that are listed for the purpose shall be allowed to cover the receptacle faces.
SUBSTANTIATION: Third Party Listing Agency's have listed special insulating faceplates that cover the receptacle faces.
One such faceplate is the KIDDY PROOF cover.
The present wording would not allow this installation.
There have been no reports that this installation presents a fire hazard.
UL has tested these covers and would not have listed such if the covers did not meet the pull out requirements.
This product should not be removed from the marked place.
Also please note that their is in the market place other covers that are listed by UL that also cover the receptacle faces.
No reports of fires or electrical shock have been reported on these other devices.
Please also consider that receptacle covers of the weather proof type do not comply with this requirement and a change may be required to exempt this requirement for weatherproof covers and hazardous location covers.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation contains several statements that are assumptions that this panel believes are incorrect or at least undocumented.
It is correct that several certification organizations have listed such products. None-the-less, significant questions remain as to the criteria for listing and the degree to which the investigation of these products inhibit full (and thus safe) engagement of the attachment plug blades in the receptacle contacts. Since there is not a specified dimension in the standard that defines the depth of the point of contact engagement below the surface of the receptacle cover, this depth varies from one product to another. Further, there is not any

standard defining the thickness of such covers.
It is also clear that these products were not listed for installation in accordance with the National Electrical Code. Recognizing that any obstruction between the plug and receptacle face can result in unsafe blade engagement, Section 410-56 (e) clearly requires receptacle faces to be "flush or project from faceplates of insulating material. None of the plates examined by the Panel meet this requirement. Therefore, their installation, regardless of whether or not they are listed, is a violation of this Section unless over ruled by the AHJ's special permission clause in Section 90-2 (c).
Analysis of a limited number of such covers indicate that some of the covers in question (including one which is listed) do inhibit attachment plug blade insertion to a potentially hazardous degree in some receptacles. While these investigations have not examined all combinations of covers and receptacles, the limited investigation indicates a potential problem exists.
Therefore, the assumption that a fire hazard does not exist is simply not correct.
The substantiation further indicates that there are no reports of fires. No data is provided as an example and no indication is given as to the data sources analyzed to support this statement. It is not likely that fire reports would be definitive enough to identify the cover as the cause, rather, the reports would likely refer to a "receptacle fire".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2801)

18- 39 - (410-56(f)(4)): Reject
SUBMITTER: Robert Hartman, Waukesha Power Systems
RECOMMENDATION: Add text to read as follows:
(4) Receptacle Orientation. Receptacles of the grounding type, mounted vertically, shall be mounted so that the grounding pole is oriented up. Receptacles mounted horizontally shall be mounted so that the ground pole is oriented up.
Exception: Where strain on the cord of a quick turn plug can be reduced, the receptacle shall be reoriented.
SUBSTANTIATION: This text is an attempt to standardize outlet installation and equipment cord manufacture. The grounding pole should be up for observation of its insertion. The grounding pole will be less likely to be broken off with this orientation. The ungrounded pole is less likely to be exposed in this orientation.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel statement on Proposal 18-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #303)

18- 40 - (410-56(f)(2)): Reject
SUBMITTER: Bruce Wardell, Jr., Belway Electric
RECOMMENDATION: Add new text to 410-56(f)(2):
Installation of an insulating, nonconductive, protective (rubber) device shall be required on both sets of termination screws of the receptacle.
SUBSTANTIATION: This will prevent accidental short circuit or shock to the electrician or others when removing or aligning energized receptacles.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains no documentation or data indicating that this is a problem sufficient to adopt this requirement
Generally accepted work practices involve de-energizing the circuit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1921)

18- 41 - (410-56(j)): Reject
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
L. Receptacles, Cord Connectors, and Attachment Plugs (Caps)
410-56. Rating and Type and Control
(a) Receptacles. Receptacles installed for the attachment of portable cords shall be rated at not less than 15 amperes, 125 volts, or 15 amperes, 250 volts, and shall be of a type not suitable for use as lampholders.
(b) CO/ALR Receptacles. Receptacles rated 20 amperes or less and directly connected to aluminum conductors shall be marked CO/ALR.
(c) Isolated Ground Receptacles. Receptacles intended for the reduction of electrical noise (electromagnetic interference) as permitted in Section 250-146(d) shall be identified by an orange triangle located on the face of the receptacle. Receptacles so identified shall be used only with grounding conductors that are isolated in accordance with Section 250-146(d). Isolated ground receptacles installed in nonmetallic boxes shall be covered with a nonmetallic faceplate.
Exception: Where an isolated ground receptacle is installed in a nonmetallic box, a metal faceplate shall be permitted if the box contains a feature or accessory that permits the effective grounding of the faceplate.
(d) Faceplates. Metal faceplates shall be of ferrous metal not less than 0.030 in. (0.762 mm) in thickness or of nonferrous metal not less than 0.040 in. (1.016 mm) in thickness. Metal faceplates shall be grounded. Faceplates of insulating material shall be noncombustible and not less than 0.10 in. (2.54 mm) in thickness but shall be permitted to be less than 0.10 in. (2.54 mm) in thickness if formed or reinforced to provide adequate mechanical strength.
(e) Position of Receptacle Faces. After installation, receptacle faces shall be flush with or project from faceplates of insulating material and shall project a minimum of 0.015 in. (0.381 mm) from metal faceplates. Faceplates shall be installed so as to completely cover the opening and seat against the mounting surface.
(f) Receptacle Mounting.
1. Receptacles mounted in boxes that are set back of the wall surface, as permitted in Section 370-20, shall be installed so that the mounting yoke or strap of the receptacle is held rigidly at the surface of the wall.
2. Receptacles mounted in boxes that are flush with the wall surface or project there from shall be installed so that the mounting yoke or strap of the receptacle is seated against the box or raised box cover.
3. Receptacles Mounted on Covers. Receptacles mounted to and supported by a cover shall be secured by more than one screw or shall be a device assembly or box cover listed and identified for securing by a single screw.
(g) Attachment Plugs. All 15- and 20-ampere attachment plugs and connectors shall be constructed so that there are no exposed current-carrying parts except the prongs, blades, or pins. The cover for wire terminations shall be a part, which is essential for the operation of an attachment plug or connector (dead-front construction). Attachment plugs shall be installed so that their prongs, blades, or pins are not energized unless inserted into an energized receptacle. No receptacle shall be installed so as to require an energized attachment plug as its source of supply.
(h) Attachment plug ejector mechanisms shall not adversely affect engagement of the blades of the attachment plug with the contacts of the receptacle.
(i) Noninterchangeability. Receptacles, cord connectors, and attachment plugs shall be constructed so that receptacle or cord connectors will not accept an attachment plug with a different voltage or current rating than that for which the device is intended; however, a 20-ampere T-slot receptacle or cord connector shall be permitted to accept a 15-ampere attachment plug of the same voltage rating. Nongrounding-type receptacles and connectors shall not accept grounding-type attachment plugs.
(j) Controlled Receptacles. 125 volt 15- and 20-ampere receptacles shall be permitted to be controlled by switches installed in accordance with Article 380. General use dimmer switches shall not be used to control 125-volt 15- and 20-ampere receptacles. See Section 380-14(e).
SUBSTANTIATION: Although the listing and installation instructions for general use dimmer switches is specific and information in th UL green book carries this information, this continues to be an issue for many because it does not appear as a

mandatory requirement in the NEC. This wording for this proposal was extracted from the UL white book 1998 edition page 20. The product category is Dimmers, General Use Switch (EOYX). Discussions with both engineers and contractors at construction sites have raised the question when wanting to apply these dimmers in this manner. The comment was something to the effect that it does not appear anywhere in the Code. That is a true statement, however 110-3(b) does cover this indirectly. Inserting this new section in Article 380 should help eliminate these gray areas and improve safety. Safety hazards and fire hazards are created if items such as vacuum cleaners and other utilization equipment is connected to a receptacle that is controlled by a dimmer switch.
PANEL ACTION: Reject.
PANEL STATEMENT: The guide information in the UL General Information Guide and the required installation instructions clearly indicate that these products are for the "control of permanently installed incandescent fixtures." The hazards mentioned in the proposer's substantiation are due to improper installation and therefore in violation of 110-3(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #329)

18- 42 - (410-57): Reject
SUBMITTER: Richard L. Miell, Otero County, CO
RECOMMENDATION: 410-57. Receptacles in Damp or Wet Locations
(c) Bathtub and shower Zone. A receptacle shall not be installed within a Bathtub and Shower Zone.
SUBSTANTIATION: This change will make this section consistant with changes in Article 100, Section 380-4, and Section 410-4, allowing a rule to reference a defined area, as defined in Article 100.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is not aware of any requirements in 380-4 that would be in conflict with 410-57. This proposal has no substantiation sufficient to define the problem with the present wording.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2498)

18- 43 - (410-57(b)(1)): Accept in Principle in Part
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
RECOMMENDATION: Revise as follows:
(1) A receptacle installed in a wet location ~~where the product is intended to be plugged into it is not attended while in use (e.g., sprinkler system controllers, landscape lighting, holiday lights, etc.)~~ shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.
SUBSTANTIATION: Uniform enforcement of this is a nightmare, for instance, the receptacle on the patio bubble cover or no bubble cover? How does the inspector or contractor know how if someone is going to be in attendance?
THIS IS NOT USER FRIENDLY CODE LANGUAGE so eliminate the problem which is attendance and come back to uniformity.
PANEL ACTION: Accept in Principle in Part.
Modify the text of proposed 420-8(b) to read as follows:
"420-8 (b) Wet Locations.
(1) 15- and 20-ampere outdoor receptacles. 15- and 20-ampere, 125- and 250-volt receptacles installed outdoors in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted.
(2) Other receptacles. All other receptacles installed in a wet location shall comply with (a) or (b) below:
(a) A receptacle installed in a wet location where the product intended to be plugged into it is not attended while in use (e.g., sprinkler system controller, landscape lighting, holiday lights, etc.) shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.
(b) A receptacle installed in a wet location where the product intended to be plugged into it will be attended while in use (e.g., portable tools, etc.) shall have and enclosure that is weatherproof when the attachment plug is removed."
PANEL STATEMENT: The panel accepts the intent of the proposal and is incorporating the change into proposed Article 420.
The proposal covered all types and sizes of receptacles and locations. The Panel has limited the wording to specific current / voltage ratings and to those installed outdoors.
The reason for limiting this requirement to outdoor receptacles is that a number of receptacles are installed in wet locations indoors in facilities such as food processing plants or breweries where washdown of walls is commonly done with high pressure sprayers. Enclosures intended to be weatherproof when the plug cap is inserted or removed may well not provide the degree of protection afforded by enclosures which are weatherproof only when the plug is removed. Such facilities typically do not leave attachment plug caps inserted and unattended.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
WALL: The submitter of the proposal did not provide technical substantiation nor did he mention any safety issues. The submitter indicated only that enforcement of the present code language was a "nightmare"; therefore, the proposal should be rejected.

(Log #2497)

18- 44 - (410-57(b)(2)): Reject
SUBMITTER: Andre R. Cartal, Bldg Dept., Princeton Borough, NJ
RECOMMENDATION: Delete. See proposal for Section 410-57(b)(1).
SUBSTANTIATION: Uniform enforcement of this is a nightmare, for instance, the receptacle on the patio bubble cover or no bubble cover? How does the inspector or contractor know how if someone is going to be in attendance?
THIS IS NOT USER FRIENDLY CODE LANGUAGE so eliminate the problem which is attendance and come back to uniformity.
PANEL ACTION: Reject.
PANEL STATEMENT: The reason for limiting this requirement to outdoor receptacles is that a number of receptacles are installed in wet locations indoors in facilities such as food processing plants or breweries where washdown of walls is commonly done with high pressure sprayers. Enclosures intended to be weatherproof when the plug cap is inserted or removed may well not provide the degree of protection afforded by enclosures which are weatherproof only when the plug is removed. Such facilities typically do not leave attachment plug caps inserted and unattended.
Therefore the requirements in 410-57 (b) (2) have been maintained. See panel action on Proposal 18-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3311)

18- 45 - (410-57(b)(3) (New)): Accept in Principle
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Add a new subsection to read as follows:
410-57(b)(3) - A 125-volt, single phase, 15- and 20-ampere receptacle type ground-fault circuit-interrupter, installed in an outdoor wet location in a dwelling unit shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.
SUBSTANTIATION: Section 210-8(a)(3) requires all 125-volt, single-phase, 15- and 20-ampere outdoor receptacles in dwelling units to be ground-fault circuit-interrupter protected. A common means of achieving this protection is to install a receptacle type GFCI on the outside of the dwelling unit in a location that is unprotected from exposure to weather conditions such as rain and snow. A receptacle type GFCI installed in such a location must be adequately protected to prevent corrosion of internal components due to excessive exposure to moisture. The result of prolonged direct exposure to moisture may compromise the capability of the GFCI to provide personnel protection.
It is difficult to predict that an outdoor receptacle installed in a dwelling unit will be used only with equipment that is attended while in use. These outdoor dwelling unit receptacles are commonly used for unattended applications, such as landscape and seasonal lighting, that probably were not foreseen at the time of installation. In order to provide maximum protection for the receptacle GFCI it is essential to install an enclosure/cover that

protects the GFCI under all conditions, regardless of whether or not a plug is inserted or removed.

A receptacle GFCI requires a higher level of protection from water than a standard receptacle because of the potential moisture damage to the circuitry that provides ground fault protection. Underwriters Laboratories recognizes this by requiring GFCI instruction sheets to specify that in wet locations a weatherproof cover must be provided to keep dry both the receptacle and plugs inserted into the receptacle.

It is important to adopt this proposed requirement to ensure the highest level of safety when a GFCI type receptacle is installed in dwelling unit locations.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on proposal 18-43.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1980)

18- 46 - (410-57(c)): Reject
SUBMITTER: Victor V. Timpanaro, Rep. Municipal Electrical Inspections Assn. of NJ Inc.
RECOMMENDATION: Revise as follows:

Bathtub and Shower Space. A receptacle shall not be installed within 5 feet of a bathtub or shower space.

SUBSTANTIATION: Commentary following the above section in NFPA 70 Handbook, page 424, states reason for above rule was to prohibit installation of receptacles inside bathtub and shower spaces to prevent use of shavers, radios, hair dryers, etc.

Several illustrations shown in code change books have shown that a receptacle outlet may be installed immediately outside the tub area, though GFCI protected.

Since the intent seems to be to prevent the use of the aforementioned electrical products which prove to be a potential hazard, as explained in the commentary, the permitted use of a receptacle outlet installed as illustrated, still presents the same hazard, since the product can be plugged into the outlet.

Your panel may choose 5 or 6 feet whichever you believe would accomplish the purpose. However, to be consistent with the requirement for hot tubs located at Section 680-41(a)(1), you may wish to use the 5 ft dimension.

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 210-52 (d) requires a wall receptacle outlet within 36 in. of the outside edge of the basin in bathrooms. This requirement is to ensure that a wall receptacle is present in the bathroom to eliminate the need for serving the bathroom with an extension cord.
Many bathrooms are not large enough to require this receptacle to be located 5 ft. from the bath or shower zone.

The receptacle must be grounded and protected with a GFCI in accordance with Section 210-8 (a)(1) which provides protection from shock hazard.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1979)

18- 47 - (410-57(c), FPN (New)): Reject
SUBMITTER: Victor V. Timpanaro, Rep. Municipal Electrical Inspections Assn. of NJ Inc.
RECOMMENDATION: Add a fine print note to read as follows:

FPN: For purposes of clarification, the bathtub and shower space is that zone that completely surrounds the shower stall or bathtub including the rim around the tub, however large in dimension, and ends at the front edge of the bathtub or shower stall.

SUBSTANTIATION: Recent legal challenges to the lack of a definition and avoid a decision leading to installation and approval of receptacles installed in the space defined because a rim which extends beyond the bathtub itself may be large enough to permit a receptacle.

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC Style Manual does not allow definitions as fine print notes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2083)

18- 48 - (410-57(f)): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Revise text to read as follows:

(f) Installation. A receptacle outlet installed outdoors shall be located so that water accumulation is not likely to touch the ~~outlet cover or~~ receptacle face plate.

SUBSTANTIATION: As worded the section is not clear as to the water accumulation on the outlet which holds the receptacle.

This rewrite will clarify this over site.

Also water must accumulate on the cover when it rains.

Only the face plate under the cover must be kept dry.
PANEL ACTION: Accept in Principle.
Delete the wording in the proposed new 420-8(f).
PANEL STATEMENT: The panel accepts the intent of the proposal and is incorporating the change into proposed Article 420.

The revision to 410-57 (b) accepted in Proposal 18-43 eliminates the need for this requirement. Deleting the requirement eliminates the wording described by the submitter as unclear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
EXPLANATION OF NEGATIVE:

KEMPEL: The submitter's substantiation infers that the phrase "water accumulation" as used in 410-57(f) refers to rain drops or sprinkler spray that strikes the outlet cover. The panel action and panel statement were based on this inference. The phrase "located so that water accumulation is not likely to touch the outlet cover" in 410-57(f) could also refer to water that might collect below the receptacle and rise high enough to contact it. Further research of earlier Code cycle documents reveals that this was the intent of the original requirement, which was added as Section 410-54(d) to the 1971 NEC. Thus, this Code section is instructing the installer to mount the receptacle high enough above grade to prevent this.

This being the case, 410-57(f) [420-8(f)] should not be deleted as this is the only section in Article 410 that addresses this installation issue. Also, the fact that the submitter and Panel 18 interpreted the existing wording differently than intended validates the submitter's contention that 410-57(f) needs clarification.

MEZGER: The reason for my negative vote is that the panel's interpretation of the proposer's intent was apparently in error as adequately explained and reviewed in the negative vote submitted by Mr. Kempel. Therefore, 410-57(f) should not be deleted as proposed. Clarification of the clause should be considered.

(Log #2084)

18- 49 - (410-57(f)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a second paragraph to read as follows:

"A weatherproof faceplate assembly shall not be dependent on a single mounting screw or support to secure the weatherproof faceplate assembly to the outlet box or any surface mounted assembly."

SUBSTANTIATION: Weatherproof faceplate assembly's are now becoming to large to accept only the single screw to support the cover to the receptacle center screw.

With the cord now dependent on the cover being closed or water tight when the cover is closed this additional requirement puts additional forces on a single screw.

Where force is put on the cord additional forces allow water to enter the sealing area around the outlet box and cover plate.

Box covers are now manufactured with additional mounting means and the code should change to make this requirement mandatory for a safer installation.

There are reported concerns where the covers are missing due to this support being inadequate.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a product safety requirement that more appropriately belongs in the product standard.
The substantiation anecdotally indicates there are "reported concerns where covers are missing due to this support being

inadequate", but provides no documentation of the specific problem.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2085)

18- 50 - (410-57(f)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Revise section to read as follows and add a new subsection to read:
(f) Installation.
(1) A receptacle outlet installed outdoors shall be located so that water accumulation is not likely to touch the outlet cover or plate.
(2) A receptacle outlet installed outdoors on a dwelling unit shall comply with Section 410-57(b)(1).
SUBSTANTIATION: Dwelling units are more susceptible to having attachment plugs remain attached to the receptacle then other type occupancies which lead to a hazardous condition when the occupant attempts to disengage the plug.
By requiring the cover to comply with 410-57(b)(1) will eliminate the haste to unplug the flexible cord when it starts to rain.
Also many Christmas decorations are left unattended during this season.
Requiring this while not attended cover will eliminate this concern.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel actions and panel statements in Proposals 18-43 and 18-48.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2086)

18- 51 - (410-57(f) (New)): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Add a new section to 410-57(f) after (e) as (f) and change section (f) to (g). To read as follows.
(f) Surface Mounting with Faceplate. The enclosure for a receptacle installed in an outlet box surface-mounted on any type surface shall be made weatherproof by means of a weatherproof faceplate assembly that provides a watertight connection between the faceplate assembly and the outlet box.
SUBSTANTIATION: Presently there is no requirement in this section to require a weatherproof cover on surface mounted outlet boxes that have receptacles installed.
Adding this section will correct this over site.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation is incorrect. Sections 410-57 (a) and (b) are not limited to flush mounted receptacles. They apply as well to surface mounted installations.
Further, these Sections refer to "enclosures" which would include the outlet box in surface mounted installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2817)

18- 52 - (410-58): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
RECOMMENDATION: After existing material, add:
(c) Warning tags. Replacement cord connectors and attachment plugs, shall be permanently tagged with warnings that improper use of this product can cause fiery death, shock, or electrocution.
SUBSTANTIATION: There is a dire need to install permanent warning tags on all replacement cord connectors and attachment plugs. This because, as presently designed, 4 of 6 ways to wire replacement components to cords, or cordsets, can cause electrocutions and fiery deaths.
For the past 13 years, I have been trying to convince the National Fire Protection Association that electrocutions and fatal, destructive fires of electrical origin alluded to by the U.S. Consumer Product Protection Agency, are caused by serious defects in the design of our cord and plug connected grounding system.
Yet, despite my admonitions regarding these life threatening hazards, cord components continue to be sold at hardware stores without any warning tags or instructions; warnings that 4 of 6 ways to wire this product to the white, black, and green cord conductors can cause an electrocution or fiery death.
And, to further compound the chances of fatal wiring errors are the molded extension cords now flooding the market without any color coding whatsoever.
The most insidious nature of the present cord and plug connected grounding system is that a reversal of the white and green wires will operate an appliance properly. They are both grounded conductors.
However, the wiring error will cause current to flow through a hundred feet, or so, of the flexible metal raceways that lace the space inside the walls and ceilings of practically every dwelling, and tenement, in our nation; literally converting rooms into electric ovens.
Massive current from a heater, for example, will cause the lengthy raceway and up to sixteen outlet box connections to overheat enough to cause "unseen", and undetectable, fire inside walls of dwellings. Tests I've made with heater current disclosed flexible raceway temperatures of 150 degrees in open air. The temperatures could be considerably higher inside insulated sealed walls. And, any poorly made, or rusted out, grounding connector may cause arcing sufficient enough to cause immediate ignition.
Tenements, and older dwellings, converted to electricity prior to the adoption of the equipment grounding system are extremely vulnerable to fires inside walls because they lack the approved grounding connectors now in use. There was no need to fasten armored cable securely in those days because the only purpose for armored cable was to protect conductors from damage and to contain, and dissipate heat. It never occurred to electricians that at some future date the armor would be permitted to carry current.
Since practically every dwelling in our nation uses metal raceways as the equipment grounding conductor it is imperative to prevent massive current, such as from heaters, dryers, and air conditioners, to flow through them for extended periods of time.
Two wire redundancy together with a slight, no cost, change in existing components will prevent a reversal of the white and green conductors from causing deadly fires inside walls, and also correct the many design defects, and cord violations, that cause electrocutions.
If the system I propose is adopted by our nation, a homeowner no longer will be playing 4 bullet "Russian Roulette" with their family because it is impossible to wire the cord and plug grounding system so as to cause an electrocution or fiery death.
However, despite my many proposals during the past 13 years, the National Fire Protection and NEMA still refuses to correct the product design defects that cause electrocutions and fiery deaths.
Therefore, permanent warning tags should be attached to all cord replacement components to, at least, warn a homeowner that 4 of the 6 ways they wire the component can cause an electrocution or a fiery death.
PANEL ACTION: Reject.
PANEL STATEMENT: Most electrical equipment when improperly connected or used represents a potential shock or fire hazard. Code requirements are written to clearly define how to properly install electrical equipment. Product safety standards, including their marking requirements, are developed to assure that equipment installed in accordance with this Code function safely.
The current combination of requirements contained in this Code and related product safety standards is adequate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2822)

18- 53 - (410-58(a)): Reject
SUBMITTER: Frank Martucci, Fort Lee, NJ
RECOMMENDATION: Add after first sentence: "Each grounding pole for cord connectors, and attachment plugs shall have two wiring sites. The cord connectors, and attachment plugs, shall be designed so that only the grounding pole can be wired with two conductors."
SUBSTANTIATION: Note: This proposal is related to a proposal for Section 250-45 seeking the adoption of electrocution-proof and fire-proof cord components for all cord and plug connected equipment. The adoption of both proposals will make the cord and plug connected grounding system electrocution-proof, and fire-proof.

The proposal will correct the design defects in existing line and extension cords that cause thousands of electrocutions and fiery deaths each and every year. Ralph Nader accused the medical profession of accidentally electrocuting 5000 patients a year with electrical equipment and covering up the deaths. The U.S. National Institute for Occupational Safety and Health estimates 700 Americans are electrocuted on the job each year. The Consumer Product Safety Commission estimates 600 persons lose their lives each year by electrocution in and around the home. And each year, hundreds of thousands of fires of electrical origin result in many more deaths, as well as billions of dollars of property damage.

Yet, despite these horrific statistics, not a single attempt has ever been made by government agencies, or the National Fire Protection Association, to investigate and correct the design defects in the electrical grounding system responsible for them.

For the past 13 years, I have been trying to convince the National Fire Protection Association that electrocutions, and fatal, destructive, fires, of electrical origin, alluded to by the U.S. consumer Product Protection Agency, are caused by serious defects in the design of our cord and plug connected grounding system.

Yet, despite my admonitions regarding these life threatening hazards, cord components continue to be sold at hardware stores, without warning tags or instructions; warnings that 4 of 6 ways to wire this product to the white, black, and green cord conductors can cause an electrocution of fiery death.

And, to further compound the chances of fatal wiring errors are the molded extension cords now flooding the market without any color coding whatsoever.

The most insidious nature of the present cord and plug connected grounding system is that a reversal of the white and green wires will operate an appliance properly. They are both grounded conductors.

However, the wiring error will cause current to flow through a hundred feet, or so, of the flexible metal raceways that lace the space inside the walls and ceilings of practically every dwelling, and tenement, in our nation; literally converting rooms into electric ovens.

Massive current from a heater, for example, will cause the lengthy raceway and up to sixteen outlet box connections to overheat enough to cause "unseen", and undetectable, fire inside walls of dwellings. Tests I've made with heater current disclosed flexible raceway temperatures of 150 degrees in open air. The temperatures could be considerably higher inside insulated sealed walls. And, any poorly made, or rusted out, grounding connector may cause arcing sufficient enough to cause immediate ignition.

Tenements, and older dwellings, converted to electricity prior to the adoption of the equipment grounding system are extremely vulnerable to fires inside walls because they lack the approved grounding connectors now in use. There was no need to fasten armored cable securely in those days because the only purpose for armored cable was to protect conductors from damage and to contain, and dissipate, heat. It never occurred to electricians that at some future date the armor would be permitted to carry current.

Since practically every dwelling in our nation uses metal raceways as the equipment grounding conductor it is imperative to prevent massive current, such as from heaters, dryers, and air conditioners, to flow through them for extended periods of time.

Two wire redundance together with a slight, no cost, change in existing components will prevent a reversal of the white and green conductors from causing deadly fires inside walls, and also correct the many design defects, and cord violations, that cause electrocutions.

If the system I propose is adopted by our nation, a homeowner no longer will be playing 4 bullet "Russian Roulette" with his family because it is impossible to wire the cord and plug grounding system so as to cause an electrocution or fiery death.

However, despite my many proposals during the past 13 years, the National Fire Protection Association still remains unconvinced the deadly fires that incinerate entire families within seconds, and cause billions of dollars of property damage each year, are "unseen" fires that originate, and rage inside walls.

Therefore, the carnage will continue until, hopefully, new members of the NFPA wall see the danger as I do.

We're talking about fires within walls that rage, undetected by occupants, sprinkler systems, or smoke alarms until too late. "Unseen" fires that superheat the interior of walls until they flashover and consume occupants and their procession within seconds.

Case in point is an article in the January 5, 1994 issue of the Bergen Record that reported a firefighter, (name deleted), was incinerated by a sudden inferno while searching for survivors. His buddy said a "flashover" from superheated walls caused temperatures to rise from 100 degrees to 2000 degrees within seconds. Everything in the room became incinerated within seconds.

Rutherford Fire Chief (name deleted), explained that the interiors of walls create a large area where "unseen" fires can develop and build up heat due to lack of ventilation. It makes for the ideal conditions for a flashover.

The January 15, 1995 issue of the Bergen Record reported that a house fire in Burbank, IL killed 6 children and one adult despite working smoke alarms. The report stated a smoke alarm was still blaring when firefighters arrived.

The October 9, 1995 issue of the New York Post reported that 31 year old hero firefighter (name deleted) was incinerated when the room he was standing in suddenly flashed over.

The March 22, 1998 mysterious fire that killed 11 students in Pennsylvania could also have been caused by "unseen", and undetectable, raging fires inside the cabin walls that flashed over and incinerated them within seconds.

And during a two week period of the 1998-9 Christmas season, fast moving fires in the New York Metropolitan area caused 8 deaths, several injuries, and millions of dollars of property damage. Fire officials blamed heaters that ignited combustible material. I say heater "current" and not heater "heat" is responsible for all fast moving, inferno, type fires.

A fire that demonstrates how wrong the NFPA is concerning the cause of fires is an inferno that killed nine members of a man's family while he talking to his wife on the phone. He heard his wife scream in agony at the same time the smoke alarm went off.

Orange fire officials blamed the tragedy on a heater placed too close to a blanket. And a spokesperson for the National Fire Protection Agency also informed an investigative reporter that "most heater related deaths are caused by heaters placed too close to combustible material."

Nothing could be further from the truth. In the first place, I found it impossible to get tissue paper to burn while draped around two types of electric heaters turned on for three hours. Try the experiment and see for yourself.

We are also led to believe that cigarettes, halogen lamps, or candles are also reasons for fast moving fires that caused fatalities and total destruction of property. This is simply not true. If working smoke alarms are sensitive enough to blare when toasters are used, they most certainly will warn occupants in ample time to escape if a blanket, drape, paper, or chair is on fire inside a room.

Fires that start inside rooms can be easily detected and extinguished by occupants. While serving on the fire brigade in Francis Dealfield Hospital, every fire responded to was extinguished and occupants were able to walk away unharmed.

It's the fires that start inside walls that kill and destroy property. But how can a fire start inside a wall? Walls are sealed from floor to ceiling. A fire, originating in a room, would have to rage for a half hour or more before it burnt itself into a wall, during which time smoke alarms and occupants would have detected the fire in ample time to extinguish it or escape.

And people can't smoke, use heaters, play with matches, or toss lit cigarettes inside the walls of dwellings. So its obvious that the electrical system, prone to overheating, and arcing, is to blame for flashover, fireball, and inferno type fires that kill and destroy property.

The cause of fires inside the walls are the design defects in line and extension cords together with an ill-conceived grounding system adopted and installed in practically every building in our nation

According to the original National Electric Code document, devised under the influence of insurance companies, the grounding conductor should only be copper, copper clad, or aluminum (Article 250-95 in the original code.).

Instead, electrical safety has been severely compromised with exceptions to the original code whereby inappropriate corrosive metal raceways are permitted to be used as the equipment grounding conductor.

The exception also violates the intent of the code that mandates all conductors must terminate in splice boxes to contain any heat or sparking from poorly made connections.

Because practically all buildings in our nation use the metal raceways as the grounding conductor, it behooves NEMA and the NFPA to prevent wiring errors from causing massive current to cause them to overheat and cause raging fires inside the walls.

No family should become incinerated because a plug is inadvertently wired with reversed green and white conductors. Or die because a replacement plug was not properly installed on one of the violation extension cords now flooding the market with similarly colored conductors. The white, green, and black conductors are now all black, all yellow, all gray or all brown.

My proposal provides a standard that will make all line and extension cords fire-proof, and also electrocution-proof, by eliminating or ameliorating the potentially hazardous defects in their design. And even though all conductors are similarly colored.

The standard requires no physical changes except to provide a no cost second wiring site only at the ground pole of cord components.

The extra conductor in all cords is the only cost, a small price to pay to eliminate the following design defects:

1ST DESIGN DEFECT: This defect defies conventional wisdom and practice. Instead of the redundancy resorted to by every other federal agency whenever lives are at stake, the protective equipment grounding conductor used on practically all electrical devices has been reduced up to 66%.

This increases the chances of shock or electrocution from loss of grounding or injury due to line drop shock. My proposal, will prevent loss of grounding and voltage drop.

2ND DESIGN DEFECT: This defect results from sizing cord, and cordset, equipment grounding conductors the same as the circuit conductors (3#18, 3#16, 3#14, etc). The equipment grounding conductor must, at all times, assure that it will withstand fault currents for the length of time it takes fuses, or circuit breakers, to clear a fault. A 20 ampere circuit breaker, for example, can cause spike currents that could burn open the equipment grounding conductor, instead of the circuit conductor, leaving the metal exposed parts of an appliance energized.

Two equipment grounding conductors in all cords, regardless of wire size, will assure that the circuit conductors will always burn open first during massive ground faults.

3RD DESIGN DEFECT: This cord design defect permits miswired devices to operate safely until they are plugged into an outlet, or extension cord, with reversed polarity. The drill in figure 1 operates safely when used with a properly wired outlet, or extension cord, even though improperly wired with reversed green and white conductors.

However, the moment the drill is plugged into an outlet, or extension cord, wired with reversed polarity, the case of the drill becomes energized with a full 120 volt potential, figure 2.

Figure 3 illustrates how my electrocution-proof grounding system will correct this “Russian Roulette” type hazard. The two grounding conductors needed to correct the two previous design defects will make possible a wiring scheme that absolutely prevents miswired cords from causing shock or electrocution regardless of whether, or not, a wall outlet, or extension cord remains wired with reversed polarity.

If all cord components, and device terminals, are designed according to the specification in my proposal, there is no possible way to miswire a cord without at least one of the three grounded conductors (two green and one white) attached to the grounding pole of components and exposed metal parts of electrical devices or extension cords.

Acceptance of my proposal will eliminate the cord design defect that permits wiring errors to shock or electrocute.

4TH DESIGN DEFECT: No provision is provided in existing cords to activate branch circuit ground fault current interrupters when miswiring energizes the exposed metal parts of electrical devices. A ground fault causing current to flow through people cannot trip circuit breakers or blow fuses.

Accepting my proposal will assure that an equipment grounding conductor is ALWAYS attached to the metal exposed parts of electrical devices, despite wiring errors, thereby providing the necessary impedance required to activate branch circuit ground fault current interrupters.

In fact, adoption of my proposal will convert branch circuit ground fault current interrupters into people GFCIs. See how the second grounded conductor in figure 3 prevents shock, or electrocution, by providing the low resistance path required to activate branch circuit ground fault devices.

5TH DESIGN DEFECT: No provision is provided in existing cords to prevent miswiring from causing current to flow through metal raceways. A heater, or extension cord, miswired with reversed green and white conductors, can cause raceway heating, or arcing, at metal raceway connections sufficient enough to cause “unseen” raging fires inside walls.

If my proposal is accepted, the second grounding conductor will shunt any metal raceway current back to the proper circuit conductor.

Figure A illustrates how heater current flows through metal raceways when a line cord, or extension cord, is miswired with reversed green and white conductors.

Figure B illustrates how my proposal will prevent current flow through raceways.

At the New Orleans annual meeting a member ridiculed my A and B figures so I am also submitting figures C and D. They depict, in diagram form, how current flowing through metal raceways can be automatically shunted back to the white circuit conductor.

The second grounding conductor, in conjunction with electrocution-proof and fire-proof cord components, will shunt raceway current to the proper circuit conductor.

Current flowing through raceways, instead of the white conductor, cause the ground poles of all downstream outlets to become energized, a hazard also eliminated by the second ground conductor and the properly designed cord components I propose.

6TH DESIGN DEFECT: Molded cords have similarly colored branch circuit conductors instead of the usual black and white ones, a violation of the National Electrical Code. Without color coding, there is no way to prevent replacement components from being wired with reversed polarity. Even manufacturers are shipping extension cords with reversed polarity. I can corroborate this by producing such an extension cord purchased at a local hardware store.

Figure 2 illustrates how extension cords, or wall outlets, wired with reversed polarity, will cause shock, or electrocution, if used with devices, or another extension cord, inadvertently wired with reversed green and white conductors.

Figure 3 illustrates how a second grounding conductor, together with electrocution-proof components will prevent electrocution from this type of wiring hazard.

Accepting my proposal will permit the SAFE repair of molded cords even if all conductors are colored the same.

7TH DESIGN DEFECT: Providing only one equipment grounding conductor for up to 6 extension outlets. Accepting my proposal will ameliorate this defect.

8th DESIGN DEFECT: Molded cord components cannot be examined or repaired at the strain relief. Accepting my proposal will provide true assurance that the protective equipment grounding conductors will never open prior to the circuit conductors.

9th DESIGN DEFECT: The lack of wiring safeguards. Experienced electricians, including myself, have admitted catching themselves wiring outlets and cords improperly. It is unconscionable to permit a grounding system whereby an electrical worker could be responsible for an electrocution or fiery death.

If four of six ways to wire an attachment plug can cause an electrocution, or fiery death, it becomes imperative that they be designed to at least assure the proper attachment of the equipment grounding conductor.

My proposal will absolutely assure that the grounding pole of cord components will be attached to a grounded conductor regardless of any amount of wiring errors.

It will also assure that the ground poles of cord components are always wired with two green conductors. A green and white, green and black, or black and white conductor attached to the ground pole clamp will be immediately noticed and corrected.

Conclusion: Thousands of our citizens suffer fiery deaths, electrocutions, and serious, shock induced, injuries, because of the above mentioned design defects in all cords

Design defects that caused an 8 fold increase in electrocutions on construction sites, despite the use of extensive written assured grounding programs by well supervised, and qualified, personnel. Without the assured grounding program, the loss of life and serious injuries would have been considerably higher.

Millions of homeowners, other workers, and patients, exposed to the same defectively designed cords, do not have this mandated assured grounding program and remain unprotected. Therefore, it behooves NEMA and NFPA to adopt my self monitoring electrocution-proof and fire-proof grounding system.

My proposal, if adopted by our nation, will provide true assured grounding for every man, woman, and child, in every area of our nation, without the need for, costly, ineffective, testing programs.

No one should needlessly suffer fiery deaths, shock, or electrocution in order to save the cost of less than two cups of coffee.

Note: Supporting material is available upon request at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The Panel has seriously considered and responded in detail to the submitter's concerns for at least three

previous Code cycles. The Panel has meticulously pointed out the errors and misrepresentations in the data such as:

No credible source has verified Mr. Nader's claim of 5000 hospital electrocutions.
CPSC actually reports fewer than 200 electrocutions per year associated with low voltage utilization equipment.
The submitter cites seven fires in support of this proposal.
None of the cited fires indicated an electrical cause.
The October 9, 1995 fire that killed a firefighter in New York was a kitchen fire resulting from an unattended stove.
Heaters placed too close to combustible material were cited as the cause of two of the fires used to justify this proposal. It wasn't even indicated whether the heaters were electric or not. Using such data is patently misleading. Numerous types of fires other than electrical migrate into the walls. Indeed, in all probability none of these fires had anything to do with electrical equipment of any kind, much less attachment plugs or cord connectors. To imply that these fires would have been prevented by the proposal is disingenuous to say the least.
The litany of 9 "Design Defects" cited are technically without foundation. In fact, nearly all are wiring defects contrary to the provisions of this Code.
Panel 18 does not doubt the sincerity of the submitter. However, the substantiation demonstrates a fundamental lack of understanding of proven electrical safety precepts and, at times, defies the laws of physics. NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP1808)

18- 53a - (410-66(a)): Accept
SUBMITTER: CMP 18
RECOMMENDATION: Modify the text to read as follows:
"(a) Clearance.
(1) Non Type IC. A recessed fixture that is not identified for contact with insulation shall have all recessed parts spaced not less than 12.7 mm (1/2 in.) from combustible materials. The points of support and the trim finishing off the opening in the ceiling or wall surface shall be permitted to be in contact with combustible materials.
(2) Type IC. A recessed fixture that is identified for contact with insulation, Type IC, shall be permitted to be in contact with combustible materials at recessed parts, points of support, and portions passing through or finishing off the opening in the building structure."
SUBSTANTIATION: The text was modified to conform to Style Manual Section 2.1.5 and 2.1.5.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3857)

18- 54 - (410-67(c)): Reject
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Revise this section as follows:
410-67(a) General. Conductors that have insulation suitable for the temperature encountered shall be used.
(b) Circuit Conductors. Branch-circuit conductors that have an insulation suitable for the temperature encountered shall be permitted to terminate in the fixture.
(c) ~~Tap~~ Fixtures Requiring Conductors with Higher Rated Insulation. Fixtures requiring conductors having an insulation with a temperature rating higher than the branch circuit conductors shall have conductors installed with insulation ~~Tap conductors~~ of a type suitable for the temperature encountered. Such conductors shall be ~~permitted to~~ run from the fixture terminal connection to an outlet box placed at least 1 ft (305 mm) from the fixture. Such ~~tap~~ conductors shall be in suitable raceway or Type AC or MC cable of at least 18 in. (450 mm) but not more than 6 ft (1.83 m) in length.
SUBSTANTIATION: These changes are primarily editorial to recognize that in most cases, conductors the same size as the branch circuit conductors but with a higher temperature rating need to be installed from the junction box to the fixture housing. This is not really a tap as conductors of the same size are being installed but having a higher temperature rating. This occurs where the branch circuit conductors are adequate in ampacity but have an insulation that is lower than required by the lighting fixture.
This proposal also clarifies that all wiring methods must have a temperature rating sufficient for the lighting fixtures as indicated in (a) and (b) of this section.
PANEL ACTION: Reject.
PANEL STATEMENT: Tap conductors are not always temperature rated higher than the branch circuit conductors. As an example many recessed fluorescent luminaries employ tap conductors rated 90 degrees C and are attached to branch circuit conductors rated 90 degrees C. The proposed changes would reorient this section to apply only to higher temperature tap conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4224)

18- 55 - (410-67(c)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc
RECOMMENDATION: Delete this subsection.
SUBSTANTIATION: The substantiation for the present wording pointed to current recessed fixture designs that have tap con-ductors in the 18-in. range running from the fixture compartment to the prewired branch-circuit wiring com-partment. Why should such taps have to observe a 4-ft minimum length, as required in the previous Code (and every preceding Code going back to 1940)? Meanwhile, the proposal didn't change the minimum box separation part of the requirement, namely 1 ft, although very few prewired fixtures have anywhere near that degree of separation, and if they did, the minimum tap length would need to be at least 2 ft or longer.
The current wording of this rule is completely senseless. This section doesn't have anything to do with pre-wired fixtures suitable for normal branch-circuit wiring connections. The branch-circuit wiring compartment of a prewired fixture isn't an "outlet box" that has been "placed" (a field wiring requirement) as described in this rule. Due to evolving requirements for thermal protection, together with market forces, no fixtures to which this section applies are still in production.
This change proved absolutely that we are so far from the original concept for this rule, even the panel no longer has any idea why it's in the Code. The rule dates from the 1940 NEC, and it has to do with establish-ing a cold lead so the fixture heat wouldn't reach the branch circuit conductors. Before the advent of thermal protection, and prewired recessed fixtures, you ran a 4 to 6 ft lead in greenfield with Type AF or other high-temperature fixture wire from the lamp compartment to a box at least one foot away. The resulting loop of raceway made transmission of heat to the box impossible.
The beginning of the end came in the 1990 NEC, when Type AC or MC cable got added in, in spite of the fact that neither cable assembly had high-temperature conductors, and could not possibly be used for this purpose. Now we describe a tap that isn't a tap covered by the Code to a box that isn't the box described in the Code. The panel should either find a use that corresponds to today's market for this section and then write a proper rule (there might conceivably be a use with non-thermally-protected recessed fixtures in poured concrete), or, more likely, as in this proposal, delete it.
PANEL ACTION: Reject.
PANEL STATEMENT: There are luminaries in production and use today designed for installation in accordance with these requirements. While the substantiation argued the history of the wording, it did nothing to address the lack of need to ensure that luminaries are properly connected to conductors appropriate for the installation. The product standard (not 410-67(c)) addresses the flexible conduit between the luminare housing and the integral wiring compartment on a recessed luminare.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #370)

18- 56 - (410-72, Exception (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception: Metal lampholders shall be permitted for portable table or floor lamps and as covered in Sections 305-4(f) and 410-30(a).

SUBSTANTIATION: This section is suitable for fixtures, porcelain and plastic lampholders which mount directly to outlet boxes, lampholders on extension cords, but is broad enough to disallow metal lampholders in portable lamps and those recognized in Sections 305-4(f) and 410-30(a).
PANEL ACTION: Reject.
PANEL STATEMENT: Section 410-72 is in Part N titled "Construction of Flush and Recessed Fixtures". It has nothing to do with portable lamps or those recognized in Section 305-4(f) or 410-30. To imply that it does is incorrect.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP1809)

18- 56a - (410-73(e)): Accept
SUBMITTER: CMP 18
RECOMMENDATION: Modify the text to read as follows:
"(e) Thermal protection-Fluorescent Fixtures.
(1) Integral thermal protection. The ballast of a fluorescent fixture installed indoors shall have integral thermal protection. Replacement ballasts shall also have thermal protection integral with the ballast.
(2) Simple reactance ballasts. A simple reactance ballast in a fluorescent fixture with straight tubular lamps shall not be required to be thermally protected.
(3) Exit fixtures. A ballast in a fluorescent exit fixture shall not have thermal protection.
(4) Emergency egress fixtures. A ballast in a fluorescent fixture that is used for egress lighting and energized only during an emergency shall not have thermal protection."
SUBSTANTIATION: The text was modified to conform to Style Manual 2.1.5 and 2.1.5.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP1810)

18- 56b - (410-73(f)): Accept
SUBMITTER: CMP 18
RECOMMENDATION: Modify the text to read as follows:
"(f) High-Intensity- High Intensity Discharge Fixtures.
(1) Recessed. Recessed high-intensity fixtures designed to be installed in wall or ceiling cavities shall have thermal protection and be identified as thermally protected.
(2) Inherently protected. Thermal protection shall not be required in a recessed high-intensity fixture whose design, construction, and thermal performance characteristics are equivalent to a thermally protected fixture and are identified as inherently protected.
(3) Installed in poured concrete. Thermal protection shall not be required in a recessed high-intensity discharge fixture identified for use and installed in poured concrete.
(4) Recessed remote ballasts. A recessed remote ballast for a high-intensity discharge fixture shall have thermal protection that is integral with the ballast and shall be identified as thermally protected."
SUBSTANTIATION: The text was modified to conform to Style manual Section 2.1.5.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2164)

18- 57 - (410-74): Accept in Principle
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Direct-Current Equipment. Fixtures installed on dc circuits shall be equipped with auxiliary equipment and resistors especially designed ~~and~~ for dc operation, and the fixtures shall be so marked.
SUBSTANTIATION: By deleting the "and" the intent of the sentence is clearer and the reader knows what the auxiliary equipment and resistors are "especially designed for."
PANEL ACTION: Accept in Principle.
Modify the text to read as follows:
"Luminaries installed on dc circuits shall be equipped with auxiliary equipment and resistors designed for dc operation. The luminaries shall be marked for dc operation ."
PANEL STATEMENT: The text incorporates the intent of the proposal and clarifies it.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #581)

18- 58 - (410-80(a)): Reject
SUBMITTER: Jim Evanisko, Nat'l Cathode Corp.
RECOMMENDATION: Add new text to read as follows:
410-80. General.
(a) Listing. Electric-discharge lighting systems with an open-circuit voltage exceeding 1000 volts shall be listed and installed in conformance with that listing.
SUBSTANTIATION: To constitute the distinction between Outline Lighting and General Lighting with regards to illumination, safety, UL 2161, UL 48 Ifay and the authorities having jurisdiction.
PANEL ACTION: Reject.
PANEL STATEMENT: There is insufficient substantiation defining the problem. The proposal does not contain sufficient proposed text to enable the panel to understand the purpose of the proposal. The panel would encourage the submitter to submit a comment covering Proposals 18-58-through 18-63 showing in its entirety the recommended text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #582)

18- 59 - (410-80(c)): Reject
SUBMITTER: Jim Evanisko, Nat'l Cathode Corp.
RECOMMENDATION: Revise to read as follows:
410-80. General.
(c) Live Parts. The terminal of an electric-discharge lamp shall be considered as a live part.
SUBSTANTIATION: To constitute the distinction between Outline Lighting and General Lighting with regards to illumination, safety, UL 2161, UL 48 Ifay and the authorities having jurisdiction.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement for Proposal 18-58.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP1805)

18- 59a - (410-82): Accept
NOTE: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to the words "will be". This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 18
RECOMMENDATION: Modify 410-82 to read as follows:
"410-82. Lamp Terminals and Lampholders.
Parts that must be removed for lamp replacement shall be hinged or held captive. Lamps or lampholders will be designed so that there are no exposed live parts when lamps are being inserted or are being removed."
SUBSTANTIATION: The text was revised to conform to Style manual Section 3.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #583)

18- 60 - (410-83(a) (New)): Reject
SUBMITTER: Jim Evanisko, Nat'l Cathode Corp.
RECOMMENDATION: Add a new paragraph 410-83(a) to read as follows:
(a) Type. Transformers shall be enclosed, identified for the use and listed.
SUBSTANTIATION: To constitute the distinction between Outline Lighting and General Lighting with regards to illumination, safety, UL 2161, UL 48 Ifay and the authorities having jurisdiction.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 18-58.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #584)

18- 61 - (410-83(b) (New)): Reject
SUBMITTER: Jim Evanisko, Nat'l Cathode Corp.
RECOMMENDATION: Add a new paragraph 410-83(b) to read as follows:
410-83. Transformers.
(b) Voltage. Secondary-circuit voltage shall not exceed 15,000 volts, nominal, under any load condition. The voltage to ground of any output terminals of the secondary circuit shall not exceed 7500 volts, under any load conditions.
SUBSTANTIATION: To constitute the distinction between Outline Lighting and General Lighting with regards to illumination, safety, UL 2161, UL 48 Ifay and the authorities having jurisdiction.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 18-58.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #585)

18- 62 - (410-83(c) (New)): Reject
SUBMITTER: Jim Evanisko, Nat'l Cathode Corp.
RECOMMENDATION: Add a new paragraph 410-83(c) to read as follows:
410-83. Transformers.
(c) Rating. Transformers shall have a secondary short-circuit current rating of not more than 150ma if the open-circuit voltage rating is 7500 volts, and not more than 300 ma, if the open-circuit voltage rating is 7500 volts or less.
SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 18-58.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #586)

18- 63 - (410-83(d)): Reject
SUBMITTER: Jim Evanisko, Nat'l Cathode Corp.
RECOMMENDATION: Add a new paragraph 410-83(d) to read as follows:
(d) Secondary Connections. Secondary circuit outputs shall not be connected in parallel or in series.
SUBSTANTIATION: None.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 18-58.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1922)

18- 64 - (410-84(a), and (b)(1) and (2) and Exception): Reject
SUBMITTER: Michael J. Johnston, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
410-85. Transformers ~~Type~~
(a) Type. Transformers shall be listed and shall be identified for the use. Transformers shall be the enclosed type.
(b) Secondary-Circuit Ground-Fault Protection. Transformers other than the following shall have secondary-circuit ground-fault protection:
1. Transformers with isolated secondaries and with a maximum open circuit voltage of 7500 volts or less.
2. Transformers with integral porcelain or glass secondary housing for the tubing and requiring no field wiring of the secondary circuit.
Exception: Listed assemblies that require no field installed high voltage secondary circuits.
SUBSTANTIATION: The electrical characteristics of these field installed high voltage secondary circuits (i.e. capacitance effects, corona, and the resultant ozone effects) are similar to those of the secondary circuits for neon installations. These types of lighting circuits and custom systems resemble field installed neon tubing installations and the same protection should be provided for these secondaries. Clearly, in Section 410-88 the requirements for installation of secondary conductors are the same as for neon transformer secondary circuits. In fact it refers to the requirements of 600-32. No mention of length limitation here though, as in Section 600-32(j).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel assumes the proposal intends to modify 410-84, not 410-85. The substantiation does not clearly state what the hazard with electric discharge lighting systems is that would require adoption of the proposed changes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4408)

18- 65 - (410-101(c)): Reject
SUBMITTER: Ed Stubbs, City of Atlanta, GA
RECOMMENDATION: Revise as follows:
410-101(c). (Add to text)
(c) Locations Not Permitted.
(10) In clothes closets. See Section 410-8(c).
SUBSTANTIATION: Even though it is not stated in 410-101(c) "not in clothes closets", if you go to 410-8(c) fixture types not permitted, it does specify "Incandescent fixtures with open or partially closed lamps." Well, track lights do meet these violations. They come in all sizes and shapes with serious heat dissipation and clearance problems. Don't forget about those hot low voltage lights. You know how close they can be to material in a closet. We agree that lights in a closet are hazardous. Why make it worse?
PANEL ACTION: Reject.
PANEL STATEMENT: The types of luminaries prohibited by 410-8(c) include any type of track lighting that should be excluded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1080)

18- 66 - (410-105): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 12" to "12 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

ARTICLE 411 — LIGHTING SYSTEMS OPERATING AT 30 VOLTS OR LESS

(Log #549)

18- 67 - (411): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Section 411-4: Replace "10 ft (3.05 m)" with "3.0 m (10 ft)".
Section 411-5(c): Replace "7 ft (2.2 m)" with "2.1 m (7 ft)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3745)

18- 68 - (411-4(l)): Reject
SUBMITTER: John H. Schwab, Jr., City of Wauwatosa, WI
RECOMMENDATION: Add to end of (1) the following:
"or is listed for concealment or (2)..."
SUBSTANTIATION: Some manufacturers say that their cables can be used inside of building walls. This would allow such cable.
PANEL ACTION: Reject.
PANEL STATEMENT: The only wiring methods that the NEC permits to be installed concealed are AC, MC, MI, Knob and Tube, NM, and UF or SE when installed in place of NM cable. Other wires or cables require raceways. Cords can never be installed concealed. Chapter 7 wiring methods for Class 2 and Class 3 circuits can be concealed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4468)

18- 69 - (418-18(c) (New)): Reject
SUBMITTER: George H. Little, Little Enterprises
RECOMMENDATION: Add a new paragraph (c) to read as follows:
(c) Fixtures with exposed metal parts may be installed on circuits where no grounding means is available if the circuit has ground fault circuit interrupter protection.
SUBSTANTIATION: Problem - There are numerous occasions when a fixture with exposed metal parts is not permitted due to a lack of a grounding means. Article 210, Section 210-7(d)(3)(c) allows this approach for receptacles.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal appears to be intended to address 410-18 (c) not 418-18 as indicated.
See panel action on Proposal 18-28 that may help address this problem.
GFCI's are not a substitute for equipment grounding. The submitter has not provided substantiation to support his proposal. NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 420 — RECEPTACLES, CORD CONNECTORS, AND ATTACHMENT PLUGS (CAPS)

(Log #634)

18- 70 - (420 (New)): Accept
NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee notes that article placement is the responsbility of the Technical Correlating Committee and the Technical Correlating Committee assigns it as Article 406.
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Add a new Article 420 for receptacles, cord connectors and attachment plugs (cord caps) comprised of existing Sections of the 1999 NEC from Articles 410, 210 and 250 as follows:

Proposed Article 420 Section	1999 NEC Section
420-1(NEW)	None
420-2(a)(NEW)	None
420-2 (b) - (d)	410-56 (a) - (c)
420-3 (a) - (f)	210-7 (a) - (f)
420-4	410-15
420-4 (a)	410-56(f)(1)
420-4 (b)	410-56(f)(2)
420-4 (c)	410-56(f)(3)
420-4 (d)	410-56(e)
420-4 (e)	210-8(a)(7) 2nd sentence
420-4 (f)	410-3
420-5	410-56(e) last sentence
420-5 (a) - (c)	410-56(d)
420-6	NEW
420-6 (a) - (c)	410-56(g)
420-7	410-56(i)
420-8 (a) - (f)	410-57(a) - (f)
420-9 (a) - (b)	410--58(a) - (f)
420-10(a) - (d)	250-146 (a) - (d)

ARTICLE 420 — Receptacles, Cord Connectors, and Attachment Plugs (Caps)

420-1. Scope. This Article covers the rating, type and installation of receptacles, cord connectors, and attachment plugs (cord caps).
420-2. Receptacle Rating and Type
(a) Receptacles. Receptacles shall be listed for the purpose and marked with the manufacturer's name or identification, and voltage and ampere ratings.
(b) Receptacles. Receptacles installed for the attachment of portable cords shall be rated at not less than 15 amperes, 125 volts, or 15 amperes, 250 volts, and shall be of a type not suitable for use as lampholders.
FPN: See Section 210-21(b) for receptacle ratings where installed on branch circuits.
(c) Receptacles for Aluminum Conductors. Receptacles rated 20 amperes or less and designed for the direct connection of aluminum conductors shall be marked CO/ALR.
(d) Isolated Ground Receptacles. Receptacles incorporating an isolated grounding connection intended for the reduction of electrical noise (electromagnetic interference) as permitted in Section 250-146(d) shall be identified by an orange triangle located on the face of the receptacle.
(1) Receptacles so identified shall be used only with grounding conductors that are isolated in accordance with Section 250-146(d).
(2) Isolated ground receptacles installed in nonmetallic boxes shall be covered with a nonmetallic faceplate.
Exception: Where an isolated ground receptacle is installed in a nonmetallic box, a metal faceplate shall be permitted if the box contains a feature or accessory that permits the effective grounding of the faceplate.
420-3. General Installation Requirements. Receptacle outlets shall be located in branch circuits in accordance with Part C of Article 210. General installation requirements shall be in accordance with (a) through (f) below:
(a) Grounding Type. Receptacles installed on 15- and 20-ampere branch circuits shall be of the grounding type. Grounding-type receptacles shall be installed only on circuits of the voltage class and current for which they are rated, except as provided in Tables 210-21(b)(2) and (b)(3).
Exception: Non-grounding-type receptacles installed in accordance with Section 420-3(d).
(b) To Be Grounded. Receptacles and cord connectors that have grounding contacts shall have those contacts effectively grounded.
Exception No. 1: Receptacles mounted on portable and vehicle-mounted generators in accordance with Section 250-34.
Exception No. 2: Replacement receptacles as permitted by Section 420-3(d).
(c) Methods of Grounding. The grounding contacts of receptacles and cord connectors shall be grounded by connection to the equipment grounding conductor of the circuit supplying the receptacle or cord connector.
FPN: For installation requirements for the reduction of electrical noise, see Section 250-146(d).

The branch-circuit wiring method shall include or provide an equipment-grounding conductor to which the grounding contacts of the receptacle or cord connector shall be connected.

FPN No. 1: Section 250-118 describes acceptable grounding means.

FPN No. 2: For extensions of existing branch circuits, see Section 250-130.

(d) Replacements. Replacement of receptacles shall comply with (1), (2), and (3) as applicable.

(1) Where a grounding means exists in the receptacle enclosure or a grounding conductor is installed in accordance with Section 250-130(c), grounding-type receptacles shall be used and shall be connected to the grounding conductor in accordance with Sections 420-3(c) or 250-130(c).

(2) Ground-fault circuit-interrupter protected receptacles shall be provided where replacements are made at receptacle outlets that are required to be so protected elsewhere in this Code.

(3) Where a grounding means does not exist in the receptacle enclosure, the installation shall comply with (a), (b), or (c).

(a) A non-grounding-type receptacle(s) shall be permitted to be replaced with another non-grounding-type receptacle(s).

(b) A non-grounding-type receptacle(s) shall be permitted to be replaced with a ground-fault circuit interrupter-type of receptacle(s). These receptacles shall be marked "No Equipment Ground." An equipment grounding conductor shall not be connected from the ground-fault circuit interrupter-type receptacle to any outlet supplied from the ground-fault circuit interrupter receptacle.

(c) A non-grounding-type receptacle(s) shall be permitted to be replaced with a grounding-type receptacle(s) where supplied through a ground-fault circuit interrupter. Grounding-type receptacles supplied through the ground-fault circuit interrupter shall be marked "GFCI Protected" and "No Equipment Ground." An equipment grounding conductor shall not be connected between the grounding-type receptacles.

(e) Cord- and Plug-Connected Equipment. The installation of grounding-type receptacles shall not be used as a requirement that all cord- and plug-connected equipment be of the grounded type.

FPN: See Section 250-114 for types of cord- and plug-connected equipment to be grounded.

(f) Non-interchangeable Types. Receptacles connected to circuits that have different voltages, frequencies, or types of current (ac or dc) on the same premises shall be of such design that the attachment plugs used on these circuits are not interchangeable.

420-4. Receptacle Mounting. Receptacles shall be mounted in boxes, or assemblies designed for the purpose, and such boxes or assemblies shall be securely fastened in place.

(a) Receptacles mounted in boxes that are set back of the wall surface, as permitted in Section 370-20, shall be installed so that the mounting yoke or strap of the receptacle is held rigidly at the surface of the wall.

(b) Receptacles mounted in boxes that are flush with the wall surface or project therefrom shall be installed so that the mounting yoke or strap of the receptacle is held rigidly against the box or raised box cover.

(c) Receptacles Mounted on Covers. Receptacles mounted to and supported by a cover shall be held rigidly against the cover by more than one screw or shall be a device assembly or box cover listed and identified for securing by a single screw.

(d) Position of Receptacle Faces. After installation, receptacle faces shall be flush with or project from faceplates of insulating material and shall project a minimum of 0.015 in. (0.381 mm) from metal faceplates.

(e) Receptacles in Work Surfaces and Countertops. Receptacles shall not be installed in a face-up position in work surfaces or countertops.

(f) Exposed Terminals. Receptacles shall be enclosed so that live wiring terminals are not exposed to contact.

420-5. Receptacle Faceplates (Cover Plates). Receptacle faceplates shall be installed so as to completely cover the opening and seat against the mounting surface.

(a) Metal faceplates shall be of ferrous metal not less than 0.030 in. (0.762 mm) in thickness or of nonferrous metal not less than 0.040 in. (1.016 mm) in thickness.

(b) Metal faceplates shall be grounded.

(c) Faceplates of insulating material shall be non-combustible and not less than 0.10 in. (2.54 mm) in thickness but shall be permitted to be less than 0.10 in. (2.54 mm) in thickness if formed or reinforced to provide adequate mechanical strength.

420-6. Attachment Plugs. All attachment plugs and cord connectors shall be listed for the purpose and marked with the manufacturer's name or identification, and voltage and ampere ratings.

(a) Attachment plugs and cord connectors shall be constructed so that there are no exposed current-carrying parts except the prongs, blades, or pins. The cover for wire terminations shall be a part, which is essential for the operation of an attachment plug or connector (dead-front construction).

(b) Attachment plugs shall be installed so that their prongs, blades, or pins are not energized unless inserted into an energized receptacle. No receptacle shall be installed so as to require an energized attachment plug as its source of supply.

(c) Attachment Plug Ejector Mechanisms. Attachment plug ejector mechanisms shall not adversely affect engagement of the blades of the attachment plug with the contacts of the receptacle.

420-7. Non-interchangeability. Receptacles, cord connectors, and attachment plugs shall be constructed so that receptacle or cord connectors will not accept an attachment plug with a different voltage or current rating than that for which the device is intended; however, a 20-ampere T-slot receptacle or cord connector shall be permitted to accept a 15-ampere attachment plug of the same voltage rating. Non-grounding-type receptacles and connectors shall not accept grounding-type attachment plugs.

420-8. Receptacles in Damp or Wet Locations

(a) Damp Locations. A receptacle installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure for the receptacle that is weatherproof when the receptacle is covered (attachment plug cap not inserted and receptacle covers closed).

An installation suitable for wet locations shall also be considered suitable for damp locations.

A receptacle shall be considered to be in a location protected from the weather where located under roofed open porches, canopies, marquees, and the like, and will not be subjected to a beating rain or water runoff.

(b) Wet Locations.

(1) A receptacle installed in a wet location where the product intended to be plugged into it is not attended while in use (e.g., sprinkler system controllers, landscape lighting, holiday lights, etc.) shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.

(2) A receptacle installed in a wet location where the product intended to be plugged into it will be attended while in use (e.g., portable tools, etc.) shall have an enclosure that is weatherproof when the attachment plug cap is removed.

(c) Bathtub and Shower Space. A receptacle shall not be installed within a bathtub or shower space.

(d) Protection for Floor Receptacles. Standpipes of floor receptacles shall allow floor-cleaning equipment to be operated without damage to receptacles.

(e) Flush Mounting with Faceplate. The enclosure for a receptacle installed in an outlet box flush-mounted on a wall surface shall be made weatherproof by means of a weatherproof faceplate assembly that provides a watertight connection between the plate and the wall surface.

(f) Installation. A receptacle outlet installed outdoors shall be located so that water accumulation is not likely to touch the outlet cover or plate.

420-9. Grounding-Type Receptacles, Adapters, Cord Connectors, and Attachment Plugs.

(a) Grounding Poles. Grounding-type receptacles, cord connectors, and attachment plugs shall be provided with one fixed grounding pole in addition to the circuit poles. The grounding contacting pole of grounding-type plug-in ground-fault circuit interrupters shall be permitted to be of the movable, self-restoring type on circuits operating at not over 150 volts between and to conductors nor over 150 volts between any conductor and ground.

(b) Grounding-Pole Identification. Grounding-type receptacles, adapters, cord connections, and attachment plugs shall have a means for connection of a grounding conductor to the grounding pole.

A terminal for connection to the grounding pole shall be designated by one of the following.
(1) A green-colored hexagonal-headed or shaped terminal screw or nut, not readily removable.
(2) A green-colored pressure wire connector body (a wire barrel).
(3) A similar green-colored connection device, in the case of adapters. The grounding terminal of a grounding adapter shall be a green-colored rigid ear, lug, or similar device. The grounding connection shall be designed so that it cannot make contact with current-carrying parts of the receptacle, adapter, or attachment plug. The adapter shall be polarized.
(4) If the terminal for the equipment grounding conductor is not visible, the conductor entrance hole shall be marked with the word "green" or "ground," the letters "G" or "GR" or the grounding symbol, as shown in Figure 4~~20-910-58~~(b)(4), or otherwise identified by a distinctive green color. If the terminal for the equipment grounding conductor is readily removable, the area adjacent to the terminal shall be similarly marked.

Figure 4~~20-910-58~~(b)(4) Grounding symbol.

(c) Grounding Terminal Use. A grounding terminal or grounding-type device shall not be used for purposes other than grounding.
(d) Grounding-Pole Requirements. Grounding-type attachment plugs and mating cord connectors and receptacles shall be designed so that the grounding connection is made before the current-carrying connections. Grounding-type devices shall be designed so grounding poles of attachment plugs cannot be brought into contact with current-carrying parts of receptacles or cord connectors.
(e) Use. Grounding-type attachment plugs shall be used only with a cord having an equipment grounding conductor.

FPN: See section 200-10(b) for identification of grounded conductor terminals.

420-10. Connecting Receptacle Grounding Terminal to Box. An equipment bonding jumper shall be used to connect the grounding terminal of a grounding-type receptacle to a grounded box unless grounded as in (a) through (d).
(a) Surface Mounted Box. Where the box is mounted on or at the surface, direct metal-to-metal contact between the device yoke and the box shall be permitted to ground the receptacle to the box. This provision shall not apply to cover-mounted receptacles unless the box and cover combination are listed as providing satisfactory ground continuity between the box and the receptacle.
(b) Contact Devices or Yokes. Contact devices or yokes designed and listed for the purpose shall be permitted in conjunction with the supporting screws to establish the grounding circuit between the device yoke and flush-type boxes.
(c) Floor Boxes. Floor boxes designed for and listed as providing satisfactory ground continuity between the box and the device shall be permitted.
(d) Isolated Receptacles. Where required for the reduction of electrical noise (electromagnetic interference) on the grounding circuit, a receptacle in which the grounding terminal is purposely insulated from the receptacle mounting means shall be permitted. An insulated equipment grounding conductor run with the circuit conductors shall ground the receptacle grounding terminal. This grounding conductor shall be permitted to pass through one or more panelboards without connection to the panelboard grounding terminal as permitted in Section 384-20, Exception, so as to terminate within the same building or structure directly at an equipment grounding conductor terminal of the applicable derived system or service.

FPN: Use of an isolated equipment grounding conductor does not relieve the requirement for grounding the raceway system and outlet box.

SUBSTANTIATION: This proposal was developed by a Task Group of CMP-18 appointed by the chairman to consider separating 1999 NEC Article 410 into two articles, one covering lighting fixtures and the other covering receptacles, attachment plugs and cord connectors. This Task Group was appointed in response to Proposal 18-55 for the revision of the 1996 NEC.

The intent of this proposal is to relocate the general requirements covering the rating, type, construction and installation of these devices into a new article separate from lighting fixtures.

Over many Code cycles the general installation and construction requirements for receptacles, attachment plugs and cord connectors have been adopted in various Sections of the Code. Additional and related proposals are also being submitted by the Task Group to relocate these installation and construction requirements from other Articles of the Code to this new Article.

The Task Group believes this is consistent with the objective of the Usability Task Group and will make these requirements easier to find and use.

The Task Group realizes that the NEC Correlating Committee has jurisdiction over number, title and scope of articles and submits the proposed wording for their consideration.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 422 — APPLIANCES

(Log #526)

20- 4 - (422): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 422-13, replace "120 gal (454.2 L)" with "450 L (120 gal)".
2. In Section 422-16(b)(1)(b), replace "18 in. (457 mm)" with "450 mm (18 in.)" and replace "36 in. (914 mm)" with "900 mm (36 in.)".
3. In Section 422-16(b)(2)(b), replace "3 ft to 4 ft (0.914 m to 1.22 m)" with "0.9 m to 1.2 m (3 ft to 4 ft)".
4. In Sections 422-18(a) and (b), replace "35 lb (15.88 kg)" with "16 kg (35 lb)" throughout and replace "70 lb (31.76 kg)" with "32 kg (70 lb)" in part (b)'s Exception.
5. In Section 422-47(b), replace "1 gal (3.785 L)" with "3.8 L (1 gal)".
6. In Section 422-49, replace "12 in. (305 mm)" with "300 mm (12 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #4336)

20- 5 - (422-2-Appliance, Fixed (New); Appliance, Portable (New); and Appliance, Stationary (New)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and the Panel clarify their Panel Statement since the terms "fixed" and "portable" are used in Article 422. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Angelo S. Sperlongo, City of Coral Springs, FL
RECOMMENDATION: Add definitions:
Appliance, Fixed. An appliance that is fastened or otherwise secured at a specific location.
Appliance, Portable. An appliance that is actually moved or can easily be moved from one place to another in normal use.
Appliance, Stationary. An appliance that is not easily moved from one place to another in normal use.
SUBSTANTIATION: to add the definitions of Fixed, Portable and Stationary Appliances to Article 422 — Appliances.
The only space in the code where these definitions are located is Article 550 - Mobile Homes. According to the scope of Article 550-1, the provisions of this article covers the electrical conductors and equipment installed within or on mobile homes only. By adding these definitions to Article 422, it will cover electric appliances used in any occupancies.
PANEL ACTION: Reject.
PANEL STATEMENT: These terms are not used in this article and do not need to be defined.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #CP2004)

20- 5a - (422-11): Accept

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is to accept the titles for 422-11(f)(1), (2), and (3), respectively.

SUBMITTER: CMP 20

RECOMMENDATION: Add titles to the subsections as follows:

(1) Electric Heating Appliances
(2) Commercial Kitchen and Cooking Appliances
(3) Water Heaters and Steam Boilers

SUBSTANTIATION: Compliance with NEC Correlating Committee directive on style.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 1 Ryan

(Log #2268)

20- 6 - (422-11(f)): Accept in Principle in Part

Note: The Technical Correlating Committee directs that the Panel clarify the Panel Action and Statement on this Proposal. The Panel Action has not been incorporated into Proposal 20-5a as indicated in the Panel Statement. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Thomas L. Harman, Univ. of Houston Cleark Lake/Rep. Univ. of Houston Clear Lake

RECOMMENDATION: Add the following text:

The circuits supplying listed instantaneous water heaters employing resistance-type immersion electric heating elements shall be permitted to be subdivided into circuits not to exceed 80 amperes and protected at not more than 100 amperes.

SUBSTANTIATION: Due to the technological advances in tankless (instantaneous) water heater design, I believe that Section 422-11(f) should not apply as presently written to water heaters that are protected within their rating. If an instantaneous water heater is a listed (UL) product that has been field tested with a variety of supply circuits, there is no technical or safety reason to limit the branch circuit protection to 60 amperes or cause the loads to be subdivided to 48 amperes.

This requirement for water heaters was introduced in the 1975 code with the justification that heaters with "small internal conductors" might be protected by unspecified sizes of overcurrent devices.

The restrictions on overcurrent protection of water heaters in the present Code are unnecessarily restrictive for the new types of instantaneous water heaters. No technical justification has been given to limit the loads to 48 amperes. Field experience and testing has indicated that the design and control of today's instantaneous water heaters allows for their safe installation as described in the proposal.

For example, an instantaneous water heater with four elements drawing a maximum of 25 amperes each would require four 30-ampere branch circuits by the present wording of the NEC. A safer alternative would be to subdivide the loads using two elements each on a 60-ampere circuit as allowed by the proposal. Then, only two circuit breakers need be turned off to disconnect the unit. Since the heater must be a listed appliance, the internal wiring would be sufficient for the 60-ampere circuits.

PANEL ACTION: Accept in Principle in Part.

In 422-11(f)(3), insert the words "or listed instantaneous water heaters" after "stamped vessel".

PANEL STATEMENT: This more simply accomplishes the submitter's objective. This has been incorporated into Proposal 20-5a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NOT RETURNED: 1 Ryan

(Log #50)

20- 7 - (422-15(b)(3)a): Accept in Principle in Part

NOTE: The following proposal consists of Comment 20-22 on Proposal 20-5 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 20-5 was: Revise Article 422 as follows:

ARTICLE 422 — APPLIANCES

A. General

422-1. Scope. This article covers electric appliances used in any occupancy.

422-3. Other Articles. ~~All requirements of this *Code* shall apply where applicable~~. Appliances for use in hazardous (classified) locations shall comply with Articles 500 through 517.

The requirements of Article 430 shall apply to the installation of motor-operated appliances and the requirements of Article 440 shall apply to the installation of appliances containing a hermetic refrigerant motor-compressor(s), except as specifically amended in this article.

422-4. ~~422-2.~~ Live Parts. Appliances shall have no live parts normally exposed to contact.

Exception: Toasters, grills, or other appliances in which the current-carrying parts at high temperatures are necessarily exposed.

~~B. Branch Circuit Requirements~~

B. ~~C.~~ Installation ~~of Appliances~~

~~422-6. General. All appliances shall be installed in an approved manner.~~

422-10. ~~422-4.~~ Branch-Circuit Rating. This section specifies ~~sizes~~ the ratings of branch circuit ratings capable of carrying appliance current without overheating under the conditions specified. ~~This section shall not apply to conductors that form an integral part of an appliance.~~

(a) Individual Circuits. The rating of an individual branch circuit shall not be less than the marked rating of the appliance or the marked rating of an appliance having combined loads as provided in Section ~~422-32~~ 422-62.

Exception No. 1: For motor-operated appliances not having a marked rating, the branch-circuit size shall be in accordance with Part B of Article 430.

Exception No. 2: For an appliance, other than a motor-operated appliance, that ~~is continuously loaded~~, operates as a continuous load, the branch-circuit rating shall not be less than 125 percent of the marked rating; or not less than 100 percent if the branch-circuit device and its assembly are listed for continuous loading at 100 percent of its rating.

Exception No. 3: Branch circuits for household cooking appliances shall be permitted to be in accordance with Table 220-19.

(b) Circuits Supplying Two or More Loads. For branch circuits supplying appliance and other loads, the rating shall be determined in accordance with Section 210-23.

422-11. ~~422-28~~. Overcurrent Protection.

(a) Appliances. Appliances shall be protected against overcurrent in accordance with (b) through (f)(g) below and Section~~s 422-4 and 422-5.~~ 422-10.

Exception: Motors of motor-operated appliances shall be provided with overload protection in accordance with Part C of Article 430. Hermetic refrigerant motor-compressors in air-conditioning or refrigerating equipment shall be provided with overload protection in accordance with Part F of Article 440. Where appliance overcurrent protective devices that are separate from the appliance are required, data for selection of these devices shall be marked on the appliance. The minimum marking shall be that specified in Sections 430-7 and 440-4.

(b) ~~422-5.~~ Branch-Circuit Overcurrent Protection. Branch circuits shall be protected in accordance with Section 240-3.

If a protective device rating is marked on an appliance, the branch-circuit overcurrent device rating shall not exceed the protective device rating marked on the appliance.

(c) ~~(b)~~ Household-type Appliance with Surface Heating Elements. A household-type appliance with surface heating elements having a maximum demand of more than 60 amperes computed in accordance with Table 220-19 shall have its power supply subdivided into two or more circuits, each of which is provided with overcurrent protection rated at not over 50 amperes.

(d) (c) Infrared Lamp Commercial and Industrial Heating Appliances. Infrared lamp commercial and industrial heating appliances shall have overcurrent protection not exceeding 50 amperes.

(e) (d) Open-Coil or Exposed Sheathed-Coil Types of Surface Heating Elements in Commercial-type Heating Appliances. Open-coil or exposed sheathed-coil types of surface heating elements in commercial-type heating appliances shall be protected by overcurrent protective devices rated at not over 50 amperes.

(f) (e) Single Nonmotor-Operated Appliance. If the branch circuit supplies a single nonmotor-operated appliance, the rating of overcurrent protection shall (1) not exceed that marked on the appliance; (2) if the overcurrent protection rating is not marked and the appliance is rated over 13.3 amperes, not exceed 150 percent of the appliance rated current; or (3) if the overcurrent protection rating is not marked and the appliance is rated 13.3 amperes or less, not exceed 20 amperes.

Exception: Where 150 percent of appliance rating does not correspond to a standard overcurrent device ampere rating, the next higher standard rating shall be permitted.

(g) (f) Electric Heating Appliances Employing Resistance-type Heating Elements Rated More than 48 Amperes. Electric heating appliances employing resistance-type heating elements rated more than 48 amperes shall have the heating elements subdivided. Each subdivided load shall not exceed 48 amperes and shall be protected at not more than 60 amperes.

These supplementary overcurrent protective devices shall be (1) factory-installed within or on the heater enclosure or provided as a separate assembly by the heater manufacturer; (2) accessible, but need not be readily accessible; and (3) suitable for branch-circuit protection.

The main conductors supplying these overcurrent protective devices shall be considered branch-circuit conductors.

Exception No. 1: Household-type appliances with surface heating elements as covered in Section 422-11(c) ~~422-28(b)~~ and commercial-type heating appliances as covered in Section 422-11(e) ~~422-28(d)~~.

Exception No. 2: Commercial kitchen and cooking appliances using sheathed-type heating elements not covered in Section 422-28(d) shall be permitted to be subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes where one of the following is met:

a. Elements are integral with and enclosed within a cooking surface;

b. Elements are completely contained within an enclosure identified as suitable for this use; or

c. Elements are contained within an ASME rated and stamped vessel.

Exception No. 3: Water heaters and steam boilers employing resistance-type immersion electric heating elements contained in an ASME rated and stamped vessel shall be permitted to be subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes.

422-12. ~~422-7.~~ Central Heating Equipment. Central heating equipment other than fixed electric space-heating equipment shall be supplied by an individual branch circuit.

Exception: Auxiliary equipment such as a pump, valve, humidifier, or electrostatic air cleaner directly associated with the heating equipment shall be permitted to be connected to the same branch circuit.

422-13. (b) Storage-type Water Heaters. A branch circuit supplying a fixed storage-type water heater having a capacity of 120 gal (454.2 L) or less shall have a rating not less than 125 percent of the nameplate rating of the water heater.

(FPN): For branch-circuit sizing, see Section 422-10(a) ~~422-4(a),~~ Exception No. 2.

422-14. Infrared Lamp Industrial Heating Appliances. Infrared industrial heating appliance lampholders ~~(c) Lampholders. Lampholder~~s shall be permitted to be connected to any of the branch circuits in Article 210 and, in industrial occupancies, shall be permitted to be operated in series on circuits of over 150 volts to ground provided the voltage rating of the lampholders is not less than the circuit voltage.

Each section, panel, or strip carrying a number of infrared lampholders (including the internal wiring of such section, panel, or strip) shall be considered an appliance. The terminal connection block of each such assembly shall be considered an individual outlet.

422-15. Flexible Cords.

(a) (General). ~~(c) Other Appliances~~. Flexible cord shall be permitted (1) for connection of appliances to facilitate their frequent interchange or to prevent the transmission of noise or vibration or (2) to facilitate the removal or disconnection of appliances that are fastened in place, where the fastening means and mechanical connections are specifically designed to permit ready removal for maintenance or repair, and the appliance is intended or identified for flexible cord connection.

(b) ~~(d)~~ Specific Appliances.

(1) Electrically operated kitchen waste disposers shall be permitted to be cord- and plug-connected with a flexible cord identified for the purpose, terminated with a grounding-type attachment plug where all of the following conditions are met:

a. The length of the cord shall not be less than 18 in. (457 mm) and not over 36 in. (914 mm).

b. Receptacles shall be located to avoid physical damage to the flexible cord.

c. The receptacle shall be accessible.

(2) Built-in dishwashers and trash compactors shall be permitted to be cord- and plug-connected with a flexible cord identified for the purpose, terminated with a grounding-type attachment plug where all of the following conditions are met:

a. The length of the cord shall be 3 ft to 4 ft (0.914 m to 1.22 m).

b. Receptacles shall be located to avoid physical damage to the flexible cord.

c. The receptacle shall be located in the space occupied by the appliance or adjacent thereto.

d. The receptacle shall be accessible.

Exception: Listed kitchen waste disposers, dishwashers, and trash compactors protected by a system of double insulation, or its equivalent, shall not be required to be grounded. Where such a system is employed, the equipment shall be distinctively marked.

~~422-17. Wall-Mounted Ovens and Counter-Mounted Cooking Units. (3) (a) Permitted to Be Cord- and Plug-Connected or Permanently Connected~~. Wall-mounted ovens and counter-mounted cooking units complete with provisions for mounting and for making electrical connections shall be permitted to be permanently connected or, only for ease in servicing or for installation, cord- and plug-connected.

~~(b) Separable Connector or a Plug and Receptacle Combination~~. A separable connector or a plug and receptacle combination in the supply line to an oven or cooking unit shall:

a. ~~(1)~~ Not be installed as the disconnecting means required by Section 422-30 ~~422-20~~.

b. ~~(2)~~ Be approved for the temperature of the space in which it is located.

422-16. ~~422-10~~. Protection of Combustible Material. Each electrically heated appliance that is intended by size, weight, and service to be located in a fixed position shall be so placed as to provide ample protection between the appliance and adjacent combustible material.

422-17. ~~422-18~~. Support of Ceiling Fans.

(a) Ceiling Fans 35 Lb (15.88 kg) or Less. Listed ceiling fans that do not exceed 35 lb (15.88 kg) in weight, with or without accessories, shall be permitted to be supported by outlet boxes identified for such use and supported in accordance with Sections 370-23 and 370-27.

(b) Ceiling Fans Exceeding 35 Lb (15.88 kg). Listed ceiling fans exceeding 35 lb (15.88 kg) in weight, with or without accessories, shall be supported independently of the outlet box. See Section 370-23.

422-18. ~~422-16~~. Grounding. Appliances required by Article 250 to be grounded shall have exposed noncurrent-carrying metal parts grounded in the manner specified in Article 250.

(FPN): See Sections 250-42, 250-43, and 250-45 for equipment grounding of refrigerators and freezers and Sections 250-57 and 250-60 for equipment grounding of electric ranges, wall-mounted ovens, counter-mounted cooking units, and clothes dryers.

422-19. Other Installation Methods. Appliances employing methods of installation other than covered by this article shall be permitted to be used only by special permission.

C. Disconnecting Means

~~D. Control and Protection of Appliances~~

422-30. General. ~~422-20. Disconnecting Means~~. A means shall be provided to disconnect each appliance from all ungrounded conductors in accordance with the following sections of Part C ~~D~~.

If an appliance is supplied by more than one source, the disconnecting means shall be grouped and identified.

422-31. ~~422-21.~~ Disconnection of Permanently Connected Appliances.

(a) Rated at Not Over 300 Volt-Amperes or 1/8 Horsepower. For permanently connected appliances rated at not over 300 volt-amperes or 1/8 horsepower, the branch-circuit overcurrent device shall be permitted to serve as the disconnecting means.

(b) Appliances Rated Over 300 Volt-Amperes or 1/8 Horsepower. For permanently connected appliances rated over 300 volt-amperes or 1/8 horsepower, the branch-circuit switch or circuit breaker shall be permitted to serve as the disconnecting means where the switch or circuit breaker is within sight from the appliance or is capable of being locked in the open position.

(FPN No. 1): For motor-driven appliances of more than 1/8 horsepower, see Section 422-35 ~~422-27~~.

(FPN No. 2): For appliances employing unit switches, see Section 422-33 ~~422-25~~.

422-32. ~~422-22~~. Disconnection of Cord- and Plug-Connected Appliances.

(a) Separable Connector or an Attachment Plug and Receptacle. For cord- and plug-connected appliances, an accessible separable connector or an accessible plug and receptacle shall be permitted to serve as the disconnecting means. Where the separable connector or plug and receptacle are not accessible, cord- and plug-connected appliances shall be provided with disconnecting means in accordance with Section 422-31 ~~422-21~~.

(b) Connection at the Rear Base of a Range. For cord- and plug-connected household electric ranges, an attachment plug and receptacle connection at the rear base of a range, if it is accessible from the front by removal of a drawer, shall be considered as meeting the intent of Section 422-32(a) ~~422-22(a)~~.

(c) Rating. The rating of a receptacle or of a separable connector shall not be less than the rating of any appliance connected thereto.

Exception: Demand factors authorized elsewhere in this Code shall be permitted to be applied.

~~**(d) Requirements for Attachment Plugs and Connectors. Attachment plugs and connectors shall conform to the following:**~~

~~**(1) Live Parts. They shall be so constructed and installed as to guard against inadvertent contact with live parts.**~~

~~**(2) Interrupting Capacity. They shall be capable of interrupting their rated current without hazard to the operator.**~~

~~**(3) Interchangeability. They shall be so designed that they will not fit into receptacles of lesser rating.**~~

422-33. ~~422-25.~~ Unit Switch(es) as Disconnecting Means. A unit switch(es) with a marked "off" position that is a part of an appliance and disconnects all ungrounded conductors shall be permitted as the disconnecting means required by this article where other means for disconnection are provided in the following types of occupancies:

(a) Multifamily Dwellings. In multifamily dwellings, the other disconnecting means shall be within the dwelling unit, or on the same floor as the dwelling unit in which the appliance is installed, and shall be permitted to control lamps and other appliances.

(b) Two-Family Dwellings. In two-family dwellings, the other disconnecting means shall be permitted either inside or outside of the dwelling unit in which the appliance is installed. In this case, an individual switch or circuit breaker for the dwelling unit shall be permitted and shall also be permitted to control lamps and other appliances.

(c) One-Family Dwellings. In one-family dwellings, the service disconnecting means shall be permitted to be the other disconnecting means.

(d) Other Occupancies. In other occupancies, the branch-circuit switch or circuit breaker, where readily accessible for servicing of the appliance, shall be permitted as the other disconnecting means.

422-34. ~~422-26~~. Switch and Circuit Breaker to Be Indicating. Switches and circuit breakers used as disconnecting means shall be of the indicating type.

422-35. ~~422-27.~~ Disconnecting Means for Motor-Driven Appliances. If a switch or circuit breaker serves as the disconnecting means for a permanently connected motor-driven appliance of more than 1/8 horsepower, it shall be located within sight from the motor controller and shall comply with Part I of Article 430.

Exception: A switch or circuit breaker that serves as the other disconnecting means as required in Section 422-33 ~~422-25~~(a), (b), (c), or (d) shall be permitted to be out of sight from the motor controller of an appliance provided with a unit switch(es) with a marked "off" position and that disconnects all ungrounded conductors.

D. Construction

422-40. ~~422-23.~~ Polarity in Cord- and Plug-Connected Appliances. If the appliance is provided with a manually operated, line-connected, single-pole switch for appliance on-off operation, an Edison-base lampholder, or a 15- or 20-ampere receptacle, the attachment plug shall be of the polarized or grounding type.

Exception: A listed double insulated shaver using a 2-wire, nonpolarized attachment plug, if not provided with an Edison-base lampholder or a 15- or 20-ampere receptacle.

(FPN): For polarity of Edison-base lampholders, see Section 410-42(a).

422-41. ~~422-24.~~ Cord- and Plug-Connected Appliances Subject to Immersion. Cord- and plug-connected portable freestanding hydromassage units and hand-held hair dryers shall be constructed to provide protection for personnel against electrocution when immersed while in the "on" or "off" position.

422-42. ~~422-12.~~ Signals for Heated Appliances. In other than dwelling-type occupancies, each electrically heated appliance or group of appliances intended to be applied to combustible material shall be provided with a signal.

Exception: If an appliance is provided with an integral temperature-limiting device.

422-43. ~~422-8.~~ Flexible Cords.

(a) Heater Cords. All cord- and plug-connected smoothing irons and electrically heated appliances that are rated at more than 50 watts and produce temperatures in excess of 121°C (250°F) on surfaces with which the cord is likely to be in contact shall be provided with one of the types of approved heater cords listed in Table 400-4.

(b) Other Heating Appliances. All other cord- and plug-connected electrically heated appliances shall be connected with one of the approved types of cord listed in Table 400-4, selected in accordance with the usage specified in that table.

422-44. ~~422-9~~. Cord- and Plug-Connected Immersion Heaters. Electric heaters of the cord- and plug-connected immersion type shall be so constructed and installed that current-carrying parts are effectively insulated from electrical contact with the substance in which they are immersed.

422-45. ~~422-11~~. Stands for Cord- and Plug-Connected Appliances. Each smoothing iron and other cord- and plug-connected electrically heated appliance intended to be applied to combustible material shall be equipped with an approved stand, which shall be permitted to be a separate piece of equipment or a part of the appliance.

422-46. ~~422-13.~~ Flatirons. Electrically heated smoothing irons shall be equipped with an identified temperature-limiting means.

422-47. ~~422-14.~~ Water Heaters.

(a) Storage- and Instantaneous-type Water Heaters. Each storage- or instantaneous-type water heater shall be equipped with a temperature-limiting means in addition to its control thermostat to disconnect all ungrounded conductors, and such means shall be (1) installed to sense maximum water temperature and (2) either a trip-free, manually reset type or a type having a replacement element. Such water heaters shall be marked to require the installation of a temperature and pressure relief valve.

(FPN): See *Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems,* **ANSI Z21.22-1990.**

Exception: Water heaters with supply water temperature of 82°C (180°F) or above and a capacity of 60 kW or above and identified as being suitable for this use; and water heaters with a capacity of 1 gal (3.785 L) or less and identified as being suitable for such use.

422-48. ~~422-15~~. Infrared Lamp Industrial Heating Appliances.

(a) 300 Watts or Less. Infrared heating lamps rated at 300 watts or less shall be permitted with lampholders of the medium-base, unswitched porcelain type or other types identified as suitable for use with infrared heating lamps rated 300 watts or less.

(b) Over 300 Watts. Screw-shell lampholders shall not be used with infrared lamps over 300 watts rating.

Exception: Lampholders identified as suitable for use with infrared heating lamps rated more than 300 watts.

422-49. High Pressure Spray Washers.

~~(3)~~ Cord- and plug-connected high-pressure spray washing machines shall be provided with factory-installed ground-fault circuit-interrupter protection for personnel. The ground-fault circuit-interrupter shall be an integral part of the attachment plug or shall be located in the supply cord within 12 in. (305 mm) of the attachment plug.

Exception No. 1: A high-pressure spray washer rated for a 3-phase supply system.

Exception No. 2: A high-pressure spray washer rated over 250 volts.

422-50. ~~422-29~~. Cord- and Plug-Connected Pipe Heating Assemblies. Cord- and plug-connected pipe heating assemblies intended to prevent freezing of piping shall be listed.

E. Marking ~~of Appliances~~

422-60. ~~422-30.~~ Nameplate.

(a) Nameplate Marking. Each electric appliance shall be provided with a nameplate giving the identifying name and the rating in volts and amperes, or in volts and watts. If the appliance is to be used on a specific frequency or frequencies, it shall be so marked.

Where motor overload protection external to the appliance is required, the appliance shall be so marked.

(FPN): See Section 422-11(a) ~~422-28(a),~~ Exception, for overcurrent protection requirements.

(b) To Be Visible. Marking shall be located so as to be visible or easily accessible after installation.

422-61. ~~422-31.~~ Marking of Heating Elements. All heating elements that are rated over one ampere, replaceable in the field, and a part of an appliance shall be legibly marked with the ratings in volts and amperes, or in volts and watts, or with the manufacturer's part number.

422-62. ~~422-32.~~ Appliances Consisting of Motors and Other Loads. Appliances shall be marked in accordance with (a) or (b) below.

(a) Marking. In addition to the marking required in Section 422-60 ~~422-30~~, the marking on an appliance consisting of a motor with other load(s) or motors with or without other load(s) shall specify the minimum supply circuit conductor ampacity and the maximum rating of the circuit overcurrent protective device.

Exception No. 1: Appliances factory-equipped with cords and attachment plugs, complying with Section 422-60 ~~422-60~~.

Exception No. 2: An appliance where both the minimum supply circuit conductor ampacity and maximum rating of the circuit overcurrent protective device are not more than 15 amperes and complies with Section 422-60 ~~422-30~~.

(b) Alternate Marking Method. An alternate marking method shall be permitted to specify the rating of the largest motor in volts and amperes, and the additional load(s) in volts and amperes, or volts and watts in addition to the marking required in Section 422-30.

Exception No. 1: Appliances factory-equipped with cords and attachment plugs, complying with Section 422-30.

Exception No. 2: The ampere rating of a motor 1/8 horsepower or less or a nonmotor load 1 ampere or less shall be permitted to be omitted unless such loads constitute the principal load.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Accept in principle, revise panel action as follows:

422-15(b)(3)a Delete ~~not to be installed as the disconnecting means required by Section 422-30.~~ 422-32(a) revise first sentence:

For cord- and plug-connected appliances an accessible separable connector or accessible plug and receptacle shall be permitted to serve as the disconnecting means. Where the separable connector or plug and receptacle are not readily accessible ~~cord-and-plug-connected appliances shall be provided with~~ a disconnecting means in accordance with Section 422-31 shall be provided.

SUBSTANTIATION: Section 422-15a is under the heading Flexible Cords; Part C covers disconnecting means. The requirement that a separable connector or plug and receptacle not be the disconnecting means required by Section 422-30 is confusing as that section specifies disconnecting means specifically permitting such means for cord- and plug-connected appliances which includes ovens or cooking units. A receptacle installed in the cavity of a built-in oven appears to meet both Article 100 definitions of accessible, i.e., not closed in by building structure and not guarded by effective means (the oven can be pulled from the cavity). The last sentence should apply to receptacles not readily accessible, as in the case of having to remove an obstacle (oven) to gain access. A counter top cooking unit supplied by cord and plug will almost always have an accessible plug/receptacle cord which complies with Section 433-32(a) as a disconnect, but disallowed by Section 422-15(b)(3)a.

PANEL ACTION: Accept in Principle in Part.

See the actions on Proposals 20-8 and 20-11.

PANEL STATEMENT: The action on Proposal 20-8 addresses the first part of this proposal. The panel statement for Proposal 20-11 provides the reason for not accepting the second part of this proposal.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #CP2005)

20- 7a - (422-16): Accept

SUBMITTER: CMP 20

RECOMMENDATION: Add subsection titles as follows:

(B)(1) Electrically Operated Kitchen Waste Disposers
(B)(2) Built-in Dishwashers and Trash Compactors
(B)(3) Wall-Mounted Ovens and Counter-Mounted Cooking Units

SUBSTANTIATION: Compliance with NEC Correlating Committee directive on style.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #891)

20- 8 - (422-16(b)(3)): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise second paragraph:

A separable connector or a plug and receptacle in the supply line to an oven or cooking unit shall ~~(1) not be installed as the disconnecting means required by Section 422-30 and (2)~~ be approved for the temperature of the space in which it is installed.

SUBSTANTIATION: Disconnecting means is covered in Part C and Section 422-32 permits a plug/receptacle as the disconnecting means. A plug and receptacle not closed in by building finish is accessible.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #3352)

20- 9 - (422-31 and 422-35): Accept

SUBMITTER: Bryan D. Stokes, SGS Architects Engineers

RECOMMENDATION: Relocate after 422-35 (including exceptions) below 422-31(b), and renumber section as 422-32. Delete FPN No. 1 of 422-31(b) and renumber FPN No. 2 as FPN No. 1. Renumber remaining sections accordingly.

SUBSTANTIATION: This proposal will make the code more user friendly.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #2772)

20- 10 - (422-31(b)): Reject

SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.

RECOMMENDATION: Add the word "individually" in between the words "being" and "locked."

SUBSTANTIATION: This word will help to avoid the questions as to whether or not a panel cover hasp, and lock or other locking device constitutes a disconnecting means.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided sufficient substantiation for the need for this proposal.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #892)

20- 11 - (422-32(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence:
Where the separable connector or plug and receptacle are rendered not readily accessible by stationary appliances, cord- and plug-connected appliances shall be provided with disconnecting means in accordance with Sections 422-31 or 422-33.
SUBSTANTIATION: The two definitions of accessible in Article 100 do not appear applicable to plug/receptacles of this section. Cords are not permitted by Section 400-8 to be behind building walls or finish nor are outlet boxes for receptacles or cord connection, by Section 370-29, and the appliances of this section don't fit the description of building in Article 100.
Section 550-8(d) Exception No. 2 indicates appliances (obstacles) may render receptacles not "readily" accessible. Section 422-33 seems to be an appropriate alternative.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient substantiation for this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 1 Ryan
EXPLANATION OF NEGATIVE:
EGAN: An appliance disconnecting means is normally plug and cord as per manufacturer's specifications. The question is accessibility. The disconnecting means is arrived at only after the removal of panels, panel hardware, or stationary appliance while still energized.

(Log #CP2007)

20- 11a - (422-47): Accept
Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to read as follows:
"422-47. Water Heater Controls. All Storage or instantaneous-type water heaters shall be equipped with a temperature-limiting means in addition to its control thermostat to disconnect all ungrounded conductors. Such means shall be:
(1) Installed to sense maximum water temperature; and
(2) Either a trip-free, manually reset type or type having a replacement element. Such water heaters shall be marked to require the installation of a temperature and pressure relief valve.
Exception No. 1: Storage water heaters that are identified as being suitable for use with supply water temperature of 82 degrees C (180 degrees F) or above and a capacity of 60 kW or above.
Exception No. 2: Instantaneous-type water heaters that are identified as being suitable for such use, with a capacity of 4L (1 gal) or less.
FPN: See ANSI Z21.22-1999/CSA 4.4-M99, Relief Valves for Hot Water Supply Systems."
SUBMITTER: CMP 20
RECOMMENDATION: Revise to read as follows:
"422.47. Water Heater Controls.
(A) Storage or Instantaneous-Type Water Heaters. All storage or instantaneous-type water heaters other than (1) and (2) below shall be equipped with a temperature-limiting means in addition to its control thermostat to disconnect all ungrounded conductors. Such means shall be:
(a) Installed to sense maximum water temperature; and
(b) Be either a trip-free, manually reset type or a type having a replacement element. Such water heaters shall be marked to require the installation of a temperature and pressure relief valve.
(1) Storage Water Heaters. Storage water heaters that are identified as being suitable for use with supply water temperature of 82°C (180°F) or above and a capacity of 60 kW or above; or
(2) Instantaneous-Type Water Heaters. Instantaneous-type water heaters that are identified as being suitable for such use, with a capacity of 4L (1 gal) or less.
FPN: See ANSI Z21.22-1999/CSA 4.4-M99, Relief Valves for Hot Water Supply Systems."
SUBSTANTIATION: This revision incorporates the recommendations of Proposals 20-12 and 20-13, as well as modifying the text to comply with the style manual. It also corrects an error that existed in the 1999 edition of the code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #4225)

20- 12 - (422-47): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows
422.47. Water Heater Controls.
(a) Temperature Limitation, General. Each storage- or instantaneous-type water heater not covered in (B) shall be equipped with a temperature-limiting means in addition to its control thermostat to disconnect all ungrounded conductors, and such means shall be (1) installed to sense maximum water temperature and (2) either a trip-free, manually reset type or a type having a replacement element. Such water heaters shall be marked to require the installation of a temperature and pressure relief valve.
(b) Temperature Limitation, Exempt. Instantaneous-type water heaters with supply water temperature of 82°C (180°F) or above and a capacity of 60 kW or above, and water heaters with a capacity of 1 gal (3.785 L) or less, shall be permitted without the temperature limitation controls in (A). Such units shall be identified as being suitable for such use.
SUBSTANTIATION: This essentially returns to the 1996 language, but without the former exception form. The 1999 version is so horribly worded as to be unintelligible without a copy of the 1996 NEC as a guide, along with a Code analysis to explain that no substantive change was intended. The 1999 wording does not comply with current style manual requirements, being written in the negative ("other than …") and with the reader expected to filter that exclusionary thought over the entire first subsection but only over the first half of the second subsection. This proposal achieves the intent of the panel with far more straightforward wording.
PANEL ACTION: Accept in Principle.
See Proposal 20-11a.
PANEL STATEMENT: Proposal 20-11a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #2575)

20- 13 - (422-47, FPN): Accept
SUBMITTER: David Berning, A.O. Smith Watr Products Co.
RECOMMENDATION: Update title of standard to:
ANSI/ Z21.22-1999/CSA 4.4-M99, Relief Valves for Hot Water Supply Systems.
SUBSTANTIATION: A new edition of the standard has been published. Automatic gas shutoff devices are now covered in a separate standard.
PANEL ACTION: Accept.
Proposal 20-11a.
PANEL STATEMENT: This has been incorporated into Proposal 20-11a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #2574)

20- 14 - (422-47(b)): Reject
SUBMITTER: David Berning, A.O. Smith Watr Products Co.
RECOMMENDATION: Separate the following from beginning of (b) by a line and revise as indicated:
Shall be equipped with a temperature-limiting ~~means~~ control(s) in addition to its control thermostat(s).
SUBSTANTIATION: The most popular control arrangement utilizes two thermostats with either one or two limit controls.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: "Temperature Limiting Means" does not restrict the methods used to control.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #2931)

20- 15 - (422-49): Reject
SUBMITTER: Timothy D. Curry, Curry Electric, Inc.
RECOMMENDATION: Revise text to read as follows:
"All ~~single phase~~ cord ~~and plug~~ connected high pressure spray washing machines rated at ~~250~~ 480 volts or less shall be provided with factory installed ground fault circuit-interrupter protection for personnel. The ground fault circuit interrupter shall be an integral part of the attachment plug or shall be located in the supply cord within 12 in. (305 mm) of the ~~attachment plug~~ supply end."
SUBSTANTIATION: These types of units are typically used in commercial truck and heavy equipment washing. The cords are subject to all types of abuse, misuse, and just plain wear and tear. Any sharp or heavy object could cut or damage the cord, in such a way as to allow current leakage, shock, or electrocution. Listed GFCI units are now available to protect the users of this equipment.
In the 1990-1993 code cycle, verbiage was added to Section 422-8(d)(3) to increase the required GFCI protection, from only 125 volt units, to 125 and 240 volt, single phase units. This was done simply because the GFCI units had not been available, and now were. Please see 1992 ROP (Log #3740), page 362. Also see 1992 ROC (Log #764), page 440. The code panel unanimously accepted the proposal and comment, without asking for further documented injury statistics.
In the 1993-1996 code cycle, Proposal #20-8 (Log #2590), 1995 ROP, page 479, was rejected because the panel was not aware of any listed GFCIs to meet the proposal.
However, in the same 1993-1996 code cycle, Proposal #20-7 (Log #2088), page 478 of the ROP, was accepted. See also comments #20-5, 20-6, 20-7, and 20-8, pages 285 and 286 of the 1995 ROC. This change deleted the exception that had previously allowed double insulated spray washers without GFCI protection. This was done simply because new two wire GFCI devices were available.
When a proposal was made in the 1996-1999 code cycle, see Log #3121, page 661 of the 1998 ROP, it was rejected only for lack of a "body count". See also 1998 ROC page 500, (Logs #1368 and #1362).
The real problem seems to be that we cannot satisfy the committee. Once a hurdle is cleared, that is, units are now available, the committee requests "field data/body count" I would submit that the same "field data" that caused the GFCI requirement to be added, prior to the 1993, for 125 volt units, is still relative today. Also, as evidenced in the 1992 change and the 1995 deletion, the committee was able to move forward with increased protection, without any further "field data". Other areas have also had GFCI protection expanded, for example, wet bar outlets, and kitchen counter outlets, beyond the 6 ft rule, were all added without "field data". Please except this proposal and increase the protection of the people using this equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The present code requirement has reduced the hazards referenced in the original proposal, as indicated by CPSC data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #3309)

20- 16 - (422-51 (New)): Reject
SUBMITTER: Jack Wells, Pass & Seymour/Legrand
RECOMMENDATION: Add a new section to read as follows:
422-51. Kitchen Waste Disposers. A momentary contact switch shall operate electrically operated kitchen waste disposers.
SUBSTANTIATION: I have provided a copy of a US Consumer Product Safety Commission report describing injuries sustained as a result of individuals using garbage disposals. Many of these injuries could have been avoided if a momentary contact switch was used to control the operation of the garbage disposal. A momentary contact switch requires the operator to continuously depress the switch lever to run the garbage disposal. As a result, the operator is in a position to immediately turn off the garbage disposal by simply releasing the switch lever when it is recognized that material entering the disposal unit presents a hazardous situation. The momentary contact switch also assures that the operator is in attendance while the garbage disposal is running. The CPSC Report indicates that there are many incidents of people placing fingers into the garbage disposal and foreign material such as knives and forks entering the disposal. Both the attendance of the operator and the quick response afforded by the use of a momentary contact switch insures that the operator is in a position to recognize when a hazard occurs and is able to quickly turn off the garbage disposal.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The incident data does not indicate that the use of a momentary contact switch would have prevented the injuries noted by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 2
NOT RETURNED: 1 Ryan
EXPLANATION OF NEGATIVE:
EGAN: A momentary contact switch provides an immediate means of disconnect if the opposing hand is subject to physical injury from the appliance.
KOESSEL: I support the substantiation and feel it is in the realm of safe operation.
COMMENT ON AFFIRMATIVE:
CLINE: I agree with the panel's action to reject, but wish to further emphasize the reasons. 1) There should be a very strong desire to NOT have one wet hand on the switch and one hand in the water pushing food into the disposal. 2) The stance and stretch required, and the possible task vision impairment of operating the momentary switch while pushing food into the disposal could add great hazards. 3) Not a single incident confirmed an injury which would have been avoided by a finger coming off the momentary switch after the incident started. I tallied the first 124 incidents as: 73 incidents completely unrelated to a running disposal; 39 as possibly but not probably related to a running disposal; and 12 which appeared to be related to a running disposal, but only two of these appear that they might have been alleviated by the proposed switch. Almost all hand-in-the-disposal injuries appear to be due to cuts received while cleaning out broken or jammed materials in a motionless disposal.

(Log #293)

20- 17 - (422-55 (New)): Reject
SUBMITTER: George Dumsar, Connecticut Light & Power Co.
RECOMMENDATION: Propose that water cooler/drinking fountains be GFCI protected.
SUBSTANTIATION: Water coolers/drinking fountains contain 3 elements that potentially could be hazardous, metal, water and electricity.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical justification, nor has he provided suggested text. There is no history of shock problems. The code does not prevent these from being GFCI-protected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #4226)

20- 18 - (422-62): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:

422-62. Appliances Consisting of Motors and Other Loads.

(a) Nameplate Horsepower Markings. Where a motor-operated appliance nameplate includes a horsepower rating, that rating shall not be less than the horsepower rating on the motor nameplate. Where an appliance consists of multiple motors, or one or more motors and other loads, the nameplate value shall not be less than the equivalent horsepower of the combined loads, calculated in accordance with Section 430-110(c)(1).

(b) Additional Nameplate Markings. Appliances, other than those factory-equipped with cords and attachment plugs and with nameplates in compliance with Section 422-60, shall be marked in accordance with (1) or (2).

(1) Marking. In addition to the marking required in Section 422-60, the marking on an appliance consisting of a motor with other load(s) or motors with or without other load(s) shall specify the minimum supply circuit conductor ampacity and the maximum rating of the circuit overcurrent protective device. This requirement shall not apply to an appliance with a nameplate in compliance with Section 422-60 where both the minimum supply circuit conductor ampacity and maximum rating of the circuit overcurrent protective device are not more than 15 amperes.

(2) Alternate Marking Method. An alternate marking method shall be permitted to specify the rating of the largest motor in volts and amperes, and the additional load(s) in volts and amperes, or volts and watts in addition to the marking required in Section 422-60. The ampere rating of a motor 1/8 horsepower or less or a nonmotor load 1 ampere or less shall be permitted to be omitted unless such loads constitute the principal load.

SUBSTANTIATION: Item (a) of this proposal provides CMP 20 with a vehicle to correct an oversight in the 1999 NEC adoption process. While acting on the submitter's Proposal 11-10, the TCC directed that the final sentence of the panel action be given to CMP 20 for action during the comment period within Article 422. The issue was mislaid and never made it on to CMP 20's comment agenda. There was no reason for CMP 20 to have known about the referral, and it fell through the cracks. The first half of this proposal is a more robust and complete version of that original CMP 11 recommendation, appropriately located and in a convenient form for CMP 20 to be able to complete the anticipated action.

Item (b) of this proposal is editorial, aimed at correcting the manner in which four exceptions were converted to positive text by dumping them into the middle of the affected sections in the 1999 rewrite. This wording if far more clear without returning to the use of exceptions. The key is to realize that one of the exceptions to each of the 1996 subsections was identical, and therefore amenable to being inserted into the parent language. The remaining exceptions, one to each subsection, then fold into the end of the subsections much more cleanly and in a way that avoids the run-on sentence construction of the 1999 version.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
NOT RETURNED: 1 Ryan
EXPLANATION OF NEGATIVE:
TALKA: Proposed revision to 422-62 makes reference to Section 430-110(c)(1) for the calculation of equivalent horsepower rating of an appliance having multiple motors and/or combination loads. Section 430-110(c)(1) has nothing to do with calculating equivalent horsepower ratings, but rather it deals with determination of the size of a disconnect switch, in FLA and LRA, for multiple motor loads and/or combination loads. Section 430-110(c)(1) to determine the FLA and LRA values of motor loads based upon Tables 430-147, 430-148, 430-149, or 430-150 and to add these values to the rating in amperes of the other non-motor loads. It does not indicate to revert back to the tables to determine the equivalent horsepower rating of the combined load. If Section 422-62 pertained to the determination of the sizing of the appliance disconnect, then 430-110(c)(1) would be a proper reference. However 422-62 deals with the rating of the appliance and as such the reference to 430-110(c)(1) is improper.

ARTICLE 424 — FIXED ELECTRIC SPACE-HEATING EQUIPMENT

(Log #527)

20- 19 - (424): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 424-34, replace "7 ft (2.13 m)" with "2.1 m (7 ft)".
2. In Section 424-35, replace "3 in. (76 mm)" with "75 mm (3 in.)".
3. In Section 424-36, replace "2 in. (50.8 mm)" with "50 mm (2 in.)" throughout.
4. In Section 424-39, replace "8 in. (203 mm)" with "200 mm (8 in.)" and replace "2 in. (50.8 mm)" with "50 mm (2 in.)".
5. In Section 424-41(b), replace "2 13/42 watts/ft (2 3/4 watts/305 mm)" with "9 watts/m (2 3/4 watts/ft)" and replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)".
6. In Section 424-41(d), replace "3-in. (76-mm)" with "75 mm (3 in.)".
7. In Section 424-41(e), replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".
8. In Section 424-41(f), replace "16 in. (406 mm)" with "400 mm (16 in.)" and replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
9. In Section 424-41(g), replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".
10. In Section 424-41(i), replace "2 1/2 in. (64 mm)" with "65 mm (2 1/2 in.)".
11. In Sections 424-43(b) and (c), replace "6 in. (152 mm)" with "150 mm (6 in.)" throughout.
12. In Section 424-44(a), replace "16 1/2 watts/linear foot (305 mm)" with "54 watts/linear meter (16 1/2 watts/linear foot)".
13. In Section 424-44(b), replace "1 in. (25.4 mm)" with "25 mm (1 in.)".
14. In Section 424-59 FPN, replace "4 ft (1.22 m)" with "1.2 m (4 ft)".
15. In Section 424-61, replace "4 ft (1.22 m)" with "1.2 m (4 ft)".
16. In Section 424-93(a)(3), replace "8 in. (203 mm)" with "200 mm (8 in.)" and replace "2 in. (50.8 mm)" with "50 in.)".
17. In Section 424-93(b)(3), replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
18. In Section 424-94, replace "2 in. (50.8 mm)" with "50 mm (2 in.)" throughout.
19. In Section 424-98(a), replace "33 watts/ft^2 (33 watts/0.093 m^2)" with "355 watts/m^2 (33 watts/ft^2)".
20. In Section 424-99(b), replace "15 watts/ft^2 (15 watts/0.093 m^2)" with "160 watts/m^2 (15 watts/ft^2)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #3880)

20- 20 - (424-3(a)): Accept
SUBMITTER: J. Philip Simmons, Simmons Electrical Services
RECOMMENDATION: Revise as follows:

424-3(a) Branch-Circuit Requirements. Individual branch circuits shall be permitted to supply any size fixed electric space-heating equipment.

Branch circuits supplying two or more outlets for fixed electric space-heating equipment shall be rated 15, 20, 25, or 30 amperes. In other than residential occupancies, fixed infrared heating equipment shall be permitted to be supplied from branch circuits rated not over 50 amperes.

SUBSTANTIATION: Twenty-five ampere overcurrent devices are standard overcurrent devices in Section 240-6. They should be

permitted for use as the overcurrent protection for fixed electric space-heating branch circuits.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #2383)

20- 21 - (424-19(a)(2)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise 424-19(a)(2) as shown below:
(2) Heater Containing a Motor(s) Rated Over 1/8 Horsepower. The above disconnecting means shall be permitted to serve as the required disconnecting means for both the motor controller(s) and heater ~~by one of the means specified in~~ where the installation complies with a through ~~d~~ c below.
~~a. Where the above disconnecting means is also in sight from the motor controller(s) and heater.~~
~~b~~ a. Where the disconnecting means is not within sight from the heater, a separate disconnecting means shall be installed, or the disconnecting means shall be capable of being locked in the open position, or unit switches complying with Section 424-19(c) shall be permitted.
~~c~~ b. Where the disconnecting means is not within sight from the motor controller location, a disconnecting means complying with Section 430-102 shall be provided.
~~d~~ c. Where the motor is not in sight from the motor controller location, Section 430-102(b) shall apply.
SUBSTANTIATION: Substantiation for Proposal 10-48 for the 1990 Code indicates that it was intended to effect an editorial change, but in fact it changed (or at least obscured) the literal meaning of Section 424-19(a)(2). The term "one of the means" used in the sentence that was added literally requires the installation to comply with only one of the items "a" through "d". Item "a" can be deleted because the remaining items cover the cases where the disconnecting means is not in sight from the motor controller or heater, or the motor controller is not within sight of the motor.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text is more clearly understood.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #421)

20- 22 - (424-35): Reject
SUBMITTER: Louis Chiappone, Delta-Therm Corp.
RECOMMENDATION: Delete text:
~~The lead wire shall have the following color identification to indicate the circuit voltage on which it is to be used:~~
~~120 volts, nominal — yellow~~
~~208 volts, nominal — blue~~
~~240 volts, nominal — red~~
~~277 volts, nominal — brown~~
~~480 volts, nominal — orange~~
SUBSTANTIATION: The use of color coding cold leads is redundant to the marking requirement for volts and watts or volts and amperes. This requirement forces manufactures to inventory up to five colors times the number of gauge sizes. Where a cable is dual rated, such as 208/240 volts, the proper color coding is indeterminable. Deleting the color coding requirement does not compromise safety since the voltage information is available on the cold leads.
PANEL ACTION: Reject.
PANEL STATEMENT: This seriously compromises safety.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #1141)

20- 23 - (424-35): Reject
SUBMITTER: Edward Witte, Delta-Therm Corp.
RECOMMENDATION: Revise text to read:
"Each unit length of heating cable shall have a permanent legible marking on each non-heating lead located within 3 in. (76 mm) of the terminal end. When the marking is the identifying name, identification symbol, or catalog number, the lead wire shall have the following color identification to indicate the circuit voltage on which it is to be used:
120 volt, nominal - yellow 208 volt, nominal - blue 240 volt, nominal - red 277 volt, nominal - brown 480 volt, nominal - orange."
SUBSTANTIATION: It is redundant to mark the volts and amps, or the volts and watts, and then also color code the leads. This now forces a manufacturer to stock five wire colors times the number of gauge sizes used.
PANEL ACTION: Reject.
PANEL STATEMENT: Color-coding is simpler and more reliable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #2799)

20- 24 - (424-40): Reject
SUBMITTER: Edward Witte, Delta-Therm Corp.
RECOMMENDATION: Revise as follows:
Splices. Embedded cables shall be spliced only where necessary and only by approved means,. ~~and in no case shall the length of the heating cable be altered.~~ Altering the heating cable length will require a voltage transformer to maintain the original cable electrical parameters.
SUBSTANTIATION: All cable splices or repairs involve altering cable length to some extent. This code change will resolve any conflicts due to code interpretation.
PANEL ACTION: Reject.
PANEL STATEMENT: The language being suggested is not precise and could lead to a safety problem in the choice of a transformer.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #893)

20- 25 - (424-43(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Free nonheating leads of cables shall be installed in accordance with approved wiring methods from the junction box to a location within the ceiling. Such installations shall be permitted to be single conductors in approved raceways, ~~single or~~ multiconductor Type UF, Type NMC, Type MI cables, or other approved conductors. Bushings or other approved fittings shall be used where the leads emerge within the ceiling.
SUBSTANTIATION: Single conductors are generally required to be part of a recognized wiring method, why not single conductor Type UF? Such conductors do not appear to be open exposed wiring covered by Article 320; Sections 424-44(f); 424-98(f); and 426-22(c) require bushings or approved fittings, as does Section 300-16 which may not apply; a similar requirement for this section seems warranted.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical justification for this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #1140)

20- 26 - (424-44(g)): Reject
SUBMITTER: Edward Witte, Delta-Therm Corp.
RECOMMENDATION: Revise text to read:
(g) Ground-Fault Circuit-Interrupter Protection for Conductive Heated Floors of Bathrooms, Hydromassage Bathtub, Spa, and Hot Tub Locations. Ground-fault circuit-interrupter protection for personnel shall be provided for electrically heated floors in bathrooms, hydromassage bathtub, spa, and hot tub locations. This shall apply to ~~all~~ systems used with conductive floor coverings,

whether cable, panel, or other approved types.
Exception: Embedded mineral insulated cable used as floor heating in public, commercial, or industrial buildings shall not require ground-fault circuit-interrupter protection.
SUBSTANTIATION: A potential situation exists when a facility utilizing mineral insulated cable for floor heating adds a shower or bathroom which will be located in one or more circuit zones. This will require the owner to purchase one or more ground-fault circuit-interrupter devices. These devices are not available in all the voltages and current ratings that the heating cables can be operating on. On long cable lengths nuisance tripping will be likely with a ground fault trip level of 4 to 6 mA. Due to the hygroscopic nature of magnesium oxide, the dielectric in mineral insulated cable, the unlikely occurrence of a breach in the outer sheath will short the cable internally thusly tripping the over-current protection device.
PANEL ACTION: Reject.
PANEL STATEMENT: The scenario described by the submitter in his substantiation is exactly why the GFCI requirement was added.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #3391)

20- 27 - (424-44(g)): Accept in Principle
SUBMITTER: John E. Turner, Swansea Consulting
RECOMMENDATION: Delete "Conductive," and delete "used with conductive floor coverings", to read:
(g) Ground-Fault Circuit-Interruption Protection for Heated Floors of Bathrooms, Hydromassage Bathtub, Spa, and Hot Tub Locations. Ground-fault circuit-interrupter protection for personnel shall be provided for electrically heated floors in bathrooms, hydromassage bathtub, spa, and hot tub locations. This shall apply to all systems, whether cable, or other approved types.
SUBSTANTIATION: The word "conductive" can be confusing as it might be understood to mean either thermally conductive or electrically conductive. In either case the word "conductive" is unnecessary. The thermal conductivity of the floor is a design consideration and not a safety issue. When one considers the electrical conductivity of the floor, the present wording implies that electrically heated floors, under floor coverings that are not electrically conductive, do not need GFCI protection. While the floor covering may initially provide electrical insulation, this could be compromised over a period of time and in a wet environment. The initial submission (Log #2783) which initiated this new Section 424-44(g) in the 1999 National Electrical Code specifically referred to degradation due to the flexibility of the substrate.
PANEL ACTION: Accept in Principle.
See Proposal 20-28.
PANEL STATEMENT: Proposal 20-28 accomplishes this.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

(Log #4227)

20- 28 - (424-44(g)): Accept in Principle in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
"Ground-fault circuit-interrupter protection for personnel shall be provided for electrically heated floors in bathrooms, and in hydromassage bathtub, spa, and hot tub locations. This shall apply to all systems, whether cable, panel, or other types, used with conductive flooring or floor coverings ~~whether cable, panel, or other approved types~~. Conductive flooring shall include, but not be limited to, exposed concrete, masonry, and tile subject to foot traffic."
SUBSTANTIATION: This proposal corrects some editorial deficiencies in the existing rule. First, it deletes the term "approved." Although it was undoubtedly included in an attempt to force approvals, it actually worsens the situation by leaving a gap in Code coverage; no rule literally now applies to an unapproved system. In addition, it clarifies that the rule applies to flooring in general and not just coverings. Finally, the rewritten requirement clarifies that flooring systems that would be considered grounded by Condition 2 of the workspace tables would be considered conductive here. Most inspectors are applying the rule this way, seeing relatively few sheet-metal bathroom floors, for example, but the issue needs to be put to rest.
PANEL ACTION: Accept in Principle in Part.
Revise 424-44(g) to read as follows:
"424-44(g) Ground Fault Circuit-Interruption Protection for Heated Floors of Bathrooms, and in Hydromassage Bathtub, Spa, and Hot Tub Locations. Ground-fault circuit-interrupter protection for personnel shall be provided for electrically heated floors in bathrooms, and in hydromassage bathtub, spa, and hot tub locations."
PANEL STATEMENT: The panel's version clearly meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 1 Ryan

ARTICLE 426 — FIXED OUTDOOR ELECTRIC DEICING AND SNOW-MELTING EQUIPMENT

(Log #560)

12- 3 - (426): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 426-20(a), replace "120 watts / ft. ^{2} (120 watts/0.093 m^2)" with "11 watts / m^2 (120 watts / ft.^{2})".
2. In Section 426-20(b), replace "1 in. (25.4 m)" with "25 mm (1 in.)".
3. In Section 426-20(c)(1), replace "2 in. (50.8 mm)" with "50 mm (2 in.)".
4. In Section 426-20(c)(1), replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)".
5. In Section 426-20(c)(2), replace "3 1/2 in. (89 mm)" with "90 mm (3 1/2 in.)".
6. In Section 426-20(c)(2), replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)".
7. In Section 426-22(b), replace "1 in. to 6 in (25.4 mm to 152 mm)" with "25 mm to 150 mm (1 in. to 6 in.)".
8. In Section 426-22(b), replace "…not be less than 1 in. (25.4 mm) or more than 6 in. (152 mm)" with "…not be less than 25 mm (1 in.) or more than 150 mm (6 in.)".
9. In Section 426-22(e), replace "6 in. (152 mm)" with "150 mm (6 in.)".
10. In Section 426-23(a), replace "6 in. (152 mm)" with "150 mm (6 in.)".
11. In Section 426-25, replace "3 in. (76 mm)" with "75 mm (3 in.)"

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
Accept the proposal as modified below:
In Item (1) (Section 426-20(a)), replace "11 watts/m2" with "1300 watts/m2".
PANEL STATEMENT: The panel action corrects a mathematical error.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 Kelly, Laney

(Log #2486)

12- 4 - (426-28): Reject
SUBMITTER: James M. Imlah, City of Hillsboro, OR
RECOMMENDATION: Revise as follows:
Equipment Protection. Equipment ground-fault protection ~~of equipment~~ shall be provided for fixed outdoor electric deicing and snow melting equipment, except for equipment that employs mineral-insulated, metal sheathed cable embedded in a noncombustible medium.

SUBSTANTIATION: Clarification is needed so that it is clear that an equipment GFCI device (30 ma) which has a higher trip rating for the protection of equipment. The code statement seems to infer that the electric deicing equipment shall be protected by a personal type GFCI (5 mas or less) that could cause inadvertent tripping due to the heating effects of the deicing equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The present language is consistent with the definition in Article 100. The proposal provides no substantiation regarding a problem with the existing language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 Kelly, Laney

(Log #2115)

12- 5 - (426-32): Accept in Part
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete the "a" at the end of the first line as follows for clarity:
"Unless protected by ~~a~~ ground-fault circuit-interrupter protection for personnel, the secondary winding of the isolation transformer connected to the impedance heating elements shall not have an output voltage greater than 30 volts ac."
Revise the second paragraph to:
"Where ground-fault circuit-interrupter protection for personnel is provided, the voltage shall ~~be permitted to~~ not be greater ~~than 30 but not more~~ than 80 volts."
SUBSTANTIATION: These revisions will clarify some misunderstandings, and GFCI protection may be provided for any voltage less than 80 volts.
PANEL ACTION: Accept in Part.
Delete the "a" at the end of the first line as follows for clarity:
"Unless protected by ~~a~~ ground-fault circuit-interrupter protection for personnel, the secondary winding of the isolation transformer connected to the impedance heating elements shall not have an output voltage greater than 30 volts ac."
PANEL STATEMENT: The submitter has not provided substantiation with regard to a problem with the language in the second paragraph.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 Kelly, Laney

(Log #894)

12- 6 - (426-42): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete this section.
SUBSTANTIATION: Editorial. The provisions of Section 300-20 already do not apply due to Exception No. 2 for Section 300-20(a).
PANEL ACTION: Reject.
PANEL STATEMENT: The current language is necessary because it is a modification of a general rule and should be located in the specific Article. The submitter has not provided any substantiation with regard to a problem with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 Kelly, Laney

ARTICLE 427 — FIXED ELECTRIC HEATING EQUIPMENT FOR PIPELINES AND VESSELS

(Log #561)

12- 7 - (427): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 427-18, replace "6 in. (152 mm)" with " 150 mm (6 in.)".
2. In Section 427-20, replace "3 in. (76 mm)" with "75 mm (3 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #3716)

12- 8 - (427-23): Accept
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Wayne A. Williams, Raychem HTS
RECOMMENDATION: Revise text as follows:
427-23. ~~Metal Covering.~~ Grounded Conductive Covering. Electric heating equipment shall have a grounded ~~metal~~ conductive covering in accordance with (a) or (b). The conductive ~~metal~~ covering shall provide an effective ground path for equipment protection.
(a) Heating Wires or Cables. Heating wires or cables shall have a grounded conductive ~~metal~~ covering that surrounds the heating element and bus wires, if any, and their electrical installation.
(b) Heating Panels. Heating panels shall have a grounded conductive ~~metal~~ covering over the heating element and its electrical insulation on the side opposite the side attached to the surface to be heated.
SUBSTANTIATION: Materials other than "metal" can provide an effective ground path to operate the required equipment protection. New conductive materials or combinations of conductive materials and metallic grounding conductors can be used in place of metal braid or sheaths to provide a low impedance ground path sufficient to operate the equipment protection device. This can be accomplished while maintaining 100 percent coverage of the heating device.
The code should not restrict technological innovation, provided the intended safety of the system is maintained.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
NEGATIVE: 3
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
HANTHORN: I am voting negative on this proposal for the following reason: Right now the various approval bodies - UL and FM, the heating cable standard IEEE 515, and Recommended Practice IEEE 515.1 require a metal braid or sheath on heating cables. If a homeowner or other person installing the heater or working on equipment which utilizes a heating cable should penetrate the heating cable with a sharp object and contact the heating conductor or bus bar, they will cause a short between that and the braid causing the protective device to trip. My understanding of the proposed construction which would be permitted by this code change is that the braid could be replaced by a conductive polymer plus a grounding wire. If the person happens to penetrate the heater away from the grounding wire, will the voltage to which they are subjected be low enough to not cause them injury?
I feel acceptance of this proposed change should be delayed until the various approval bodies, standards and practices include tests to ensure the safety of the person.
QUAVE: The submitter did not provide any substantiation to the claim that "grounding conductive covering" can provide a low impedance path. Article 250 requires that equipment grounding shall be such that there is a path of sufficient low impedance to clear any fault current that may be on it.
TROUT: This proposal should have been rejected. The metal covering required is for physical protection of heating cables and the heating panel element. The grounding requirement is necessary because of the presence of the metal covering in close proximity to the heating elements and circuits. The metal covering is not intended as the equipment grounding conductor required by Article 250.
No documentation was provided to show that any new conductive materials would furnish the physical protection intended, nor was any documentation provided to show that these new conductive

materials anticipated have successfully passed any testing which would indicate their ability to carry ground fault current levels which might be expected.

(Log #3717)

12- 9 - (427-23): Reject
SUBMITTER: Wayne A. Williams, Raychem HTS
RECOMMENDATION: Replace current text with text from 426-27.
Current text:
427-23. ~~Metal Covering. Electric heating equipment shall have a grounded metal covering in accordance with (a) or (b). The metal covering shall provide an effective ground path for equipment protection.~~
~~(a) Heating Wires or Cables. Heating wires or cables shall have a grounded metal covering that surrounds the heating element and bus wires, if any, and their electrical insulation.~~
~~(b) Heating Panels. Heating panels shall have a grounded metal covering over the heating element and its electrical insulation on the side opposite the side attached to the surface to be heated.~~
Proposed text:
427-23. Grounded Conductive Covering, ~~Grounding Braid or Sheath~~
Grounding means, such as copper braid, metal sheath, or other approved means, shall be provided as part of the heated section of the cable, panel, or unit.
SUBSTANTIATION: Adoption of this language will bring correlation with Section 426-27. This language meets the intent of requiring an "approved means" for grounding the heated section of the equipment covered by this article. Leaves the specific requirement to the certified approval agency and relevant national standard(s) for the equipment. Materials other than "metal" can provide an effective ground path to operate the required equipment protection. New conductive materials or combinations of conductive materials and metallic grounding conductors can be used in place of metal braid or sheaths to provide a low impedance ground path sufficient to operate the equipment protection device. This can be accomplished while maintaining 100 percent coverage of the heating device.
The code should not restrict technological innovation, provided the intended safety of the system is maintained.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provides no substantiation for deletion of requirements in parts (a) and (b) of 427-23. The existing language in 427-23 meets the panel's intent for providing an effective ground path for equipment protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #2116)

12- 10 - (427-27): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise the second paragraph to read:
"Where ground-fault circuit-interrupter protection for personnel is provided, the voltage shall ~~be permitted to~~ not be greater ~~than 30 but not more~~ than 80 volts."
SUBSTANTIATION: This revision will clarify some misunderstanding, GFCI protection may be provided for any voltage less than 80 volts.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation with regard to a problem with the present language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #895)

12- 11 - (427-47): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete this section.
SUBSTANTIATION: Editorial. The provisions of Section 300-20 already do not apply due to Exception No. 2 for Section 300-20(a).
PANEL ACTION: Reject.
PANEL STATEMENT: The current language is necessary because it is a modification of a general rule and should be located in the specific article. The submitter has not provided any substantiation with regard to a problem with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #323)

12- 12 - (427-58 (New)): Reject
SUBMITTER: Julius M. Marsh, Specialty Supply Co.
RECOMMENDATION: Add a paragraph dealing with the sheath temp of electrical heat tracing for pipelines in classified locations.
SUBSTANTIATION: The public needs more specific guidance on the application of electrical heat tracing on pipelines and vessels particularly in classified (hazardous) locations and specifically the issue of sheath temp. Also address the question of whether or not heat tracing is considered to be exposed if covered by insulation on the pipeline.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided specific recommendations for changes to the Code in accordance with the NFPA Regulations Governing Committee Projects, 4-3.3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #324)

12- 13 - (427-59 (New)): Reject
SUBMITTER: Julius M. Marsh, Specialty Supply Co.
RECOMMENDATION: It shall be permitted to provide ground fault alarm indication on entire panelboards rather than individual branch circuits in industrial establishments where conditions of maintenance and supervision ensure only qualified persons will service the system.
SUBSTANTIATION: Ground fault branch circuit breakers for 250V or less circuits are readily available and reasonably economical. GF branch breakers for circuits over 250V are not economical nor are they readily available. The cost of providing GF breakers on circuits over 250V is very unreasonable and impractical.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no requirement for ground fault alarm indication on individual branch circuits in the current Code. The submitter's concerns are addressed in 427-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

ARTICLE 430 — MOTORS, MOTOR CIRCUITS, AND CONTROLLERS

(Log #552)

11- 3 - (430): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 430-7(a)(12), replace "7 in. (178 mm)" with "175 mm (7 in.)".
2. In Section 430-9(c), replace "7 lb-in. (0.79 N•m)" with "0.8 N•m (7 lb-in.)".
3. In Section 430-28(1), replace "10 ft (3.05 m)" with "3.0 m (10 ft)".
4. In Section 430-28(2), replace "25 ft. (7.62 m)" with "7.5 m (25 ft.)".
5. In Section 430-28 Exception, replace "25 ft. (7.62 m)" with "7.5 m (25 ft)" in two locations.
6. In Section 430-28 Exception, replace "35 ft. (10.67 m)" with "11

m (35 ft.)".
7. In Section 430-28 Exception, replace "100 ft. (30.5 m)" with "30 m (100 ft.)".
8. In Section 430-28 Exception (g), replace "30 ft. (9.14 m)" with "9.0 m (30 ft.)".
9. In Section 430-53(d)(2), replace "25 ft. (7.62 m)" with "7.5 m (25 ft.)".
10. In Section 430-123, replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".
11. In Section 430-132 (3), replace "8 ft. (2.44 m)" with "2.5 m (8 ft.)".
12. In Section 430-145 (b), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".
13. In Section 430-145 (b), In the first Paragraph, replace "3/8 in." with "Metric Designator 12 (Trade size 3/8)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1081)

11- 4 - (430): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 430 as follows:
430-9(c) - change "No. 14" to "14 AWG"
430-22(c) - change "No. 14" to "14 AWG" and "No. 18" to "18 AWG"
430-28(e) - change "No. 6 copper or No. 4 aluminum" to "6 AWG copper or 4 AWG aluminum"
430-145(b), 3rd paragraph - change "No. 10" to "10 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1101)

11- 4a - (430 and 440): Accept
SUBMITTER: CMP 11
RECOMMENDATION: 1. In 430-7(b), add headings to (1) - (5), as follows:
(1) Multispeed Motors.
(2) Single-Speed Motors.
(3) Dual Voltage Motors.
(4) 50/60 Hz Motors.
(5) Part-Winding Motors.
2. In 430-7(d), add headings to (1) and (2), as follows:
(1) Factory-Wired.
(2) Not Factory-Wired.
3. In Section 430-32(a), add headings to (1) - (4), as follows:
(1) Separate Overload Device.
(2) Thermal Protector.
(3) Integral With Motor.
(4) Larger Than 1500 Horsepower.
4. In 430-32(b), add headings to (1) and (2), as follows:
(1) Within Sight From Controller.
(2) Not Within Sight From Controller.
5. In 430-32(c), add headings to (1) - (4), as follows:
(1) Separate Overload Device.
(2) Thermal Protector.
(3) Integral With Motor.
(4) Impedance-Protected.
6. In 430-52(c), add headings to (1) - (7), as follows:
(1) In Accordance With Table 430-152.
(2) Overload Relay Table.
(3) Instantaneous Trip Circuit Breaker.
(4) Multispeed Motor.
(5) Power Electronic Devices.
(6) Self-Protected Combination Controller.
(7) Motor Short-Circuit Protector.
7. In 430-72(b), add headings to (1) and (2), as follows:
(1) Separate Overcurrent Protection.
(2) Branch Circuit Overcurrent Protective Device.
8. In 430-72(c), add headings to (1) - (5), as follows:
(1) Compliance With Article 725.
(2) Compliance With Article 450.
(3) Less Than 50 Volt-Amperes.
(4) Primary Less Than 2 Amperes.
(5) Other Means.
9. In 430-83(a), add headings to (1) and (2), as follows:
(1) Horsepower Ratings.
(2) Circuit Breaker.
10. In 430-109(a), add headings (1) - (6), as follows:
(1) Motor Circuit Switch.
(2) Molded Case Circuit Breaker.
(3) Molded Case Switch.
(4) Instantaneous Trip Circuit Breaker.
(5) Self-Protected Combination Controller.
(6) Manual Motor Controller.
11. In 430-125(b), add headings to (1) - (4), as follows:
(1) Type of Overload Device.
(2) Wound-Rotor ac Motors.
(3) Operation.
(4) Automatic Reset.
12. In 430-125(c), add headings to (1), (2) and (3) as follows:
(1) Type of Protection.
(2) Reclosing.
(3) Combination Protection.
Also, 430-125(c)(1), make the first statements in (a) and (b) headings (titles).
13. In 440-12(a), add headings to (1) and (2) as follows:
(1) Ampere Rating.
(2) Equivalent Horsepower.
14. In 440-12(b), add headings to (1) and (2), as follows:
(1) Horsepower Rating.
(2) Full-Load Current Equivalent.
15. In 440-22(b), add headings to (1) and (2), as follows:
(1) Motor-Compressor Largest Load.
(2) Motor-Compressor Not Largest Load.
SUBSTANTIATION: The proposed revisions are intended to comply with the NEC Style Manual, 2.1.5, with respect to headings.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2602)

11- 5 - (430): Reject
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise 430 to read as follows:
430-52. Rating or Setting for Individual Motor Circuit.
(a) General. The motor branch-circuit short-circuit and ground-fault protective device shall comply with (b) and either (c) or (d), as applicable.
(b) All Motors. The motor branch-circuit short-circuit and ground-fault protective device shall be capable of carrying the starting current of the motor.
(c) Rating or Setting.
1. A protective device that has a rating or setting not exceeding the value calculated according to the values given in Table 430-52 shall be used.

**Table 430-52. Maximum Rating or Setting of Motor Branch-Circuit Short-Circuit and Ground-Fault Protective Devices

Type of Motor	Percentage of Full-Load Current			
	Nontime Delay Fuse	Duel Element (Time-Delay Fuse)1	Instantaneous Trip Breaker	Inverse Time Breaker2
Single-phase motors	300	175	800	250
AC polyphase motors other than wound-rotor				
Squirrel cage—				
Other than Design E	300	175	800	250
Design E	300	175	1100	250
Synchronous3	300	175	800	250
Wound rotor	150	150	800	150
Direct current (constant voltage	150	150	250	150

Note: For certain exceptions to the values specified, see Sections 430-52 through 430-54.
1 The values in the Nontime Delay Fuse column apply to Time-Delay Class CC fuses.
2 The values given in the last column also cover the ratings of nonadjustable inverse time types of circuit breakers that may be modified as in Section 430-52.
3 Synchronous motors of the low-torque, low-speed type (usually 450 rpm or lower), such as are used to drive reciprocating compressors, pumps, etc., that start unloaded, do not require a fuse rating or circuit-breaker setting in excess of 200 percent of full-load current.**

Exception No. 1: Where the values for branch-circuit short-circuit and ground-fault protective devices determined by Table 430-52 do not correspond to the standard sizes or ratings of fuses, nonadjustable circuit breakers, thermal protective devices, or possible settings of adjustable circuit breakers, the next higher standard size, rating, or possible setting shall be permitted.

Exception No. 2: Where the rating specified in Table 430-52, as modified by Exception No. 1, is not sufficient for the starting current of the motor:

(a) The rating of a nontime-delay fuse not exceeding 600 amperes or a time-delay Class CC fuse shall be permitted to be increased but shall in no case exceed 400 percent of the full-load current.

(b) The rating of a time-delay (dual-element) fuse shall be permitted to be increased but shall in no case exceed 225 percent of the full-load current.

(c) The rating of an inverse time circuit breaker shall be permitted to be increased but shall in no case exceed 400 percent for full-load currents of 100 amperes or less or 300 percent for full-load currents greater than 100 amperes.

(d) The rating of a fuse of 601-6000 ampere classification shall be permitted to be increased but shall in no case exceed 300 percent of the full-load current.

FPN: See Appendix D, Example No. D8, and Figure 430-1.

2. Where maximum branch-circuit short-circuit and ground-fault protective device ratings are shown in the manufacturer's overload relay table for use with a motor controller or are otherwise marked on the equipment, they shall not be exceeded even if higher values are allowed as shown above.

3. An instantaneous trip circuit breaker shall be used only if adjustable and if part of a listed combination motor controller having coordinated motor overload and short-circuit and ground-fault protection in each conductor, and the setting is adjusted to no more than the value specified in Table 430-52.

FPN: For the purpose of this article, instantaneous-trip circuit breakers may include a damping means to accommodate a transient motor inrush current without nuisance tripping of the circuit breaker.

Exception No. 1: Where the setting specified in Table 430-52 is not sufficient for the starting current of the motor, the setting of an instantaneous trip circuit breaker shall be permitted to be increased but shall in no case exceed 1300 percent of the motor full-load current for other than Design E motors or Design B energy efficient motors and no more than 1700 percent of full-load motor current for Design E motors or Design B energy efficient motors. Trip settings above 800 percent for other than Design E motors or Design B energy efficient motors and above 1100 percent for Design E motors or Design B energy efficient motors shall be permitted where the need has been demonstrated by engineering evaluation. In such cases, it shall not be necessary to first apply an instantaneous-trip circuit breaker at 800 percent or 1100 percent.

FPN: For additional information on the requirements for a motor to be classified "energy efficient," see Motors and Generators, NEMA Standards Publication No. MG1-1993, Revision 1, Part 12.59.

Exception No. 2: Where the motor full-load current is 8 amperes or less, the setting of the instantaneous-trip circuit breaker with a continuous current rating of 15 amperes or less in a listed combination motor controller that provides coordinated motor branch-circuit overload and short-circuit and ground-fault protection shall be permitted to be increased to the value marked on the controller.

4. For a multispeed motor, a single short-circuit and ground-fault protective device shall be permitted for two or more windings of the motor, provided the rating of the protective device does not exceed the above applicable percentage of the nameplate rating of the smallest winding protected.

Exception: For a multispeed motor, a single short-circuit and ground-fault protective device shall be permitted to be used and sized according to the full-load current of the highest current winding, where all of the following conditions are met.

(a) Each winding is equipped with individual overload protection sized according to its full-load current.

(b) The branch-circuit conductors supplying each winding are sized according to the full-load current of the highest full-load current winding.

(c) The controller for each winding has a horsepower rating not less than that required for the winding having the highest horsepower rating.

5. Suitable fuses shall be permitted in lieu of devices listed in Table 430-52 for power electronic devices in a solid state motor controller system provided that the marking for replacement fuses is provided adjacent to the fuses.

6. A listed self-protected combination controller shall be permitted in lieu of the devices specified in Table 430-52. Adjustable instantaneous-trip settings shall not exceed 1300 percent of full-load motor current for other than Design E motors or Design B energy efficient motors and not more than 1700 percent of full-load motor current for Design E motors or Design B energy efficient motors.

7. A motor short-circuit protector shall be permitted in lieu of devices listed in Table 430-52 if the motor short-circuit protector is part of a listed combination motor controller having coordinated motor overload protection and short-circuit and ground-fault protection in each conductor and it will open the circuit at currents exceeding 1300 percent of motor full-load current for other than Design E motors or Design B energy efficient motors and 1700 percent of motor full-load motor current for Design E motors or Design B energy efficient motors.

(d) Torque Motors. Torque motor branch circuits shall be protected at the motor nameplate current rating in accordance with Section 240-3(b).

430-53. Several Motors or Loads on One Branch Circuit. Two or more motors or one or more motors and other loads shall be permitted to be connected to the same branch circuit under conditions specified in (d) and in (a), (b), or (c).

(a) Not Over 1 Horsepower. Several motors, each not exceeding 1 hp in rating, shall be permitted on a nominal 120-volt branch circuit protected at not over 20 amperes or a branch circuit of 600 volts, nominal, or less, protected at not over 15 amperes, if all of the following conditions are met.

1. The full-load rating of each motor does not exceed 6 amperes.
2. The rating of the branch-circuit short-circuit and ground-fault protective device marked on any of the controllers is not exceeded.
3. Individual overload protection conforms to Section 430-32.

(b) If Smallest Rated Motor Protected. If the branch-circuit short-circuit and ground-fault protective device is selected not to exceed that allowed by Section 430-52 for the smallest rated motor, two or more motors or one or more motors and other load(s), with each motor having individual overload protection, shall be permitted to be connected to a branch circuit where it can be determined that the branch-circuit short-circuit and ground-fault protective device will not open under the most severe normal conditions of service that might be encountered.

(c) Other Group Installations. Two or more motors of any rating or one or more motors and other load(s), with each motor having individual overload protection, shall be permitted to be connected to one branch circuit where the motor controller(s) and overload device(s) are (1) installed as a listed factory assembly and the motor branch-circuit short-circuit and ground-fault protective device is either provided as part of the assembly or is specified by a marking on the assembly, or (2) the motor branch-circuit short-circuit and ground-fault protective device, the motor controller(s), and overload device(s) are field-installed as separate assemblies listed for such use and provided with manufacturers' instructions for use with each other, and (3) all of the following conditions are complied with.

1. Each motor overload device is listed for group installation with a specified maximum rating of fuse or inverse time circuit breaker, or both.
2. Each motor controller is listed for group installation with a specified maximum rating of fuse or circuit breaker, or both.
3. Each circuit breaker is one of the inverse time type and listed for group installation.
4. The branch circuit shall be protected by fuses or inverse time circuit breakers having a rating not exceeding that specified in Section 430-52 for the highest rated motor connected to the branch circuit plus an amount equal to the sum of the full-load current ratings of all other motors and the ratings of other loads connected to the circuit. Where this calculation results in a rating less than the ampacity of the supply conductors, it shall be permitted to increase the maximum rating of the fuses or circuit breaker to a value not exceeding that permitted by Section 240-3(b).
5. The branch-circuit fuses or inverse time circuit breakers are not larger than allowed by Section 430-40 for the overload relay protecting the smallest rated motor of the group.

FPN: See Section 110-10 for circuit impedance and other characteristics.

(d) Single Motor Taps. For group installations described above, the conductors of any tap supplying a single motor shall not be required to have individual branch-circuit short-circuit and ground-fault protective device, provided they comply with either of the following.

1. No conductor to the motor shall have an ampacity less than that of the branch-circuit conductors.
2. No. conductor to the motor shall have an ampacity less than one-third that of the branch-circuit conductors, with a minimum in accordance with Section 430-22; the conductors to the motor overload device being not more than 25 ft (7.62 m) long and being protected from physical damage.

430-54. Multimotor and Combination-Load Equipment. The rating of the branch-circuit short-circuit and ground-fault protective device for multimotor and combination-load equipment shall not exceed the rating marked on the equipment in accordance with Section 430-7(d).

430-55. Combined Overcurrent Protection. Motor branch-circuit short-circuit and ground-fault protection and motor overload protection shall be permitted to be combined in a single protective device where the rating or setting of the device provides the overload protection specified in Section 430-32.

430-56. Branch-Circuit Protective Devices—In Which Conductor Branch-circuit protective devices shall comply with the provisions of Section 240-20.

430-57. Size of Fuseholder. Where fuses are used for motor branch-circuit short-circuit and ground-fault protection, the fuseholders shall not be of a smaller size than required to accommodate the fuses specified by Table 430-52.

Exception: Where fuses having time delay appropriate for the starting characteristics of the motor are used, it shall be permitted to use fuseholders sized to fit the fuses that are used.

430-58. Rating of Circuit Breaker. A circuit breaker for motor branch-circuit short-circuit and ground-fault protection shall have a current rating in accordance with Sections 430-52 and 430-110.

E. Motor Feeder Short-Circuit and Ground-Fault Protections

430-61. General. Part E specifies protective devices intended to protect feeder conductors supplying motors against overcurrents due to short circuits or grounds.

FPN: See Appendix D, Example No. D8.

430-62. Rating or Setting—Motor Load.

(a) Specific Load. A feeder supplying a specific fixed motor load(s) and consisting of conductor sizes based on Section 430-24 shall be provided with a protective device having a rating or setting not greater than the largest rating or setting of the branch-circuit short-circuit and ground-fault protective device for any motor supplied by the feeder [based on the maximum permitted value for the specific type of a protective device shown in Table 430-52, or Section 440-22(a) for hermetic refrigerant motor-compressors], plus the sum of the full-load currents of the other motors of the group. Where the same rating or setting of the branch-circuit short-circuit and ground-fault protective device is used on two or more of the branch circuits supplied by the feeder, one of the protective devices shall be considered the largest for the above calculations.

Exception: Where one or more instantaneous trip circuit breakers or motor short-circuit protectors are used for motor branch-circuit short-circuit and ground-fault protection as permitted in Section 430-52(c), the procedure provided above for determining the maximum rating of the feeder protective device shall apply with the following provision. For the purpose of the calculation, each instantaneous trip circuit breaker or motor short-circuit protector shall be assumed to have a rating not exceeding the maximum percentage of motor full-load current permitted by Table 430-52 for the type of feeder protective device employed.

FPN: See Appendix D, Example No. D8.

(b) Other Installations. Where feeder conductors have an ampacity greater than required by Section 430-24, the rating or setting of the feeder overcurrent protective device shall be permitted to be based on the ampacity of the feeder conductors.

**Relocating and changing Table 430-152 to Code Section 430-52 and changing table to 430-52.

SUBSTANTIATION: 1. To put all percentages together, and under the same section.

2. Will make looking up percentage chart easier.

PANEL ACTION: Reject.

PANEL STATEMENT: Table 430-152 is now referenced in 11 places in Article 430, from page 267 through page 270 (430-52, 430-57, and 430-62) and the proposed revision includes the same number and locations of references to the table. Relocating the table to 430-52 does not make it easier to look up. The proposal does not make the necessary changes in the table to correlate with the proposed change to become Table 430-52.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

GARVEY: Of the 11 places Table 430-152 is referenced, all but three are within 430-52. The Panel's Action to accept Proposal 11-48 effectively makes two of the three redundant. This leaves one minor reference to sizing fuseholders in 430-57. Since the majority of the references to the Table are found in 430-52, Section 430-52 is where the Table belongs.

(Log #CP1102)

11- 5a - (FPN Figure 430-1): Accept

SUBMITTER: CMP 11

RECOMMENDATION: Add caption to Fine Print Note Figure 430-1, as follows:

"Article 430 Contents"

SUBSTANTIATION: The addition of a caption is intended to comply with NEC Style Manual 2.3.1.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2866)

11- 6 - (430-2): Reject
SUBMITTER: David R. Petrozza, Steel City Inspection Agency
RECOMMENDATION: Revise text to read as follows:

430-2 Adjustable-Speed Drive Systems. The incoming branch circuit or feeder to power conversion equipment included as part of an adjustable-speed drive system shall be based on the rated input to the power conversion equipment. ~~Where the power conversion equipment is marked to indicate that overload protection is included, additional overload protection shall not be required.~~ Appropriate devices shall be provided to detect and automatically de-energize the supplied motor or provide an adequate alarm if there is any increase in temperature of the motor beyond design limits.

The disconnecting means shall be permitted to be in the incoming line to the conversion equipment and shall have a rating not less than 115 percent of the rated input current of the conversion equipment.

SUBSTANTIATION: Adjustable speed drives provide overload protection by a factory installed programmed thermal model of the motor. While this may be satisfactory for mechanical overloads it will not detect excessive heating that will occur when the motor is operated at 50 percent base speed or less. A motor operated by a constant torque pulse width modulated drive will draw full load amperes at as low as 20 percent base speed. Due to the fact that the armature mounted fan is running slower at reduced speeds this will result in dangerous over heating of the motor that will not be detected by the drive programmed overload.

Compliance with the above proposed code change could be as easy as wiring a thermal protector integral with the motor into the start permissive of the drive.

PANEL ACTION: Reject.
PANEL STATEMENT: No evidence of a field problem has been supplied. Drive systems are manufactured and listed to specific industry standards that address motor overheating conditions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4385)

11- 7 - (430-6(a)(1)): Reject

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting relative to the Style Manual. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Add the following text:

The nameplate rating shall be used when it is greater than the table value.

SUBSTANTIATION: Where a motor such as one used for a special purpose is installed, the circuit components should be sized sufficient for the connected motor when it exceeds the table value.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concern is already covered by Tables 430-148 through 430-150.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GARVEY: There are references to special purpose motors in the Tables 148, 149, and 150. All three references say essentially the same thing. "Motors built for low speeds or high torques may require more running current, and multispeed motors will have full-load current varying with speed. In these cases, the nameplate current rating shall be used." Placing this mandatory language once in the general rule, 430-6(a)(1) enhances usability. The NEC style manual Section 2.3 suggest that tables consist of a brief title followed by the data with any accompanying Notes. Mandatory requirements are easier to find if found within the text of the general rules.

(Log #3827)

11- 8 - (430-7(a)(1) through (4)): Reject
SUBMITTER: Nico Santana, Riviera Electric
RECOMMENDATION: Delete Section 430-7(a) 1 through 4.
SUBSTANTIATION: This section has much to do with NEMA/ANSI/IEEE, and little to do with what a field electrician has control over. In the interest of brevity and clarity, and controlling the content of an increasingly complex tool, please consider placing this information where it belongs - with the manufacturer's publications.
PANEL ACTION: Reject.
PANEL STATEMENT: Many motors are not designed or manufactured to NEMA standards. The marking under (a)(1) is needed on the motor so the installer/user of the motor can determine where to go for the manufacturer's publication. The markings under (a)(2), (3), and (4) are needed to determine compliance with other requirements in Article 430.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1834)

11- 9 - (430-10(a), FPN): Reject
SUBMITTER: Timothy L. Shank, City of Orlando, FL
RECOMMENDATION: Add "and 380-9(b)" after 373-8, and change "Section" to "Sections."
SUBSTANTIATION: Calls attention to another rule that covers the same situation. Will make the NEC more user friendly.
PANEL ACTION: Reject.
PANEL STATEMENT: The material contained in 380-3(b) is duplicative to 373-8, and, as such, does not add any new requirements. It is assumed the proposal should have referred to 380-3(b), rather than 380-9(b), which has no relevance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #553)

11- 10 - (Table 430-10(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical
RECOMMENDATION: Revise Table 430-10(b) Minimum Wire-Bending Space at the Terminals of Enclosed Motor Controllers as follows, to add the metric values.

Table 430-10(b) Minimum Wire-Bending Space at the Enclosed Motor Controllers

Size of Wire (AWG or kcmil)	Wires per Terminal*		
	1		
	mm	in.	mm
14–10	Not specified		
8–6	38	1 1/2	
4–3	50	2	
2	65	2 1/2	
1	75	3	
1/0	125	5	12
2/0	150	6	15
3/0–4/0	175	7	17
250	200	8	20
300	250	10	25
350–500	300	12	30
600–700	350	14	40
750–900	450	18	47

*Where provision for three or more wires per terminal exists, the mi shall be in accordance with the requirements of Article 373.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4461)

11- 11 - (430-12): Reject
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
RECOMMENDATION: Delete entire section and tables.
SUBSTANTIATION: This material addresses a factory standard, not field selection, construction, or installation. With the Code as lengthy as it is, such material should be left to ANSI and NRTLs, and addressed by Sections 110-2 and 110-3.
PANEL ACTION: Reject.
PANEL STATEMENT: Most general use motors are not listed by testing laboratories. The provisions of this section are necessary to require constructions that can be safely installed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3959)

11- 12 - (430-12(a)): Reject
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: (A companion proposal was submitted for Section 430-31).
Add a new sentence to the end of existing paragraph 1 (after the word "apparatus") as follows:
Protection against 3-phase motor overheating caused by phase loss, phase reversal and system voltage unbalance shall be provided for circuits supplying stationary 3-phase motors for driving processes or other machinery types as opposed to portable motor-driven equipment. This protection shall be permitted with the installation of voltage sensing devices that open all three poles simultaneously of the motor supply circuit disconnect.
SUBSTANTIATION:
Regardless of the cause, whether it be mechanical overloads or one of the three abnormal operating conditions referred to in the Proposal, the resulting overcurrents produce excessive heating in the motor windings, creating the potential for equipment damage, fire, and other safety concerns. Voltage sensing devices (relays) are commonly installed for the purpose of tripping a circuit breaker or an electrically ganged operated switch upon detection of voltage decrease below a set threshold or loss of voltage indicating a loss of phase or unbalance between phases supplying stationary motor-driven processes.
Throughout the United States, users of 3-phase motors, especially the new high-efficiency "E" motors, are experiencing motor damage caused by phase loss, phase reversal, and system voltage unbalance. For instance, a July 4, 1995 lightning storm caused a New York State utility's customer's three-phase motor to single phase, which resulted in a fire. Upon loss of three-phase power, the 10 horsepower, three-phase 120/208-volt motor, which drove the exhaust fan on an unmanned furnace, stopped exhausting the furnace gases. As a result, the furnace overheated, spreading fire to the remainder of the plant. If the exhaust motor had single phase protection with alarm annunciation, the customer could have avoided this fire. This incident is presently under litigation for damages in New York State.
The existing requirements for overload (operating overcurrent) protection are not adequate to protect 3-phase motors against overheating under these operating conditions. The electrical industry has recognized and acknowleged this problem in the publication of technical papers. The electric utilities are very familiar with the problem due to numerous customer complaints and damage claims. These are abnormal operating conditions caused by things such as auto accidents, storms, customer load switching, and human error. In the majority of cases, the electric utilities have no control over the causes, and cannot provide adequate protection against damage to customer equipment. Utility Tariffs and Filed Rules require customers to protect their equipment for these conditions. However, there is presently no clear and specific Code requirement to support this need.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal would require a redundant level of protection that is not necessary, but allowed as a design consideration. It is assumed the proposal should have referred to 430-125(a), rather than 430-12(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1EXPLANATION OF NEGATIVE:
THOMAS: While the Panel feels that the current requirements in Article 430 provide adequate motor protection, there continues to be motor failures, which result in claims and litigation. Additional technical documentation with specific proposals could possibly identify steps to mitigate these motor failures.
COMMENT ON AFFIRMATIVE:
HAMER: API supports the Panel Action to reject this proposal.

(Log #554)

11- 13 - (Table 430-12(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 430-12(b) as follows to add the metric values, and delete the note regarding unit conversions.
(Table shown on following page)
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement. A "soft" conversion is necessary to conform to industry practice.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

Table 430-12(b) Terminal Housings — Wire-to-Wire Connections
Motors ~~11 in.~~ 275 mm (11 in.) in Diameter or Less

Horsepower	Cover Opening Minimum Dimension mm	in.	Usable Volume Minimum cm^3	$in.^3$
1 and smaller[a]	41	1 5/8	170	10.5
1 1/2, 2 and 3[b]	45	1 3/4	275	16.8
5 and 7 1/2	50	2	365	22.4
10 and 15	65	2 1/2	595	36.4

Motors Over ~~11 in.~~ 275 mm (11 in.) in Diameter Alternating-Current Motors

Maximum Full Load Current for 3-Phase Motors with Maximum of 12 Leads (Amperes)	Terminal Box Cover Opening Minimum Dimension mm	in.	Usable Volume Minimum cm^3	$in.^3$	Typical Maximum Horsepower 3-Phase 230 Volt	460 Volt
45	65	2.5	595	36.4	15	30
70	84	3.3	1265	77	25	50
110	100	4.0	2295	140	40	75
160	125	5.0	4135	252	60	125
250	150	6.0	7380	450	100	200
400	175	7.0	13775	840	150	300
600	200	8.0	25255	1540	250	500

Direct-Current Motors

Maximum Full-Load Current for Motors with Maximum of Six Leads (Amperes)	Terminal Box Minimum Dimensions mm	in.	Usable Volume Minimum cm^3	$in.^3$
68	65	2.5	425	26
105	84	3.3	900	55
165	100	4.0	1640	100
240	125	5.0	2950	180
375	150	6.0	5410	330
600	175	7.0	9840	600
900	200	8.0	18040	1100

Notes:
~~1. For SI units, 1 in. = 25.4 mm.~~
~~2.~~ Auxiliary leads for such items as brakes, thermostats, space heaters, exciting field, etc. shall be permitted to be neglected if their current-carrying area does not exceed 25 percent of the current-carrying area of the machine power leads.
[a]For motors rated 1 hp and smaller and with the terminal housing partically or wholly integral with the frame or end shield, the volume of the terminal housing shall not be less than ~~1.1 in.3~~ 18.0 cm^3 (1.1 $in.^3$) per wire-to-wire connection. The minimum cover opening dimensions is not specified.
[b]For motors rated 1 1/2, 2, and 3 hp and with the terminal housing partially or wholly integral with the frame or end shield, the volume of the terminal housing shall not be less than ~~1.4 in.3~~ 23.0 cm^3 (1.4 $in.^3$) per wire-to-wire connections. The minimum cover opening dimension is not specified.

(Log #555)

11- 14 - (Table 430-12(c)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 430-12(c)(1) to add metric values and delete the note regarding unit conversions.

Table 430-12(c)(1). Terminal Spacings – Fixed Terminals

Nominal Volts	Minimum Spacing (in.) Between Line Terminals mm.	in.	Between Line Terminals and Other Uninsulted Metal Parts mm	in.
240 or less	6	1/4	6	1/4
over 250–600	10	3/8	10	3/8

~~Note: For SI units, 1 in. = 25.4 mm.~~

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #556)

11- 15 - (Table 430-12(c)(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 430-12(c)(2) to add the metric values and delete the note regarding unit conversions.

Table 430-12(c)(2). Usable Volume – Fixed Terminals

Power-Supply Conductor Size AWG	Minimum Usable Volume per Power-Supply Conductor	
	cm^3	$in.^3$
14	16	1
12 and 10	20	1 1/4
8 and 6	37	2 1/4

~~Note: For SI units, 1 in. = 25.44 mm~~

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #896)

11- 16 - (430-14(a)): Accept
Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Ventilation and Maintenance. Except for submersible types, ~~Motors~~ motors shall be located so that adequate ventilation is provided, and so that maintenance, such as lubrication of bearings and replacing of brushes, can be readily accomplished.
SUBSTANTIATION: Editorial. Article 100 definition of ventilated indicates a circulation of air is required. While it is self-evident that submersible motors are not ventilated, a rule that literally applies but is not reasonable invites ridicule of the code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GARVEY: The Panel should accept only the principle of the submitter's suggestion. The proposed text conflicts with the NEC style manual, Section 2.6.1. Exceptions should follow the general rule. There are two issues addressed in 430-14(a), dissipation of heat to maintain the motor within the rated temperature rise and location of the motor to provide for maintenance. The Panel should consider separating these issues into two subsections, one section on "Cooling" or "Heat Dissipation" and the second section on "Location".

(Log #2467)

11- 17 - (430-17): Reject
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Add new sentence:
Where two or more motors have the same rated full load current only one of them shall be considered as the highest rated (largest) motor.
SUBSTANTIATION: This was taken from Section 440-7 and will make 430-17 clear.
PANEL ACTION: Reject.
PANEL STATEMENT: The section is clear as written. The submitter has provided no documentation of problems in the field.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #897)

11- 18 - (430-21): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence:
Part B specifies ~~sizes~~ ampacities of conductors capable of carrying the motor current without overheating under the conditions specified.
SUBSTANTIATION: Editorial. Part B specifies ampacities, not sizes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4331)

11- 19 - (430-21): Accept in Principle
SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services
RECOMMENDATION: Add a second sentence to read as follows:
For motors with design letters B, C, D, or E, conductors having an insulation rating of 75°C (167°F) or higher shall be permitted to be used provided the ampacity of such conductors does not exceed the 75°C (167°F) ampacity.
SUBSTANTIATION: To correlate with the requirements of Section 110-14(c)(1)(d). This section addresses motor circuit conductors and should be mentioned in Article 430 to eliminate misapplication of code requirements, and make the Code more user friendly.
PANEL ACTION: Accept in Principle.
In FPN No. 2 change "Section 430-9(b)" to "110-14(c) and 430-9(b)".
PANEL STATEMENT: Section 110-14(c) is generally applicable to motor circuit conductor terminations and Section 110-14(c)(1)(d) specifically covers motor circuit conductor terminations. The panel action should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1103)

11- 19a - (430-21, FPN No. 3 (New)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: In the second sentence, delete "See Part K" and add FPN No. 3, as follows:
"FPN No. 3: For over 600 volts, nominal, see Part K."
SUBSTANTIATION: The revision is intended to comply with the NEC Style Manual, 3.1, with respect to explanatory information.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3096)

11- 20 - (430-22): Accept in Principle

Note: The Technical Correlating Committee notes that the Panel Statement indicates that the FPN was deleted, however, the Panel Action still includes the FPN following Exception No. 2.

The Technical Correlating Committee directs the panel clarify the Panel Action and Panel Statement on this Proposal. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)

RECOMMENDATION: Revise as follows:

Single Motor

Relocate and renumber existing second paragraph as paragraph (b). Relocate and renumber existing third paragraph as paragraph (c). Add a new paragraph (d) as shown by underlined text. Renumber existing paragraphs (b) and (c) as (e) and (f), respectively. Relocated/renumbered and new text are as follows:

(a) General. Branch-circuit conductors that supply a single motor used in a continuous duty application shall have an ampacity of not less than 125 percent of the motor's full-load current rating as determined by Section 430-6(a)(1).

Exception No. 1: For dc motors operating from a rectified single-phase power supply, the conductors between the field wiring terminals of the rectifer and the motor shall have an ampacity of not less than the following percent of the motor full-load current rating:

a. Where a rectifier bridge of the single-phase half-wave type is used, 190 percent

b. Where a rectifier bridge of the single-phase full-wave type is used, 150 percent

Exception No. 2: Circuit conductors supplying power conversion equipment included as part of an adjustable-speed drive system shall have an ampacity not less than 125 percent of the rated input to the power conversion equipment.

b) For a multispeed motor, the selection of branch-circuit conductors on the line side of the controller shall be based on the highest of the full-load current ratings shown on the motor nameplate. The selection of branch-circuit conductors between the controller and the motor shall be based on the current rating of the winding(s) that the conductors energize.

(c) For a wye-start motor, the selection of branch-circuit conductors on the line side of the controller shall be based on the motor full-load current. The selection of conductors between the controller and the motor shall be based on 58 percent of the motor full-load current.

(d) For a part-winding connected motor, the selection of branch-circuit conductors on the line side of the controller shall be based on the motor full-load current. The selection of conductors between the controller and the motor shall be based on 50 percent of the motor full-load current.

FPN: See Appendix D, Example No. D8, and Figure 430-1.

SUBSTANTIATION: Information cannot be easily located and part-winding is not included. Users frequently consult with manufacturers for this information.

PANEL ACTION: Accept in Principle.

Revise as follows:

"Single Motor."

Relocate and renumber existing second paragraph as paragraph (b). Relocate and renumber existing third paragraph as paragraph (c). Add a new paragraph (d) as shown by underlined text. Renumber existing paragraphs (b) and (c) as (e) and (f), respectively. Delete the FPN. Relocated/renumbered and new text are as follows:

"(a) General. Branch-circuit conductors that supply a single motor used in a continuous duty application shall have an ampacity of not less than 125 percent of the motor's full-load current rating as determined by Section 430-6(a)(1).

Exception No. 1: For dc motors operating from a rectified single-phase power supply, the conductors between the field wiring terminals of the rectifer and the motor shall have an ampacity of not less than the following percent of the motor full-load current rating:

a. Where a rectifier bridge of the single-phase half-wave type is used, 190 percent

b. Where a rectifier bridge of the single-phase full-wave type is used, 150 percent

Exception No. 2: Circuit conductors supplying power conversion equipment included as part of an adjustable-speed drive system shall have an ampacity not less than 125 percent of the rated input to the power conversion equipment.

FPN: See Appendix D, Example No. D8, and Figure 430-1.

(b) Multi-speed Motor. For a multispeed motor, the selection of branch-circuit conductors on the line side of the controller shall be based on the highest of the full-load current ratings shown on the motor nameplate. The selection of branch-circuit conductors between the controller and the motor shall be based on the current rating of the winding(s) that the conductors energize.

(c) Wye-Start Delta-Run Motor. For a wye-start, delta-run connected motor, the selection of branch-circuit conductors on the line side of the controller shall be based on the motor full-load current. The selection of conductors between the controller and the motor shall be based on 58 percent of the motor full-load current.

(d) Part-Winding Motor. For a part-winding connected motor, the selection of branch-circuit conductors on the line side of the controller shall be based on the motor full-load current. The selection of conductors between the controller and the motor shall be based on 50 percent of the motor full-load current."

PANEL STATEMENT: The Panel action editorially corrects the proposal, and adds headings in accordance with the NEC Style Manual.

The FPN was deleted as it provides no substantive guidance.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2283)

11- 21 - (430-22 Exception No. 3 (New)): Reject

SUBMITTER: Terry L. Schneider, Regional Bldg Dept.

RECOMMENDATION: Add new text to read as follows:

"The full load current rating shall not exceed 15 amperes for No. 14, 20 amperes for No. 12, and 30 amperes for No. 10 copper, or 15 amperes for No. 12 and 25 amperes for No. 10 aluminum and copper-clad aluminum after any correction factors for ambient temperature and number of conductors have been applied."

SUBSTANTIATION: All other sections of the code limit actual load possible to the above values for small conductors, motor full load rating is not addressed, and starting current in many circumstances can cause conductor slap in the conduits, and presently allow 20 amp, motor on #14 THHN and 24 amp on 12 THHN. Conflicts with the rest of the standards in the code.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter apparently believes 240-3(d) is applicable to motor circuits. That is not correct. See 240-3(g).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #371)

11- 22 - (430-22(a)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add to second paragraph:

Where a continuous-duty motor is connected to a branch circuit by means of a field-installed flexible cord, attachment plug and receptacle, the flexible cord conductors shall have an ampacity of not less than 125 percent of the motor full-load current rating as determined by Section 430-6(a)(1).

SUBSTANTIATION: Since a cord with attachment plug is not generally considered as branch circuit conductors, the requirements of the first paragraph do not apply. Section 430-6 indicates required sizes and ampacities to be considered for cords, but this section applies the multiplier to such ampacities (ratings) and does not include cords which are technically not branch circuit conductors.

Permanently connected cords as permitted elsewhere in the code and used as branch circuit conductors are included. Factory-installed cords for listed equipment would be included in the proposal. The wording of (b) which is not limited to branch circuit conductors, covers a cord/plug connection for other than continuous-duty motors.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has provided no evidence that a problem exists in the field.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1154)

11- 23 - (430-22(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise text to read:
(b) Other than Continuous Duty. Branch-circuit conductors ~~Conductors~~ for a motor used in a short-time, intermittent, periodic, or varying duty application shall have an ampacity of not less than the percentage of the motor nameplate current rating shown in Table 430-22(b), unless the authority having jurisdiction grants special permission for conductors of lower ampacity. Service and feeder conductors that supply only a motor for duty-cycle service shall comply with this section.
SUBSTANTIATION: It appears reasonable to apply this section to service and feeder conductors that supply only such a motor as they see the same heating effect as the branch-circuit conductors. "Branch-circuit" is added as it appears the intent is not to apply this section to service or feeder conductors that supply other additional load. (See Sections 230-23(a), 230-31(a), 230-42(a), and 430-24.)
This proposal does not address how much additional load the service and feeder conductors should supply in order not to invoke additional ampacity for the table percentages above 125 percent. If the proposal is accepted perhaps the panel could address that.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are addressed by the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #898)

11- 24 - (430-24): Accept in Principle in Part
Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to references to entire articles. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Conductors supplying several motors, or a motor(s) and other load(s) shall have an ampacity not less than ~~at least equal to~~ the sum of the full-load current rating as determined by Section 430-6(a)(1) of all the motors, plus 25 percent of the highest rated motor of the group, plus 125 percent of the continuous load, plus the ampere rating of other loads determined in accordance with Article 220 and other applicable articles. (remainder unchanged).
SUBSTANTIATION: "Not less than" is proposed as a preferable phrase. The reference to Article 220 does not provide sufficient clarification since the loads, per se, are not increased, only conductor ampacities for continuous loads.
PANEL ACTION: Accept in Principle in Part.
Revise the first paragraph of 430-24 to read:
"Conductors supplying several motors, or a motor(s) and other load(s) shall have an ampacity not less than 125 percent of the full-load current rating of the highest rated motor plus the sum of the full-load current ratings of all the other motors in the group, as determined by 430-6(a), plus the ampacity required for the other loads determined in accordance with Article 220 and other applicable articles."
PANEL STATEMENT: The panel accepts the first proposed change. The second proposed change is inadequate to meet the submitter's intent. The increased minimum ampacity of conductors for some other loads is not limited to continuous loads, as defined in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2471)

11- 25 - (430-24): Accept in Principle
SUBMITTER: Andrew Schmid, Goldhorn Electrical Construction
RECOMMENDATION: Revise as follows:
430-24 . Several Motors or a Motor(s) and other load(s). Conductors supplying several motors, or a motor(s) and other load(s), shall have an ampacity at least equal to ~~the sum of the full load current rating as determined by Section 430-6(a)(1) of all the motors plus 25 percent of the highest rated motor in the group~~ 125 percent of the largest motors current, in addition to any other motor(s) current(s) in the group as determined by Section 430-6(a)(1) plus the ampere rating of the other loads determined in accordance with Article 220 and other applicable articles.
SUBSTANTIATION: While teaching the code to my students, it has come to my attention that they typically have a much easier time working with and applying 430-22 because of the way it is presented. However, they get confused and struggle when applying 430-24. The majority of these students feel the wording is a little hard to comprehend and apply. However, with the proposed change in wording, I feel the article will be more user friendly and will make this section easier for anyone using this code to apply.
PANEL ACTION: Accept in Principle.
See the panel action on Proposal 11-24.
PANEL STATEMENT: The panel action on Proposal 11-24 should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #899)

11- 26 - (430-28): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence:
Feeder tap conductors shall have an ampacity not less than that required by Part B and Part E, shall terminate in ~~a branch-circuit~~ an overcurrent protective device and, in addition, shall meet one of the following requirements:.
SUBSTANTIATION: Editorial. In the exception condition b. indicates the tap conductors may be a feeder. Reference to Part E and deletion of "branch-circuit" will correlate with the condition of tap conductors which are a feeder. By definition of feeder, tap conductors are included up to the final overcurrrent device.
PANEL ACTION: Reject.
PANEL STATEMENT: A branch circuit overcurrent device is not limited to branch circuits. It may also be used on feeders.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #908)

11- 27 - (430-28(3) and Exception No. 2 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete ~~(3) Have the same ampacity as the feeder conductors.~~
Add an exception to read as follows:
Exception No. 2: Feeder taps shall be permitted in accordance with Sections 240-21(b)(5) and 240-21(c)(4).
SUBSTANTIATION: Section 240-3(e) indicates conductors of the same ampacity of properly protected conductors to which they are tapped are not "tap conductors" and therefore are not feeder tap conductors covered in this section. The provisions of Sections 240-21(b)(5) and (c)(4) should also be suitable for motor tap conductors where the conductors have an ampacity not less than the motor overcurrent device they supply.
PANEL ACTION: Reject.
PANEL STATEMENT: The second paragraph of 240-3(e) applies only to Article 240. The changes proposed introduce confusion in lieu of the simple and accurate statement in the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1104)

11- 27a - (430-31and FPN No. 1 (New)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: 1. In fourth paragraph, delete "See Part K".
2. Add new FPN No. 1 after fourth paragraph to read as follows:
FPN No. 1: For over 600 volts, nominal, see Part K.
3. Existing FPN to become FPN No. 2.
SUBSTANTIATION: The revision is intended to comply with the NEC Style Manual, 3.1, with respect to explanatory information.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3958)

11- 28 - (430-31): Reject
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: Note: A companion proposal was submitted for Section 430-125(a).
Add a new sentence to the end of existing paragraph 2 (after the word "faults") as follows:
It does include protection against 3-phase motor overheating caused by phase loss, phase reversal and system voltage unbalance where voltage sensing devices are installed to open all three poles simultaneously of the motor supply circuit disconnect. This applies to stationary 3-phase motors for driving processes or other machinery types as opposed to portable motor-driven equipment."

SUBSTANTIATION: Regardless of the cause, whether it be mechanical overloads or one of the three abnormal operating conditions referred to in the Proposal, the resulting overcurrents produce excessive heating in the motor windings, creating the potential for equipment damage, fire, and other safety concerns. Voltage sensing devices (relays) are commonly installed for the purpose of tripping a circuit breaker or an electrically ganged operated switch upon detection of voltage decrease below a set threshold or loss of voltage indicating a loss of phase or unbalance between phases supplying stationary motor-driven processes.
Throughout the United States, users of 3-phase motors, especially the new high-efficiency "E" motors, are experiencing motor damage caused by phase loss, phase reversal, and system voltage unbalance. For instance, a July 4, 1995 lightning storm caused a New York State utility's customer's three-phase motor to single phase, which resulted in a fire. Upon loss of three-phase power, the 10 horsepower, three-phase 120/208-volt motor, which drove the exhaust fan on an unmanned furnace, stopped exhausting the furnace gases. As a result, the furnace overheated, spreading fire to the remainder of the plant. If the exhaust motor had single phase protection with alarm annunciation, the customer could have avoided this fire. This incident is presently under litigation for damages in New York State.
The existing requirements for overload (operating overcurrent) protection are not adequate to protect 3-phase motors against overheating under these operating conditions. The electrical industry has recognized and acknowleged this problem in the publication of technical papers. The electric utilities are very familiar with the problem due to numerous customer complaints and damage claims. These are abnormal operating conditions caused by things such as auto accidents, storms, customer load switching, and human error. In the majority of cases, the electric utilities have no control over the causes, and cannot provide adequate protection against damage to customer equipment. Utility Tariffs and Filed Rules require customers to protect their equipment for these conditions. However, there is presently no clear and specific Code requirement to support this need.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's recommendation would, if accepted, protect motors and motor circuits against phase loss, phase reversal, and system voltage imbalance simply by saying the motors and circuits are protected. If, in fact, there is a need for additional motor and motor circuit protection against the phenomena described, the submitter has not proposed a Code requirement that would meet the need. Further, no substantiation for exempting "portable motor-driven equipment" has been provided.
Meeting the requirements of Article 430 provides the intended level of protection against voltage imbalance, phase loss and phase reversal conditions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
THOMAS: See my Explanation of Negative Vote on Proposal 11-12.

(Log #3820)

11- 29 - (430-32, 430-34, and 430-52): Reject
SUBMITTER: Loren Feldman, Riviera Electric
RECOMMENDATION: Move Sections 430-32, 430-34, and 430-52 to the end of Section 430-152.

SUBSTANTIATION: Sections 430-32, 430-34, and 430-52 are not located in the appropriate location.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel assumes the submitter is referring to Table 430-152 since there is no Section 430-152. Sections 430-32 and 430-34 are under Part C (overload protection). Section 430-52 and referenced Table 430-152 are under Part D (short-circuit and ground-fault protection). For motor circuits, the requirements for these forms of protection are not the same.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2470)

11- 30 - (430-32(a)(1)): Accept in Principle
SUBMITTER: Andrew Schmid, Goldhorn Electrical Construction
RECOMMENDATION: Revise as follows:
Motors with a marked service factor ~~not less than~~ equal to or greater than 1.15
Motors with a marked temperature rise ~~not over~~ equal to or lower than 40°C
SUBSTANTIATION: It has been my experience, when teaching the fundamentals of Article 430 to my students that the wording of 430-32(a)(1), 430-32(c)(1), and 430-34 is so that it causes great confusion the way it is written. The revision of this article would make it much more feasible to apply with the information presented on the nameplate of the motor, and would eliminate the mind game of trying to quickly and correctly apply the text.
PANEL ACTION: Accept in Principle.
See the Panel action on Proposal 11-34.
PANEL STATEMENT: The panel action on Proposal 11-34 should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2600)

11- 31 - (430-32(a)(1)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 14 and 19 for action. This action will be considered by the Panels as a Public Comment.
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise text to read as follows:
430-32. Continuous-Duty Motors.
(a) More than 1 Horsepower. Each continuous-duty motor rated more than 1 hp shall be protected against overload by one of the following means.
1. A separate overload device that is responsive to motor current. This devise shall be selected to trip or shall be rated at no more than the following percent of the motor nameplate full-load current rating:

Motors with a marked service factor not less than 1.15	125 percent
Motors with a marked temperature rise not over 40°C	125 percent
All other motors	115 percent

Modification of this value shall be permitted as provided in Section 430-32 Exception No. 1. For a multispeed motor, each winding connection shall be considered separately. Where a separate motor overload device is connected so that it does not carry the total current designated on the motor nameplate, such as for wye-delta starting, the proper percentage of nameplate current applying to the selection or setting of the overload device shall be clearly designated on the equipment, or the manufacturer's selection table shall take this into account.

FPN: Where power factor correction capacitors are installed on the load side of the motor overload device, see Section 460-9.

Exception No. 1: Selection of Overload Relay. Where the overload relay selected in accordance with Sections 430-32(a)(1) and (c)(1) is not sufficient to start the motor or to carry the load, the next higher size overload relay shall be permitted to be used, provided the trip current of the overload relay does not exceed the following percentage of motor nameplate full-load current rating:

Motors with marked service factor not less than 1.15	140 percent
Motors with a marked temperature rise not over 40°C	140 percent
All other motors	130 percent

If not shunted during the starting period of the motor as provided in Section 430-35, the overload device shall have sufficient time delay to permit the motor to start and accelerate its load.

FPN: A Class 20 or 30 overload relay will provide a longer motor acceleration time than a Class 10 or 20, respectively. Use of a higher class overload relay may preclude the need for selection of a higher trip current.

SUBSTANTIATION: Change 430-34 to an Exception to the general rule of 430-32(a)(1). Because this is really an Exception to 430-32(a)(1).
PANEL ACTION: Accept in Principle.
1. Renumber 430-32(b) as 430-32(d).
2. Renumber 430-32(c) as 430-32(b).
3. Renumber 430-32(d) as new 430-32(e).
4. Renumber 430-34, including FPN, as 430-32(c).
5. Change reference in first sentence, second paragraph of 430-32(a)(1) to read 430-32(c).
6. Change both references in 430-32(b)(2) to read 430-32(b).
7. Change the reference in 430-32(c)(1) paragraph 2 to read 430-32(c).
8. Change the reference in 430-32(c)(4) to read 430-32(d)(1).
9. Change the reference in the first sentence of 430-32(c)(1) to read 430-32(b)(1).
10. Change the reference to 430-32(b) and (c) in 430-42(a) to read 430-32(b) and (d).
11. Change the reference in 430-7(a)(13) from 430-32(c)(2) to 430-32(b)(2).
12. Change the reference in 430-7(a)(14) from 430-32(c)(4) to 430-32(b)(4).
13. In Annex D, delete the reference to 430-34 following the title.
14. In Annex D, Example D8, under the heading Motor Overload Protection, revise 430-34 to read 430-32(c).

PANEL STATEMENT: The panel revisions are editorial and consistent with the NEC Style Manual, 2.6.1. The Panel action should meet the submitter's intent.
The panel requests the TCC direct panel 14 to modify the reference in 505-21, bullet item 7, from 430-34 to 430-32(c), consistent with this action. Also direct Panel 19 to modify the reference in 551-10(e)(3), bullet item 3, from 430-32(c) to 430-32(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3676)

11- 31a - (430-32(a)(1)): Reject
SUBMITTER: George Ferguson, Eastern Michigan Univ.
RECOMMENDATION: Revise text to read as follows:
430.32(a)(1) Motors with a marked service factor not less than 1.15 ~~125%~~ and

Motors with a marked temperature rise not over 40°C	125%
All other motors	115%

SUBSTANTIATION: At present there is disagreement whether the first two conditions are "either/or" type or "and" type conditions. This change would clarify the application of this rule.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel statement on Proposal 11-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4480)

11- 32 - (430-32(a)(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
430.32. Continuous-Duty Motors.
(a) More than 1 Horsepower. Each continuous-duty motor rated more than 1 hp shall be protected against overload by one of the following means.
1. A separate overload device that is responsive to motor current. This device shall be selected to trip or shall be rated at no more than the following percent of the motor nameplate full-load current rating:

Motors with a marked service factor not less than 1.15	125%
Motors with a marked temperature rise not over 40°C	125%
All other motors	115%

Modification of this value shall be permitted as provided in Section 430.32 Exception No. 1. For a multispeed motor, each winding connection shall be considered separately.
Where a separate motor overload device is connected so that it does not carry the total current designated on the motor nameplate, such as for wye-delta starting, the proper percentage of nameplate current applying to the selection or setting of the overload device shall be clearly designated on the equipment, or the manufacturer's selection table shall take this into account.
FPN: Where power factor correction capacitors are installed on the load side of the motor overload device, see Section 460.9.
Exception No. 1: Selection of Overload Relay. Where the overload relay selected in accordance with Sections 430.32(a)(1) and (c)(1) is not sufficient to start the motor or to carry the load, the next higher size overload relay shall be permitted to be used, provided the trip current of the overload relay does not exceed the following percentage of motor nameplate full-load current rating:

Motors with marked service factor not less than 1.15	140 %
Motors with a marked temperature rise not over 40°C	140 %
All other motors	130 %

If not shunted during the starting period of the motor as provided in Section 430.35, the overload device shall have sufficient time delay to permit the motor to start and accelerate its load.
FPN: A Class 20 or 30 overload relay will provide a longer motor acceleration time than a Class 10 or 20, respectively. Use of a higher class overload relay may preclude the need for selection of a higher trip current.
SUBSTANTIATION: Change 430.34 to an Exception to the general rule of 430.32(a)(1). Because this is really an Exception to 430.32(a)(1).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel action on Proposal 11-31 should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #602)

11- 33 - (Table 430-32(a)(1)): Reject
SUBMITTER: Gary Wonderly, Britton, MI
RECOMMENDATION: Revise as follows:

Motors with a marked service factor not Less than 1.15	~~125%~~
And ~~Motors~~ with a marked temperature rise Not over 40°C	125%
All other motors	115%

SUBSTANTIATION: The code currently reads that motors with a marked service factor not less than 1.15 "or" motors with a marked temperature rise not over 40°C will be calculated at 125%. All motors not meeting neither of these requirements would be calculated at 115%.

Both the service factor and the temperature rise conditions should be met before using the 125%.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed change would effectively require marking of a service factor on many motors. Such a marking is not required under 430-7(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #641)

11- 34 - (Table 430-32(a)(1)): Accept in Principle

SUBMITTER: Vohn N. Peeler, Faith, NC

RECOMMENDATION: Revise as follows:

Motors with a marked service factor ~~Not less than 1.15~~ 1.15 or greater	125%
Motors with a marked temperature ~~Not over 40°C~~ 40°C or less	125%

SUBSTANTIATION: This change will make this section of the code easier for most people to understand. I have been teaching the NEC and other electrical courses for over thirty years. Students invariably have difficulty with negative language. The suggested new wording puts it in positive language.

PANEL ACTION: Accept in Principle.

Accept the proposal as modified by changing "temperature" to "temperature rise" so it reads:

"Motors with a marked temperature rise 125%"

PANEL STATEMENT: The panel assumes that the submitter is referring to the percentage values in 430-32(a)(1) and the word "rise" was omitted from the proposal in error.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #CP1114)

11- 34a - (430-32(a)(2)): Accept

SUBMITTER: CMP 11

RECOMMENDATION: Revise 430-32(a)(2) as follows:

"Motor full-load current ~~not exceeding 9 amperes~~ 9 amperes or less 170%"

SUBSTANTIATION: This change makes this section of the Code easier to understand. The suggested new wording states the condition in positive language.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #CP1115)

11- 34b - (430-32(c)(1)): Accept

SUBMITTER: CMP 11

RECOMMENDATION: Revise 430-32(c)(1) as follows:

" Motors with a marked service factor ~~not less than 1.15~~ 1.15 or greater 125"%

"Motors with a marked temperature rise ~~not over 40°C~~ 40°C or less 125%"

SUBSTANTIATION: This change makes this section of the Code easier to understand. The suggested new wording states the condition in positive language. Note: through the panel action on Proposal 11-31, 430-32(c)(1) has been renumbered as 430-32(b)(1).

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #603)

11- 35 - (Table 430-32(c)(1)): Reject

SUBMITTER: Gary Wonderly, Britton, MI

RECOMMENDATION: Revise as follows:

Motors with a marked service factor not Less than 1.15	~~125%~~
And ~~Motors~~ with a marked temperature rise Not over 40°C	125%
All other motors	115%

SUBSTANTIATION: The code currently reads that motors with a marked service factor not less than 1.15 "or" motors with a marked temperature factor not over 40°C will be calculated at 125%. All motors not meeting neither of these requirements would be calculated at 115%.

Both the service factor and the temperature rise conditions should be met before using the 125%.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed change would effectively require marking of a service factor on many motors. Such a marking is not required under 430-7(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #1792)

11- 36 - (430-34): Accept in Principle

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: Revise Section 430-34 to read as follows:

"Selection of Overload Device. Where the overload device selected in accordance with Sections 430-32(a)(1) and (c)(1) is not sufficient to start the motor or to carry the load, the next higher setting or device size shall be permitted to be used, provided the trip current of the overload device does not exceed the following percentage of motor nameplate full-load current rating: " (Rest of section to remain as is.)

SUBSTANTIATION: Both Sections 430-32(a)(1) and (c)(1) refer to overload devices. The language is general enough to allow heaters to be replaced in the case of conventional overload relays or settings to be adjusted where solid-state or other adjustable overload relays are used. In any case, the relays themselves are seldom replaced, the sensing devices or heaters are the replaceable devices. In fact, many starters are not suitable for the next larger sized relay, only for replacement of heaters up to some maximum for the relay provided with the starter. This proposal is intended to clarify the intent of the section and make it consistent with actual practice and the other referenced sections. This assumes that the intent is as stated, that only one increase in size is permitted, even if two or more increases could be made without exceeding the 140/130% levels.

The panel should also consider clarifying whether the permitted increase is to happen only once or if further increases up to the 140%/130% levels are permitted. The present language implies that only one increase in size is permitted even if the one increase does not approach 140%. Similarly, if the overload device is adjustable, the language is not clear whether only the next incremental setting is permitted or if the setting may be increased to 140%.

PANEL ACTION: Accept in Principle.

Revise the first paragraph of 430-32(c) to read as follows:

Selection of Overload Relay. Where the sensing element or setting of the overload relay selected in accordance with 430-32(a)(1) and 430-32(b)(1) is not sufficient to start the motor or carry the load, higher size sensing elements or incremental settings shall be permitted to be used, provided the trip current of the overload relay does not exceed the following percentage of the motor nameplate full-load current rating."

PANEL STATEMENT: The use of "overload device" could be interpreted to mean fuses or a circuit breaker, which is not intended. The panel has clarified the wording to permit more than one increase in the sensing element or incremental setting, provided the percent limit is not exceeded.

The renumbering is consistent with the panel action on Proposal 11-31.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #2601)

11- 37 - (430-34): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Relocated to 430-32(a)(1) Exception.
SUBSTANTIATION: Move text 430-34 to 430-32(a)(1) as an Exception to 430-32.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel action on Proposal 11-31 should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4481)

11- 38 - (430-34): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Relocated to 430.32(a)(1) Exception.
SUBSTANTIATION: Move text 430-34 to 430.32(a)(1) as an Exception to 430.32.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel action on Proposal 11-31 should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #594)

11- 39 - (Table 430-34): Reject
SUBMITTER: Gary Wonderly, Britton, MI
RECOMMENDATION: Revise as follows:

Motors with a marked service factor not less than 1.15	~~140%~~
And ~~Motors~~ with a marked temperature rise Not over 40°C	140%
All other motors	130%

SUBSTANTIATION: The Code currently reads that motors with a marked service factor not less than 1.15 "or" Motors with a marked temperature rise not over 40°C will be calculated at 140%. All motors not meeting neither of these requirements would be calculated at 130%.
Both the service factor and the temperature rise conditions should be met before using the 140%.
PANEL ACTION: Reject.
PANEL STATEMENT: See the Panel Statement on Proposal 11-33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #642)

11- 40 - (Table 430-34): Accept in Principle
SUBMITTER: Vohn N. Peeler, Faith, NC
RECOMMENDATION: Revise as follows:

Motors with a marked service factor	140%
~~Not less than 1.15~~	
1.15 or greater	
Motors with a marked temperature	140%
~~Not over 40°C~~	
40°C or less	

SUBSTANTIATION: This change will make this section of the code easier for most people to understand. I have been teaching the NEC and other electrical courses for over thirty years. Students invariably have difficulty with negative language. The suggested new wording puts it in positive language.
PANEL ACTION: Accept in Principle.
Accept the proposal as modified by changing "temperature" to "temperature rise".
Renumber as 430-32(c) in accordance with the panel action on Proposal 11-31.
PANEL STATEMENT: The panel assumes that the submitter is referring to the percentage values in 430-34 and the word "rise" was omitted from the proposal in error.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4378)

11- 41 - (430-40): Accept
SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services
RECOMMENDATION: In the third line after short circuit add or ground faults.
SUBSTANTIATION: To comply with Code terms. See definition of overcurrent and overload, Article 100.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4015)

11- 42 - (430-43): Reject
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: Delete the entire last sentence of 430-43 and replace with:
Article 430-43 Automatic Restarting. A motor overload device that can restart a motor automatically after overload tripping shall not be installed unless approved for use with the motor it protects. ~~A motor overload device that can restart a motor automatically after overload tripping shall not be installed if automatic restarting can result in injury to persons.~~ A motor overload device that can automatically reset after an overload trip shall not be able to restart the motor automatically upon reset. Manual means must be imposed in order to restart the motor.
SUBSTANTIATION: Motor starters with overloads capable of automatic reset are useful in some sectors of industry. One such example would be when the starter must be located in an area that is not easily accessible. If the motor were to trip the overloads, then personnel would not have to physically reset the overload section. My concern is that when the overload is reset automatically, the motor should not automatically restart. The motor should have to be restarted via the human factor.
What happens if the motor continuously resents automatically and resets automatically? The motor will surely burn out due to the accumulated heat from successive inrush currents. Herein lies the danger of a fire. Worse yet would be a situation when the electrician or operator is trying to figure out why the motor trips the overloads in the first place. The electrician or operator may begin adjusting the conveyor belt tensions or maybe the fanbelt tensions only to be startled when the motor overload section cools down enough to reset the overloads and in turn restart the motor automatically.
For all personnel involved, please take the time to discuss the ramifications with this dangerous practice.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed change is too restrictive. If accepted, it would prohibit automatic reset thermal protection in many applications, such as for submersable pump motors and hermetic refrigerant motor-compressors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
NAUGHTON: I disagree with the panel action. In many cases motors that automatically restart after automatically resetting go unnoticed for indefinite periods of time creating more of a hazard to equipment and for personnel.
Manual restarting after automatic resetting, as the submitter suggests will bring attention to the personnel in charge that a problem exists and repair may be needed, this would prevent any additional or increased hazard.

(Log #CP1105)

11- 42a - (430-51 and FPN No. 1 (New)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: Make the following changes in the second paragraph:
1. Change "do not" to "shall not".
2. Delete "See Part K".
3. Add new FPN No. 1, to read as follows:
"FPN No. 1: For over 600 volts, nominal, see Part K."
4. Existing FPN to become FPN No. 2.

SUBSTANTIATION: The revision are intended to comply with the NEC Style Manual, 3.1, with respect to mandatory language and explanatory information.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3454)

11- 43 - (430-52): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise Section 430-52 to read as follows:
430-52. Rating or Setting for Individual Motor Circuit.
(a) General. The motor branch-circuit short-circuit and ground-fault protective device shall comply with (b) and either (c) or (d), as applicable.
(b) All Motors. The motor branch-circuit short-circuit and ground-fault protective device shall be capable of carrying the starting current of the motor.
(c) Rating or Setting.
1. A protective device that has a rating or setting not exceeding the value calculated according to the values given in Table 430-52 shall be used.
Exception No. 1: Where the values for branch-circuit short-circuit and ground-fault protective devices determined by Table 430-52 do not correspond to the standard sizes or ratings of fuses, nonadjustable circuit breakers, thermal protective devices, or possible settings of adjustable circuit breakers, the next higher standard size, rating, or possible setting shall be permitted.
Exception No. 2: Where the rating specified in Table 430-52, as modified by Exception No. 1, is not sufficient for the starting current of the motor:
a. The rating of a nontime-delay fuse not exceeding 600 amperes or a time-delay Class CC fuse shall be permitted to be increased but shall in no case exceed 400 percent of the full-load current.
b. The rating of a time-delay (dual-element) fuse shall be permitted to be increased but shall in no case exceed 225 percent of the full-load current.
c. The rating of an inverse time circuit breaker shall be permitted to be increased but shall in no case exceed 400 percent for full-load currents of 100 amperes or less or 300 percent for full-load currents greater than 100 amperes.
d. The rating of a fuse of 601–6000 ampere classification shall be permitted to be increased but shall in no case exceed 300 percent of the full-load current.
FPN: See Appendix D, Example No. D8, and Figure 430-1.
2. Where maximum branch-circuit short-circuit and ground-fault protective device ratings are shown in the manufacturer's overload relay table for use with a motor controller or are otherwise marked on the equipment, they shall not be exceeded even if higher values are allowed as shown above.
3. An instantaneous trip circuit breaker shall be used only if adjustable and if part of a listed combination motor controller having coordinated motor overload and short-circuit and ground-fault protection in each conductor, and the setting is adjusted to no more than the value specified in Table 430-52.
FPN: For the purpose of this article, instantaneous-trip circuit breakers may include a damping means to accommodate a transient motor inrush current without nuisance tripping of the circuit breaker.
Exception No. 1: Where the setting specified in Table 430-52 is not sufficient for the starting current of the motor, the setting of an instantaneous trip circuit breaker shall be permitted to be increased but shall in no case exceed 1300 percent of the motor full-load current for other than Design E motors or Design B energy efficient motors and no more than 1700 percent of full-load motor current for Design E motors or Design B energy efficient motors. Trip settings above 800 percent for other than Design E motors or Design B energy efficient motors and above 1100 percent for Design E motors or Design B energy efficient motors shall be permitted where the need has been demonstrated by engineering evaluation. In such cases, it shall not be necessary to first apply an instantaneous-trip circuit breaker at 800 percent or 1100 percent.
FPN: For additional information on the requirements for a motor to be classified "energy efficient," see Motors and Generators, NEMA Standards Publication No. MG1-1993, Revision 1, Part 12.59.
Exception No. 2: Where the motor full-load current is 8 amperes or less, the setting of the instantaneous-trip circuit breaker with a continuous current rating of 15 amperes or less in a listed combination motor controller that provides coordinated motor branch-circuit overload and short-circuit and ground-fault protection shall be permitted to be increased to the value marked on the controller.
4. For a multispeed motor, a single short-circuit and ground-fault protective device shall be permitted for two or more windings of the motor, provided the rating of the protective device does not exceed the above applicable percentage of the nameplate rating of the smallest winding protected.
Exception: For a multispeed motor, a single short-circuit and ground-fault protective device shall be permitted to be used and sized according to the full-load current of the highest current winding, where all of the following conditions are met.
a. Each winding is equipped with individual overload protection sized according to its full-load current.
b. The branch-circuit conductors supplying each winding are sized according to the full-load current of the highest full-load current winding.
c. The controller for each winding has a horsepower rating not less than that required for the winding having the highest horsepower rating.
5. Suitable fuses shall be permitted in lieu of devices listed in Table 430-52 for power electronic devices in a solid state motor controller system provided that the marking for replacement fuses is provided adjacent to the fuses.

****Table 430-52. Maximum Rating or Setting of Motor Branch-Circuit Short-Circuit and Ground-Fault Protective Devices**

Type of Motor	Percentage of Full-Load Current			
	Nontime Delay Fuse	Duel Element (Time-Delay Fuse)[1]	Instantaneous Trip Breaker	Inverse Time Breaker[2]
Single-phase motors	300	175	800	250
AC polyphase motors other than wound-rotor				
Squirrel cage—				
Other than Design E	300	175	800	250
Design E	300	175	1100	250
Synchronous3	300	175	800	250
Wound rotor	150	150	800	150
Direct current (constant voltage)	150	150	250	150

Note: For certain exceptions to the values specified, see Sections 430-52 through 430-54.
[1]The values in the Nontime Delay Fuse column apply to Time-Delay Class CC fuses.
[2]The values given in the last column also cover the ratings of nonadjustable inverse time types of circuit breakers that may be modified as in Section 430-52.
[3]Synchronous motors of the low-torque, low-speed type (usually 450 rpm or lower), such as are used to drive reciprocating compressors, pumps, etc., that start unloaded, do not require a fuse rating or circuit-breaker setting in excess of 200 percent of full-load current.**

6. A listed self-protected combination controller shall be permitted in lieu of the devices specified in Table 430-52. Adjustable instantaneous-trip settings shall not exceed 1300 percent of full-load motor current for other than Design E motors or Design B energy efficient motors and not more than 1700 percent of full-load motor current for Design E motors or Design B energy efficient motors.

7. A motor short-circuit protector shall be permitted in lieu of devices listed in Table 430-52 if the motor short-circuit protector is part of a listed combination motor controller having coordinated motor overload protection and short-circuit and ground-fault protection in each conductor and it will open the circuit at currents exceeding 1300 percent of motor full-load current for other than Design E motors or Design B energy efficient motors and 1700 percent of motor full-load motor current for Design E motors or Design B energy efficient motors.

(d) Torque Motors. Torque motor branch circuits shall be protected at the motor nameplate current rating in accordance with Section 240-3(b).

430-53. Several Motors or Loads on One Branch Circuit. Two or more motors or one or more motors and other loads shall be permitted to be connected to the same branch circuit under conditions specified in (d) and in (a), (b), or (c).

(a) Not Over 1 Horsepower. Several motors, each not exceeding 1 hp in rating, shall be permitted on a nominal 120-volt branch circuit protected at not over 20 amperes or a branch circuit of 600 volts, nominal, or less, protected at not over 15 amperes, if all of the following conditions are met.

1. The full-load rating of each motor does not exceed 6 amperes.

2. The rating of the branch-circuit short-circuit and ground-fault protective device marked on any of the controllers is not exceeded.

3. Individual overload protection conforms to Section 430-32.

(b) If Smallest Rated Motor Protected. If the branch-circuit short-circuit and ground-fault protective device is selected not to exceed that allowed by Section 430-52 for the smallest rated motor, two or more motors or one or more motors and other load(s), with each motor having individual overload protection, shall be permitted to be connected to a branch circuit where it can be determined that the branch-circuit short-circuit and ground-fault protective device will not open under the most severe normal conditions of service that might be encountered.

(c) Other Group Installations. Two or more motors of any rating or one or more motors and other load(s), with each motor having individual overload protection, shall be permitted to be connected to one branch circuit where the motor controller(s) and overload device(s) are (1) installed as a listed factory assembly and the motor branch-circuit short-circuit and ground-fault protective device is either provided as part of the assembly or is specified by a marking on the assembly, or (2) the motor branch-circuit short-circuit and ground-fault protective device, the motor controller(s), and overload device(s) are field-installed as separate assemblies listed for such use and provided with manufacturers' instructions for use with each other, and (3) all of the following conditions are complied with.

1. Each motor overload device is listed for group installation with a specified maximum rating of fuse or inverse time circuit breaker, or both.

2. Each motor controller is listed for group installation with a specified maximum rating of fuse or circuit breaker, or both.

3. Each circuit breaker is one of the inverse time type and listed for group installation.

4. The branch circuit shall be protected by fuses or inverse time circuit breakers having a rating not exceeding that specified in Section 430-52 for the highest rated motor connected to the branch circuit plus an amount equal to the sum of the full-load current ratings of all other motors and the ratings of other loads connected to the circuit. Where this calculation results in a rating less than the ampacity of the supply conductors, it shall be permitted to increase the maximum rating of the fuses or circuit breaker to a value not exceeding that permitted by Section 240-3(b).

5. The branch-circuit fuses or inverse time circuit breakers are not larger than allowed by Section 430-40 for the overload relay protecting the smallest rated motor of the group.

FPN: See Section 110-10 for circuit impedance and other characteristics.

(d) Single Motor Taps. For group installations described above, the conductors of any tap supplying a single motor shall not be required to have an individual branch-circuit short-circuit and ground-fault protective device, provided they comply with either of the following.

1. No conductor to the motor shall have an ampacity less than that of the branch-circuit conductors.

2. No conductor to the motor shall have an ampacity less than one-third that of the branch-circuit conductors, with a minimum in accordance with Section 430-22; the conductors to the motor overload device being not more than 25 ft (7.62 m) long and being protected from physical damage.

430-54. Multimotor and Combination-Load Equipment. The rating of the branch-circuit short-circuit and ground-fault protective device for multimotor and combination-load equipment shall not exceed the rating marked on the equipment in accordance with Section 430-7(d).

430-55. Combined Overcurrent Protection. Motor branch-circuit short-circuit and ground-fault protection and motor overload protection shall be permitted to be combined in a single protective device where the rating or setting of the device provides the overload protection specified in Section 430-32.

430-56. Branch-Circuit Protective Devices — In Which Conductor. Branch-circuit protective devices shall comply with the provisions of Section 240-20.

430-57. Size of Fuseholder. Where fuses are used for motor branch-circuit short-circuit and ground-fault protection, the fuseholders shall not be of a smaller size than required to accommodate the fuses specified by Table 430-52.

Exception: Where fuses having time delay appropriate for the starting characteristics of the motor are used, it shall be permitted to use fuseholders sized to fit the fuses that are used.

430-58. Rating of Circuit Breaker. A circuit breaker for motor branch-circuit short-circuit and ground-fault protection shall have a current rating in accordance with Sections 430-52 and 430-110.

E. Motor Feeder Short-Circuit and Ground-Fault Protection

430-61. General. Part E specifies protective devices intended to protect feeder conductors supplying motors against overcurrents due to short circuits or grounds.

FPN: See Appendix D, Example No. D8.

430-62. Rating or Setting — Motor Load.

(a) Specific Load. A feeder supplying a specific fixed motor load(s) and consisting of conductor sizes based on Section 430-24 shall be provided with a protective device having a rating or setting not greater than the largest rating or setting of the branch-circuit short-circuit and ground-fault protective device for any motor supplied by the feeder [based on the maximum permitted value for the specific type of a protective device shown in Table 430-52, or Section 440-22(a) for hermetic refrigerant motor-compressors], plus the sum of the full-load currents of the other motors of the group.

Where the same rating or setting of the branch-circuit short-circuit and ground-fault protective device is used on two or more of the branch circuits supplied by the feeder, one of the protective devices shall be considered the largest for the above calculations.

Exception: Where one or more instantaneous trip circuit breakers or motor short-circuit protectors are used for motor branch-circuit short-circuit and ground-fault protection as permitted in Section 430-52(c), the procedure provided above for determining the maximum rating of the feeder protective device shall apply with the following provision. For the purpose of the calculation, each instantaneous trip circuit breaker or motor short-circuit protector shall be assumed to have a rating not exceeding the maximum percentage of motor full-load current permitted by Table 430-52 for the type of feeder protective device employed.

FPN: See Appendix D, Example No. D8.

(b) Other Installations. Where feeder conductors have an ampacity greater than required by Section 430-24, the rating or setting of the feeder overcurrent protective device shall be permitted to be based on the ampacity of the feeder conductors.

**Relocating and changing Table 430-152 to Code Section 430-52 and changing table to 430-52.

SUBSTANTIATION: 1. To put all percentages together, and under the same section.

2. Will make looking up percentage chart easier.

PANEL ACTION: Reject.

PANEL STATEMENT: See the panel action on Proposal 11-5.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

GARVEY: See my Explanation of Negative Vote on Proposal 11-5.

(Log #909)

11- 44 - (430-52(c)(1) Exception No. 1): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception No. 1: Where the values for branch-circuit short-circuit and ground-fault protective devices determined by Table 430-152 do not correspond to the standard sizes or ratings of fuses, nonadjustable circuit breakers, thermal protective devices, or possible settings of adjustable circuit breakers, ~~the next~~ a higher ~~standard~~ size, rating, or possible setting that does not exceed the next higher standard ampere rating shall be permitted.
SUBSTANTIATION: Editorial. Present literal wording only permits the next higher standard rating to be used. Smaller size increments which do not exceed the next higher standard rating should be permitted. Section 240-6 allows nonstandard ratings.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3288)

11- 45 - (430-53(c)(3)): Accept
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: James T. Pauley, Square D Co.
RECOMMENDATION: Revise Section 430-53(c)(3) as follows:
3. Each circuit breaker shall be listed and be ~~is one~~ of the inverse time type. ~~and listed for group installation.~~
SUBSTANTIATION: This is a repeat proposal from the 1999 cycle requesting the same action. CMP 11 accepted the proposal but it failed to achieve the 2/3 necessary to change the Code. The proposal is brought back once again to provide CMP 11 with information relative to the negative comments.
The negative comments reflect a number of items that are inaccurate relative to HACR circuit breakers. The requirement in the NEC should state that the CB should be a listed device and be of inverse time type. The statement "listed for the purpose" is superfluous. UL 489, Section 6.7.1 states "Heating, air conditioning, and refrigeration (HACR) circuit breakers shall comply with the construction requirements in All Types, Section 6.1." Section 6.1 contains requirements of All Types of CB's. UL and industry recognized that there is no need to have a separate set of requirements for HACR circuit breakers, when every circuit breaker is evaluated to a performance and safety level and allows it to perform acceptably in group motor installations. The revision to note specifically that the CB must be listed will ensure that the breaker meets the safety and performance expectations for these installations.
By virtue of the code having the "listed for the purpose" statement, it requires an HACR marking on the breaker. Every circuit breaker designed and evaluated to UL 489 can have an HACR marking by the requirement in 6.7.1. The code requirement simply adds costs to the product (for the label) with no benefit for safety or the user.
The fact is that in group applications, both fuses and circuit breakers that meet their respective standards are acceptable in group installations without further evaluation.
The panel should not be distracted by the "red herring" of needing short circuit current ratings on utilization equipment (e.g. air-conditioners) and attempting to relate that non-issue to HACR (as indicated in some of the negative comments). Attempting to place a short-circuit rating on a piece of utilization equipment will have severe negative effects on the industry, the consumer and will negatively impact safety. Faults that occur in utilization equipment are not like faults on the distribution system. For instance, in an air-conditioner the fault may be a winding fault in the compressor. This type of internal fault is impedance limited. There is absolutely NO evidence to support any need to short circuit ratings on utilization equipment. Another argument is that a fault is created by a maintenance technician in a piece of utilization equipment while doing service work. This is a dangerous argument will result in an assumption that some "rating" on the equipment will protect a worker who is exposed to energized parts and potential arcing faults. Working on any piece of energized electrical equipment has a hazard associated with it. If a fault is created by a technician in a utilization equipment such as an air-conditioner, it will be an arcing fault and the OCP will provide little to no "protection" for the worker under those conditions. Proper work procedures must be followed.
Also, references in the negative voting to other UL standards that mention HACR are only serving to confuse the issue. These standards have not been updated to reflect the changes in UL 489 and given and any listed breaker could also carry a HACR label, makes referencing these standards as objections to this proposal somewhat meaningless.
I urge CMP 11 to finally accept this proposal .
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 5
EXPLANATION OF NEGATIVE:
BUNCH: Changing the requirement for the circuit breaker to be listed for group installation to just a listed breaker could lead to inconsistent applications since not all breakers are HACR. Further standardization of these requirements by recognized testing labs might address this, but is not acceptable at this time.
GARVEY: The submitter should expand on the statement: "The fact is that in group application, both fuses and circuit breakers that meet their respective standards are acceptable in group applications without further evaluation". This statement seems to conflict with the UL White Book, Motor Controllers (NJOT) and testimony presented to the panel.
NAUGHTON: Substantiation has not been provided that shows UL or industry stating that there is not a need for the requirements for HACR circuit breakers as described in the submitter's substantiation. Removal of "and listed for group installations" could result in a potential hazard if used in other than group installations. Further study is needed.
SAPORITA: I must vote negative on the panel action. This is a safety issue. The proposal and substantiation incorrectly assume that all group motor installations are for heating/air conditioning/refrigeration (HACR) applications. 430-53(c) also applies to (1) other listed factory assemblies and to (2) field assembled equipment. As written, this proposal would remove the requirements for the circuit breaker's "group motor listing" for these two other applications described above. No substantiation has been provided to show that these other "systems" will be safe and free from hazards without the currently required testing and listing.
While the code permits circuit breakers to be used interchangeabily if LISTED for group installation, manufacturers have chosen not to submit their products for listing under this special application. Most likely because circuit breakers of the same rating from different manufacturers have significantly different energy let-through characteristics. This can result in damage to the controller and associated overload relays. Note the FPN reference to 110-10 at the end of 430-53(c).
SAUNDERS: The submitter's substantiation incorrectly assumes that all group motor installations are HACR (Heating Air Conditioning/Refrigeration) applications. An inverse time circuit breaker that is marked "HACR" is acceptable for group motor installations in HACR applications, but not automatically acceptable for other applications such as field assembled panels.
COMMENT ON AFFIRMATIVE:
WRIGHT: The UL listing requirements for circuit breakers listed for group installations are identical to those for circuit breakers not listed for group installations. The only reason the markings are still included in UL 489 is that the requirement for marking is still included in the NEC. Removing the marking from the NEC would permit UL to remove the marking requirements from UL 489.

(Log #3093)

11- 46 - (430-53(d)): Accept in Principle
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise section 430-53(d) and add a new item 3 to read as follows:
(d) Single Motor Taps: For group installations...provided they comply with ~~either~~ one of the following:
(3) Conductors from the branch circuit short-circuit and ground-fault protective device to a listed manual motor controller additionally marked "Suitable for Tap Conductor Protection in Group Installations" shall be permitted to have an ampacity rating of not less than 1/10 of the rating or setting of the branch circuit

protective device. The conductors from the controller to the motor shall have an ampacity in accordance with 430-22. The conductors from the branch circuit protective device to the controller shall be suitably protected from physical damage or enclosed by either an enclosed controller or by a raceway, and be not more than 10 ft. (3.05m) in length.

SUBSTANTIATION: The listed manual motor controller additionally marked "Suitable for Tap Conductor Protection in Group Installations" is a listed motor controller provided with an instantaneous trip mechanism, with motor overload protection and motor disconnect functions. It would be listed for group applications under the proposed Section 430-53(d)(3). Underwriters Laboratories Inc. is developing a special category of UL 508 to recognize this unit's functionality. It has the line-side electrical spacing in accordance with UL 508 and is limited to applications on the load-side of the motor branch-circuit protective device. The listed manual motor controller additionally "Suitable for Tap Conductor Protection in Group Installations" provides supplemental protection for the wires in this group application.

During the lase code cycle the panel was reluctant to permit any exception to the wire sizing allowed under 430-53(d) for manual motor controllers with an instantaneous trip function. The reason was that these controllers had not been subjected to testing to determine that they provide proper protection of the motor wires. Devices tested and listed as listed manual motor controllers additionally marked "Suitable for Tap Conductor Protection in Group Installations" will provide this protection.

The proposed test program is a follows:

1. Standard Fault Short-Circuit Test 10kA - no welding allowed
   a) Single-phase, "O-CO" each pole
   b) Three-phase, "O"
      1.1 Followed by trip-out, 120 percent of specified trip current
      1.2 Dieelectric Test
   c) 2x test voltage, not less than 900V
2. High Capacity Short Circuit Tests on the Controller Without Contactors
   a) "O" and "CO" tests using the same controller followed by trip-out and dieelectric tests
3. UL 508 - Motor Disconnecting Means Evaluation. These requirements qualify the device under Section 430-109A(6)
   a) Temperature
   b) Overload/endurance
   c) Three-phase short-circuit (covered by 1.b)
   d) Dielectric withstant test
4. UL 508 - Overload Relay Tests
5. Short-Circuit Tests on Magnetic Controllers used with listed manual motor controllers additionally marked "Suitable for Tap Conductor Protection in Group Installations."
   a) Standard fault short-circuit current tests.
   b) High capacity short-circuit current tests.

A UL Bulletin covering this test procedure is forthcoming. It should be noted. PANEL ACTION: Accept in Principle. Accept the recommended change in the first line of (d). Revise (3) in the proposal to read as follows:

"(3) Conductors from the branch-circuit short-circuit and ground-fault protective device to a listed manual motor controller additionally marked 'Suitable for Tap Conductor Protection in Group Installations' shall be permitted to have an ampacity not less than 1/10 the rating or setting of the branch-circuit short-circuit and ground-fault protective device. The conductors from the controller to the motor shall have an ampacity in accordance with 430-22. The conductors from the branch-circuit short-circuit and ground-fault protective device shall (1) be suitably protected from physical damage and enclosed by either an enclosed controller or by a raceway, and shall be not more than 3 m (10 ft) long, or (2) shall have an ampacity in accordance with 430-22."

PANEL STATEMENT: Revisions are editorial and to clarify that full size conductors are still permitted in the tap to the controller without a length limit.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NEGATIVE: 3

EXPLANATION OF NEGATIVE:

NAUGHTON: The submitter does not show reasoning for this change and there are concerns with UL 508 in respect to size, spacing and availability.

SAPORITA: I vote negative on the panel action because this proposal removes a degree of safety.

The proposal attempts to copy the requirements of 430-28, but with one big difference. 430-28 requires that the feeder tap terminate in a branch-circuit protective device. This proposal would substitute a manual motor protector for the branch-circuit protective device.

Manual motor protectors are not branch-circuit protective devices. They do not have the larger spacings required of branch-circuit protective devices. The larger spacings are necessary for different degrees of workmanship and for the effects of aging. These larger spacings provide the extra margin of safety for personnel installing, maintaining, and troubleshooting the motor circuit.

Finally, this proposal should be rejected because the standard does not exist to list these Manual Motor Protectors as "Suitable for Tap Conductor Protection in Group Installations", and as a result, the devices with this marking are not available.

SAUNDERS: The submitter appears to be modifying the intent of Section 430-28 (1) Feeder Taps to include devices other than branch circuit protective devices. The device referred to in the proposal to modify Section 430-53(d) is a "manual motor controller additionally marked "Suitable for Tap Conductor Protection in Group Installations"". We understand that this device consists of an instantaneous only circuit breaker (MCP) and an overload element, and that it does not meet Branch Circuit, Short Circuit and Ground Fault Protective Device Ratings or Standards. This appears to be a new product that may not be commercially available in this country and there does not appear to be any current US consensus standards that address this equipment. A "manual motor controller additionally marked "Suitable for Tap Conductor Protection in Group Installations"" to be used in this application should meet the Branch Circuit Protective device ratings as referenced in 430-28(1). Short Circuit and Ground Fault device protective ratings and standards should be required for this application and as such would not require a modification to the code. Allowing devices that do not meet the Branch Circuit Protective Device Short Circuit and Ground Fault protection standards or ratings as required in 430-28 reduces safety.

COMMENT ON AFFIRMATIVE:

RASMUSSEN: The proposal should be accepted. However, item (2) in the last sentence of the panel action is not consistent with the panel statement since 430-22 does not address the conductor ampacity relative to the rating of the branch-circuit short-circuit and ground-fault protective device. Item (2) in the last sentence of the panel action should be revised to read "(2) shall have an ampacity in accordance with 430-22 and shall have an ampacity not less than that of the branch circuit conductors." Item (2) as written in the panel action does not require "full size" conductors relative to the size of the branch-circuit short-circuit and ground-fault protective device. The intent of the proposal is to permit use of a new class of manual motor controller for motor tap conductor protection in the same manner that 430-28 permits branch-circuit protective devices to protect feeder taps. The requirements for manual motor controllers Listed and marked "Suitable for Tap Conductor Protection in Group Installations" will provide the same level of protection for motor taps as is currently required for feeder taps.

WRIGHT: The test program for these devices is the same as the test program for molded case circuit breakers. The provision for use as tap protection is the same concept as in 430-28. UL has indicated that a bulletin to industry giving the listing requirements will be published by the third quarter of 2000.

(Log #900)

11- 47 - (430-57, Exception): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete exception.

SUBSTANTIATION: Since the rule doesn't require fuseholders to accommodate the largest fuse ratings of Table 430-152, which are maximums but don't prohibit smaller ratings, this is not an exception to anything in the rule. The table already indicates time-delay fuse ratings may be smaller than other types.

PANEL ACTION: Reject.

PANEL STATEMENT: The exception is needed to facilitate the use of time delay (dual-element) fuses at less than the maximum sizes permitted in 430-52.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #3365)

11- 48 - (430-62): Accept
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise to read as follows:
A feeder supplying a specific fixed motor load(s) and consisting of conductor sizes based on Section 430-24 shall be provided with a protective device having a rating or setting not greater than the largest rating or setting of the branch-circuit short-circuit and ground-fault protective device for any motor supplied by the feeder [based on the maximum permitted value for the specific type of a protective device in accordance with Section 430-52 and ~~shown in~~ Table 430-152, or Section 440-22(a) for hermetic refrigerant motor-compressors],.plus the sum of the full-load currents of the other motors of the group.
SUBSTANTIATION: The rating determined for the branch circuit is already determined by rounding up of the overcurrent device, in accordance with Section 430-52. The existing text within the brackets directly conflicts with text in the first sentence that requires you to use the sizing of the branch-circuit short-circuit and ground-fault protective device, that has already been sized in accordance with Section 430-52(c), Exception No. 1 or 2. This clears up a conflict in calculating the feeder overcurrent protective device size.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #32)

11- 49 - (430-62(a) Exception No. 2 (New)): Accept
NOTE: The following proposal consists of Comment 11-46 on Proposal 11-63 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 11-63 was:
Revise Section 430-62(a) Specific Load as follows:
"A feeder supplying a specific fixed motor load(s) and consisting of conductor sizes based on Section 430-24 shall be provided with a protective device having a rating or setting not greater than the largest rating or setting of the branch-circuit short-circuit and ground-fault protective device for any motor supplied by the feeder ~~of the group~~ [based on the maximum permitted value for the specific type of a protective device shown in Table 430-152, or Section 440-22(a) for hermetic refrigerant motor-compressors], plus the sum of the full-load currents of the other motors of the group.
Where the same rating or setting of the branch-circuit short-circuit and ground-fault protective device is used on two or more of the branch circuits supplied by the feeder ~~of the group~~, one of the protective devices shall be considered the largest for the above calculations."
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in Principle revised as follows:
Add: Exception No. 2: Where the feeder overcurrent protective device also provides overcurrent protection for a motor control center the provisions of Section 430-94 shall apply.
SUBSTANTIATION: Where the feeder protective device also provides overcurrent protection for a motor control center, the provisions of this section and Section 430-94 may conflict.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #901)

11- 50 - (430-62(a) Exception No. 2 (New)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception No. 2: Where the feeder overcurrent protective device also provides overcurrent protection for a motor control center the provisions of Section 430-94 shall apply.
SUBSTANTIATION: This section and Section 430-94 appear to conflict.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #902)

11- 51 - (430-63): Accept
Note: The Technical Correlating Committee directs the Panel to revise the sentence structure for clarity. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Rating or Setting-Power and Light Loads. Where a feeder or service supplies a motor load and, in addition a lighting or a lighting and appliance load, the feeder and service protective device shall ~~be permitted to~~ have a rating or setting sufficient to carry the lighting or lighting and appliance load as determined in accordance with Articles 210 and 220, plus for a single motor, the rating permitted by Section 430-52, or a single motor comprised of a hermetic refrigerant motor-compressor, the rating permitted by Section 440-22, and for two or more motors, the rating permitted by Section 430-62.
Exception: Where the feeder or service overcurrent protective device provides the overcurrent protection for a motor control center the provisions of Section 430-94 shall apply.
SUBSTANTIATION: Section 230-90(a), Exception No. 1 indicates this section applies to service overcurrent protective devices also and that should be noted in this section. Sections 210-20(a); 210-11(c); 384-16(d) have mandatory requirements for overcurrent device ratings and this section should correlate with a similar mandatory rating sufficient to carry the load.
Section 440-22 covers overcurrent protective ratings for hermetic refrigerant motor-compressors and is properly referenced in Section 430-62(a).
The proposed exception would correlate with Section 430-94 and avoid an apparent conflict.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4442)

11- 52 - (Table 430-72(b)): Accept
SUBMITTER: Greg H. Jones, Rosendin Electric
RECOMMENDATION: No notes written for Table 430-72(b).
SUBSTANTIATION: Sizing overcurrent protection device in amperes. Notes are written in the 1996 NEC but not in 99.
PANEL ACTION: Accept.
PANEL STATEMENT: Notes are included in current printings of the NEC, which were inadvertantly left out of the first printing (errata was published).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #903)

11- 53 - (430-74(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) General. Motor control circuits shall be so arranged that they will be disconnected from all ungrounded ~~sources of~~ supply source conductors when the disconnecting means is in the open position.
(remainder unchanged).
SUBSTANTIATION: Editorial. Where a 120-volt motor is controlled by a 120-volt coil-operated magnetic starter, or a 480-volt motor is controlled by a 120-volt coil-operated magnetic starter supplied from an external 120-volt source, present wording infers the grounded 120-volt circuit conductor must be disconnected, since it is connected to the source of supply. Disconnecting means per Article 100 is indicated as disconnecting conductors of a circuit which includes grounded conductors. This is permitted by Section

430-105. While no one is doing this, based on the understanding of intent, such understanding should not replace concise wording.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal would permit a 3-phase delta corner grounded leg to remain energized with disconnecting means open.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1929)

11- 54 - (430-81(d) (New)): Reject
SUBMITTER: W. Creighton Schwan, Hayward, CA
RECOMMENDATION: Add new text to read as follows:
(d) Automatic Restarting. A motor that can restart automatically after shutdown shall not be installed if its automatic restarting can result in injury to persons.
SUBSTANTIATION: The Panel rejected a comment which would have returned to the 1996 wording. (See Comments 11-22 and 11-23 on Proposal 11-45, on page 525 of the 1998 ROC) on the basis of it being in the wrong place in the code, even though it has been in that place from the 1956 to 1996 codes, and as Section 4333 in the 1947 through 1953 codes. Is this a better location? If not, you move it.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is too general in its application to be practical.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
SAUNDERS: Many electrical systems and equipment "require" an "automatic restart" after a power outage condition (i.e. sump pump, exhaust fan, projection heater). The proposal as submitted could be interpreted as not permitting installations of the type.

(Log #4453)

11- 55 - (430-81(d) (New)): Reject
SUBMITTER: David E. Shapiro, Safety First Electrical Contracting, Consulting, and Safety Education
RECOMMENDATION: Add new: "(d) Automatic Restarting. A motor that can restart automatically after shutdown shall not be installed if its automatic restarting can result in injury."
SUBSTANTIATION: A comment submitted in the last Code cycle would have returned this section to its 1996 wording. The Panel rejected this, asserting that rightfully it belonged elsewhere in the Code, notwithstanding the fact that it has been located here in the versions of the Code from 1956 through 1996, following its presence in the Code from 1947 through 1953 as Section 4333. See Comments 11-22 and 11-23 on Proposal 11-45, located on page 525 of the '98 ROC. If this proposal does not sit quite right, perhaps you can accept it in principle, or refer it to the Correlating Committee.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is too general in its application to be practical.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

COMMENT ON AFFIRMATIVE:
SAUNDERS: See my Comment on Affirmative on Proposal 11-54.

(Log #4228)

11- 56 - (430-83(a)(1)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Controllers, other than inverse time circuit breakers and molded case switches, shall have horsepower ratings at the application voltage not lower than the horsepower rating of the motor. A controller for a Design E motor or a Design B energy efficient motor rated more than 2 hp shall (1) be marked as rated for use with a Design E motor or a Design B energy efficient motor, or (2) have a horsepower rating not less than 1.4 times the rating of a motor rated 3 through 100 hp, or not less than 1.3 times the rating of a motor rated over 100 hp.
SUBSTANTIATION: The added language correlates with the CMP 11 decision to treat Design B energy efficient motors the same as Design E motors for the purposes of setting instantaneous trip circuit breaker parameters in the last code cycle. That decision was substantiated on the basis of locked-rotor inrush currents equivalent to Design E motors. The provisions in this section for Design E motors (see A95 Proposal 11-69) used identical substantiation, having to do with motor currents under locked-rotor conditions. Since identical substantiation was used in the 1996 code cycle to change both this section and Section 430-52(c)(3) Exception No. 1, it doesn't seem technically consistent to now again change the rules for one section and not the other.
PANEL ACTION: Reject.
PANEL STATEMENT:
The exception in 430-52 allows the higher setting of instantaneous trip for Design B energy efficient motors only if needed to start the motor. A requirement for all motor controllers for Design B energy efficient motors to be marked, or, perhaps, have a larger horsepower rating is not justified. The submitter has presented no evidence of problems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
HAMER: See my Comment on Affirmative on 11-12.
WRIGHT: See the table of Locked-rotor currents for Design B motors. There is no separate table for energy efficient Design B motor.

MAXIMUM LOCKED-ROTOR CURRENT FOR 60-Hz DESIGN B, C, AND D MOTORS AT 230 VOLTS

Hp	Locked-Rotor Current, Amperes*	Design Letters
1/2	20	B, D
3/4	25	B,D
1	30	B, C, D
1 –1/2	40	B, C, D
2	50	B, C, D
3	64	B, C, D
5	92	B, C, D
7 – 1/2	127	B, C, D
10	152	B, C, D
15	232	B, C, D
20	290	B, C, D
25	365	B, C, D
30	435	B, C, D
40	580	B, C, D
50	725	B, C, D
60	870	B, C, D
75	1085	B, C, D,
100	1450	B, C, D
125	1815	B, C, D
150	2170	B, C, D
200	2900	B, C

*The locked-rotor current of motors designed for voltages other than 230 volts shall be inversely proportional to the voltages.

(Log #3879)

11- 57 - (430-83(a)(2)): Reject
SUBMITTER: J. Philip Simmons, Simmons Electrical Services
RECOMMENDATION: Revise text as follows:
2. A branch-circuit inverse time circuit breaker rated in amperes not less than the full-load current of the motor shall be permitted as a controller for all motors, including Design E. Where this circuit breaker is also used for overload protection, it shall conform to the appropriate provisions of this article governing overload protection.
SUBSTANTIATION: It seems this subsection is incomplete without the added wording. Obviously, a circuit breaker needs to be rated for the full-load current of the motor to be suitable for use as a controller for the motor.
PANEL ACTION: Reject.

PANEL STATEMENT: The ampere rating of the circuit breaker is required to be at least 115 percent of the full-load current rating of the motor, in accordance with 430-110(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1113)

11- 57a - (430-83(a)(3) (New)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: Add new 430-83(a)(3), to read as follows:
"(3) Molded Case Switch. A molded case switch rated in amperes shall be permitted as a controller for all motors, including Design E."
SUBSTANTIATION: Molded case switches are essentially molded case circuit breakers without overload trip mechanisms, and are rated in amperes but not in horsepower. 430-83(a)(1) requires that, for use with Design E motors, they be so identified or be effectively derated. This proposal is to provide for use of molded case switches as controllers in a manner similar to 430-83(a)(2) for circuit breakers.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #910)

11- 58 - (430-90, Exception): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete exception.
SUBSTANTIATION: Editorial. Part C specifies maximum ratings of fuses for overload protection, i.e., 115 or 125 percent, but does not preclude lower values. Where fuses are used for this application they will normally be time-delay types to allow for motor starting. If a lower than maximum rating is used which allows a smaller fuseholder, this is already covered in the rule.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception is needed to facilitate the use of time delay (dual-element) fuses at less than the maximum sizes permitted in 430-52.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3768)

11- 58a - (430-91): Reject
SUBMITTER: James L. Boyer, Firetrol, Inc.
RECOMMENDATION: Reword 430.91. Delete the existing first sentence and replace with new first sentence to read:
430.91. Motor Controller Enclosure Types. An enclosure type number shall be marked on the motor controller enclosure. ~~Table 430-91 provides a basis for selecting enclosures for use in specific locations, other than hazardous (classified) locations.~~ The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings. These internal conditions shall require special consideration by the installer and user.
FPN: See Chapter 9, Table ?, Enclosure Type Number Designations.
~~Table 430-91. Motor Controller Enclosure Selection.~~
Note: Delete Table 430-91 from Section 430, restructure and relocate to Chapter 9 as follows:
SUBSTANTIATION: Type designations are used on enclosures for other than motor controllers, such as switch and circuit breaker enclosures and could be used on transformer, panelboard, switchgear, and other enclosures. They are also used on devices, such as pilot lights, pushbuttons and could be used on fittings, operators, junction boxes, lighting enclosures, etc. By relocating Table 430-91 to Chapter 9, other Sections of the Code refer to it without referencing a section dedicated to motors and controllers.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is not aware of any other sections in the Code that refer to the NEMA enclosure type designations. The panel does not have the authority to relocate the Table to Chapter 9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

Table ~~430-91~~?. ~~Motor Controller~~ Enclosure and Device ~~Selection~~ Type Number[1] Designations.

For Outdoor Use							
Provides a Degree of Protection Against the Following Environmental Conditions	Enclosure Type Number[1]						
	3	3R	3S	4	4X	6	6P
Incidental contact with the closed equipment	X	X	X	X	X	X	X
Rain, snow, and sleet	X	X	X	X	X	X	X
Sleet[2]	—	—	X	—	—	—	—
Windblown dust	X	—	X	X	X	X	X
Hosedown	—	—	—	X	X	X	X
Corrosive agents	—	—	—	—	X	—	X
Occasional temporary submersion	—	—	—	—	—	X	X
Occasional prolonged submersion	—	—	—	—	—	—	X

For Indoor Use										
Provides a Degree of Protection Against the Following Environmental Conditions	Enclosure Type Number[1]									
	1	2	4	4X	5	6	6P	12	12K	13
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X
Falling liquids and light splashing	—	X	X	X	X	X	X	X	X	X
Circulating dust, lint, fibers, and flyings	—	—	X	X	—	X	X	X	X	X
Settling airborne dust, lint, fibers, and flyings	—	—	X	X	X	X	X	X	X	X
Hosedown and splashing water	—	—	X	X	—	X	X	—	—	—
Oil and coolant seepage	—	—	—	—	—	—	—	X	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	—	—	—	—	X
Corrosive agents	—	—	—	X	—	—	X	—	—	—
Occasional temporary submersion	—	—	—	—	—	X	X	—	—	—
Occasional prolonged submersion	—	—	—	—	—	—	X	—	—	—

[1] ~~Enclosure type~~ Type number shall be marked on ~~the motor controller~~ enclosure or device.
[2] External mechanical operating ~~M~~mechanism(s) shall be operable when ice covered.

(Log #2974)

11- 59 - (Table 430-91): Accept
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Delete the word "Occasional" (two places) from Table 430-91 before prolong submersion under both the outdoor use and indoor use.
SUBSTANTIATION: Even though Table 2-1 of NEMA Standard 250 includes the word "Occasional" before prolong submersion, the definition in NEMA 250 for an Enclosure Type 6P does not. Does occasional prolonged submersion indicate an application where an enclosure is submerged once a year for 364 days? Removing the word "Occasional" will clarify the table.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2975)

11- 60 - (Table 430-91): Accept in Principle
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Add Enclosure Types 3X, 3RX, and 3SX to Table 430-91. Motor Controller Enclosure Selection for Outdoor Use. The new Enclosures Types shall be indicated as follows:

	3X	3RX	3SX
Incidental contact with the enclosed equipment	X	X	X
Rain, snow, and sleet	X	X	X
Sleet 2	—	—	X
Windblown dust	X	—	X
Hosedown	—	—	—
Corrosive agents	X	X	X
Occasional temporary submersion	—	—	—
Occasional prolonged submersion	—	—	—

SUBSTANTIATION: These enclosures are the same as the 3, 3R, and 3S with the exception that they have been evaluated for protection against corrosive agents. Enclosures without this degree of protection will corrode due to condensation and weathering. Enclosure without protection are corroding and leaving conductors exposed. This is a safety issue and is more prevalent in the south where higher humidity exists.
NEMA Standard 250 has adopted these designators and will publish them in the next publication of this standard.
PANEL ACTION: Accept in Principle.
Accept the proposal as modified by deleting "occasional" before "prolonged submersion" in accordance with the action on Proposal 11-59.
PANEL STATEMENT: The Panel action should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3094)

11- 61 - (430-94): Accept in Principle
Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to referencing an entire article. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise 430-94 as follows:
Motor control centers shall be provided with overcurrent protection in accordance with Article 240 ~~based on~~ with a maximum rating not to exceed the rating of the common power bus. This...
SUBSTANTIATION: This section has been improperly interpreted to mean that the overcurrent device must match exactly with the rating of the power bus. The added wording will clarify that it is permissible and sometimes desirable to protect the MCC with a reduced rating for the main overcurrent protection.
PANEL ACTION: Accept in Principle.
End the first sentence after "Article 240" and add a new second sentence as follows:
"The ampere rating or setting of the overcurrent protective device shall not exceed the rating of the common power bus."
(Remainder of paragraph unchanged.)
PANEL STATEMENT: The revised wording meets the submitter's intent and is less subject to misunderstanding than the proposed wording.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #904)

11- 62 - (430-95, Exception (New)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add after second paragraph exception to read as follows:
Exception: Where used as service equipment on high-impedence grounded neutral systems in accordance with Section 250-27, a main bonding jumper shall not be required.

SUBSTANTIATION: The proposal is essentially the same as the exception for Section 384-3(c). Since this article covers motor control centers, one may conclude Section 384-3(c) does not apply. Though most impedance grounded systems may not be directly supplied by service conductors, they should be covered where used as service equipment.
PANEL ACTION: Accept in Principle.
After the second paragraph, add an exception to read as follows:
" Exception: High-impedance grounded neutral systems shall be permitted to be connected as provided in 250-36."
PANEL STATEMENT: The panel action corrects the reference to that in the 1999 NEC, and is consistent with the language in 250-28, Exception No. 2. The panel action should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #557)

11- 63 - (Table 430-97): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 430-97 to add the metric values and delete the note regarding unit conversions.
(Table shown below)
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.

Table 430-97. Minimum Spacing Between Bare Metal Parts

	Opposite Polarity Where Mounted on the Same Surface		Opposite Polarity Where Held Free in Air		Live Parts to Ground	
	mm	in.	mm	in.	mm	in.
Not over 125 volts, nominal	19	3/4	13	1/2	13	1/2
Not over 250 volts, nominal	32	1 1/4	19	3/4	13	1/2
Not over 600 volts, nominal	50	2	25	1	25	1

~~Note: For SI units, 1 in. = 25.4 mm.~~

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #905)

11- 64 - (430-97(a), Exception and (f) (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise exception for (a) to read as follows:

Exception: Conductors shall be permitted to ~~travel~~ be run horizontally through vertical sections where such conductors are isolated from the busbars by a barrier or factory-installed busbar insulation.

Add:

(f) High-Leg Marking. Where a motor-control center is supplied by a 4-wire 3-phase delta-connected system, where the midpoint of one phase is grounded, that phase busbar or conductor having the highest voltage to ground shall be durably and permanently marked by an outer finish that is orange in color.

SUBSTANTIATION: Factory-installed busbar insulation can provide satisfactory separation and negate the need for field-installed barriers and raceways where conductors enter the "wrong" section.

Though switchboads and motor-control centers may be similar in construction, it appears from this article and Article 384 they are construed as different equipment. If the marking for switchboards and panelboards is necessary for safety, such marking is also warranted for motor-control centers.
PANEL ACTION: Reject.
PANEL STATEMENT: A factory-installed insulated busbar does not provide the same level of safety as a barrier. The submitter has not provided documentation of problems in the field with respect to the recommended marking of motor-control centers.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1824)

11- 65 - (430-98(c) (New)): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Add new paragraph (c) to read as follows:

Circuit Directory. All motor control centers shall have their circuits and circuit modifications legibly identified as to their purpose or use at each disconnecting means on the front of the motor control center.
SUBSTANTIATION: This will provide a new rule in Part H of Article 430 that will ensure compliance with existing Section 110-22. This reference cannot be found in this part in the present code.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed language is not necessary. Marking is already required by 110-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2882)

11- 66 - (430-102(a) Exception No. 2): Reject
SUBMITTER: Lynn P. Swathwood, Electrical Contracting, Inc.
RECOMMENDATION: Add second sentence to the exception to read:

Types of equipment to include, metal and woodworking machines, conveyors and hoists.

SUBSTANTIATION: This addition will help clarify the types of machinery to be considered and make the Section consistent with Section 430-112. These machines have multiple motors and are controlled from a single location that includes a master disconnecting means. This will help to interpret these types.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing exception is clear, therefore the list is not necessary. Other types of machines would apply in addition to those listed in the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4229)

11- 67 - (430-102(a) Exception No. 2): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc
RECOMMENDATION: Revise as follows:

Exception No. 2: A single disconnecting means shall be permitted for a group of coordinated controllers that drive several parts of a single machine or piece of apparatus. The disconnecting means shall be located in sight from the controllers and the controllers shall be located in sight from the machine or apparatus.

SUBSTANTIATION: The present wording requires the disconnect and the controllers to be in sight of the machine. There are many layouts on large machines where that condition could be met with the disconnect completely out of sight of the controllers. The 1996 NEC precluded this possibility by requiring adjacent locations; the exception only gave relief to the individual disconnect requirement. Although the increased flexibility inherent in dropping the word "adjacent" is generally justified, the idea that the disconnect could be entirely out of sight of the controllers it disconnects is a safety hazard and not substantiated. This proposal preserves the intended flexibility in the 1999 change, while correcting the problem.
PANEL ACTION: Accept in Principle.
Revise as follows:

"Exception No. 2: A single disconnecting means shall be permitted for a group of coordinated controllers that drive several parts of a single machine or piece of apparatus. The disconnecting means shall be located in sight from the controllers and both the disconnecting means and the controllers shall be located in sight from the machine or apparatus."

PANEL STATEMENT: As proposed the disconnecting means would not be required to be in sight of the machine or apparatus. The panel action should meet the submitters intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COX: The submitter provides no substantiation of any problems caused by the present wording.

(Log #4074)

11- 68 - (430-102(b)): Accept in Principle
SUBMITTER: Michael I. Callanan, IBEW
RECOMMENDATION: Add a second sentence to read:

"The disconnecting means required in accordance with 430-102(a) may also serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location."

Remove the exception in 430-102(b).
SUBSTANTIATION: Current wording allows for the motor disconnecting means to be an unlimited distance from the motor as long as the disconnecting means for the controller can be locked in the open position. There are two serious safety issues. When the distance is excessive, workers attempt to work the equipment "hot," rather than walk the distance four times. The other issue concerns the worker who gets "hung up" and the disconnecting means is not within sight. This proposal will reduce accidental injuries and death, at very minor incremental cost to the owner.
PANEL ACTION: Accept in Principle.
Revise Section 430-102(b) to read as follows:

"(b) Motor. A disconnecting means shall be located in sight from the motor location and the driven machinery location. The disconnecting means required in accordance with 430-102(a) shall be permitted to serve as the disconnecting means for the motor if it is located in sight from the motor location and the driven machinery location.

Exception: The disconnecting means shall not be required to be in sight of the motor if such a location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property and the disconnecting means is individually capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be

permanently installed on or at the switch or circuit breaker used as the disconnecting means.

FPN: Some examples of increased or additional hazards include, but are not limited to; motors rated in excess of 100 hp, multi-motor equipment, submersible motors, motors associated with variable frequency drives and motors located in hazardous (classified) locations."

PANEL STATEMENT: The panel recognizes that where practicable the motor disconnecting means shall be located within sight from the motor or driven machinery location. In some installations however, the placement of the disconnecting means at a location in sight of the motor could result in an installation which introduces a greater or increased hazard. The panel has revised the exception to limit the application of the exception so that the motor disconnect is permitted to be located remotely only if it would result in an additional or increased hazard or it is impracticable to locate it within sight of the motor. A FPN was added to clarify examples of some of the types of increased or additional hazards.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 4

EXPLANATION OF NEGATIVE:

COX: "Practicable" is synonymous with "practical". The style manual (3.2.1) lists "practical" as a term that is possibly unenforceable and vague and states that the NEC shall not contain requirements that are unenforceable and vague. Every local disconnect installation could be argued as practicable or impracticable depending on the point of view.

It could also be argued that the addition of a local disconnect increases the hazards to persons or property for every installation. The local disconnect adds one more electrical device into the motor circuit. That device can fail through abuse, can be wired incorrectly, can fault to ground, can short circuit and can be operated by unqualified persons. This is the only location in the electrical system that unqualified persons can be easily exposed to live circuits, even with the disconnecting means in the off position.

The panel recognizes, in the exception, that local disconnects may introduce additional or increased hazards for certain installations and shall not be required for those installations. If those installations are considered "safe" without local disconnects, then the only logic remaining for requiring local disconnects for other installations would have to be for convenience. NEC 90-1(b) points out that compliance with the code will result in installations that are free from hazards, but are not necessarily efficient, convenient, etc. The convenience required, by adoption of this proposal, is not necessary for safety and would be costly to implement. Additional wiring and conduit would be needed for each motor.

The original substantiation discussed working the equipment "hot" when the distance to the disconnecting device is excessive. When working on motors, the easiest place to get at the wiring is the controller for checking for motor problems, not at the motor itself. Substantiation also mentions those getting "hung up". The local start-stop or E-stop is the proper safety shutdown for a motor; not the disconnect. Disconnects are not designed to be used as controllers.

Enforced OSHA lockout/tagout and NFPA 70E regulations referenced in the existing Fine Print Note are the means for safely installing and maintaining all electrical equipment, including motors. The chemical Industry has hundreds of thousands of motor installations around the world and has achieved an excellent safety record through utilization of lockout/tagout procedures as required by OSHA.

HAMER: When the Lockout/Tagout requirements within the NFPA 70E and OSHA are followed, additional disconnect safeguards are not required for personnel safety. This information is highlighted by the existing FPN. Additional disconnects add complexity without safety improvement benefits. The petroleum industry has a record of safe operation using the current National Electrical Code requirements in combination with the Lockout/Tagout requirements of NFPA 70E.

SAUNDERS:

- Insufficient substantiation of a problem relative to the lack of use of a disconnect in sight of the motor for all applications was not provided;
- The use of the term "impracticable" in the exception is not enforceable. The present text is enforceable and well understood as it exists;
- The present regulations for lockout (i.e. OSHA 1910.147 and NFPA 70E) provide safeguards for the motor installation and applications covered by this article where the regulations and practices are followed and enforced.

The Panel Action could consider a proposed dealing with this issue where "conditions of maintenance and supervision" address the concern where requiring an additional lockable disconnect in sight from the motor or motor driven machinery is not required. This would address the concerns of the companies where OSHA 1910.147 and NFPA 70E lockout tagout regulations and procedures are followed and strictly enforced. In locations where these conditions are not met, the added disconnecting device would be required and help ensure lockout of equipment as required by OSHA 1910.147 and NFPA 70E.

THOMAS: The existing text is adequate to provide a safe installation.

COMMENT ON AFFIRMATIVE:

NAUGHTON: This proposal allows personnel the satisfaction of visually seeing the locked out disconnecting means while the repair or maintenance is being performed, which permits for a safe job as well as reducing the chance of a potential hazardous situation.

SAPORITA: I vote affirmative with three comments: (1) We did not discuss the existing FPN at the end of 430-102(b) and as such it needs to be made clear that it should remain, probably as "FPN No. 2" while labeling the new FPN as "FPN No. 1." (2) In the first sentence of the new exception, the phrase ", required in accordance with 430-102(a)," should be added after the third "disconnecting means" and before "is individually capable...". This added phrase clarifies which disconnecting means "is individually capable of being locked in the open position." (3) While it is difficult to list all of the situations that may introduce "additional or increased hazards" the examples in the FPN would better serve the design engineering community if they were part of the specific text of the exception.

(Log #2926)

11- 69 - (430-102(b), Exception): Accept in Principle

SUBMITTER: Frank Pologruto, Rep. IBEW L.U. 98

RECOMMENDATION: Delete the Exception in Section 430-102(b).

SUBSTANTIATION: On many jobs that I have worked on, disconnect switches are not within sight of the motors to be serviced, leaves many electricians as well as myself with an uncomfortable feeling. Some buildings have motor control centers that are capable of being locked out. However, how do you lock out a circuit breaker that is not capable of being locked out? This was true on one particular job that we serviced.

As electricians we look at this exception as being questionable as to who has the authority to lock as well as unlock the disconnect switch. There is a very good possibility that a disconnect switch can be unlocked and energized when a maintenance personnel is asked to turn on a specific exhaust fan because of odors they want to exhaust out of a room. This has happened to one of our electricians and fortunately he was warned just prior to the lock being cut off and the fan being energized. While this may be a rare incident, it could have been a deadly one!

The only sure way that personnel is in control of the switch, is to have the disconnect located within sight of the motor!

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel action on Proposal 11-68 should meet the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 4

EXPLANATION OF NEGATIVE:

COX: "Practicable" is synonymous with "practical". The style manual (3.2.1) lists "practical" as a term that is possibly unenforceable and vague and states that the NEC shall not contain requirements that are unenforceable and vague. Every local disconnect installation could be argued as practicable or impracticable depending on the point of view.

It could also be argued that the addition of a local disconnect increases the hazards to persons or property for every installation. The local disconnect adds one more electrical device into the motor circuit. That device can fail through abuse, can be wired incorrectly, can fault to ground, can short circuit and can be operated by unqualified persons. This is the only location in the electrical system that unqualified persons can be easily exposed to live circuits, even with the disconnecting means in the off position.

The panel recognizes, in the exception, that local disconnects may introduce additional or increased hazards for certain installations and shall not be required for those installations. If those installations are considered "safe" without local disconnects, then the only logic remaining for requiring local disconnects for other installations would have to be for convenience. NEC 90-1(b) points out that compliance with the code will result in installations that are free from hazards, but are not necessarily efficient, convenient, etc. The convenience required, by adoption of this proposal, is not necessary for safety and would be costly to implement. Additional wiring and conduit would be needed for each motor.

The original substantiation discussed using a circuit breaker that was not capable of being locked. In this installation, the existing exception does not apply and a local disconnect is already required. Further statements indicate lack of proper procedures and training, required by OSHA, when anyone can cut off locks from equipment that has been locked-out. Adding another disconnecting means will not remedy this unsafe situation.

Enforced OSHA lockout/tagout and NFPA 70E regulations referenced in the existing Fine Print Note are the means for safely installing and maintaining all electrical equipment, including motors. The chemical Industry has hundreds of thousands of motor installations around the world and has achieved an excellent safety record through utilization of lockout/tagout procedures as required by OSHA.

HAMER: See my Explanation of Negative Vote on 11-68 (Log #4074).

SAUNDERS:

- Insufficient substantiation of a problem relative to the lack of use of a disconnect in sight of the motor for all applications was not provided;
- The use of the term "impracticable" in the exception is not enforceable. The present text is enforceable and well understood as it exists;
- The present regulations for lockout (i.e. OSHA 1910.147 and NFPA 70E) provide safeguards for the motor installation and applications covered by this article where the regulations and practices are followed and enforced.

The Panel Action could consider a proposed dealing with this issue where "conditions of maintenance and supervision" address the concern where requiring an additional lockable disconnect in sight from the motor or motor driven machinery is not required. This would address the concerns of the companies where OSHA 1910.147 and NFPA 70E lockout tagout regulations and procedures are followed and strictly enforced. In locations where these conditions are not met, the added disconnecting device would be required and help ensure lockout of equipment as required by OSHA 1910.147 and NFPA 70E.

THOMAS: See my Explanation of Negative Vote on Proposal 11-68.

COMMENT ON AFFIRMATIVE:

NAUGHTON: See my Comment on Affirmative on Proposal 11-68.

(Log #4004)

11- 70 - (430-102(b), Exception): Accept in Principle

SUBMITTER: James T. Dollard, Jr., IBEW Local Union 98/Rep. IBEW Eastern Code Advisory Group

RECOMMENDATION: Revise text as follows:

430-102(b) Exception: A disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430-102(a), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position. Circuit breakers without permanent provisions for applying a lock shall not be considered as capable of being locked in the open position.

SUBSTANTIATION: The problem with the present wording of this exception is that the disconnect in many motor applications is a circuit breaker in a panelboard that is not made with permanent provisions for locking the circuit breaker in the open position. This clearly does not meet the requirements of 430-102(b), Exception. The exception states capable of being locked. With lock in hand an installer/maintainer can apply it and work safely. This language does not include "through the use of a device which will permit a lock to be utilized."

However, the onset of circuit breaker locking devices have given the impression that any circuit breaker is capable of being locked in the open position.

Circuit breaker lockout devices are not permitted by OSHA. OSHA requires that they be approved (listed by National Recognized Testing Laboratory). None are listed. If these devices were recognized by OSHA then the NEC would expect that installer/maintainers would each carry dozens of different accessory devices to safely lockout motor power sources. This is not practical.

Permanent provisions for making circuit breaker capable of being locked in the open position are readily available from manufacturers today.

This proposal does not represent a large increase in the cost of an installation but will result in a dramatic increase in safety.

Where motors are involved we know that regular maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

The practical safeguarding of persons from electrical hazards as detailed in the scope of the NEC must not be permitted to hinge on whether or not an installer just happens to have a device that happens to fit the circuit breaker in an installation.

Where motors are involved we know that regular maintenance will take place, we must ensure that only a lock is needed by an installer/maintainer to work safely.

PANEL ACTION: Accept in Principle.

Add the following to 430-102(b), Exception:

"The provision for locking or adding a lock to the disconnecting means shall be permanently installed on or at the switch or circuit breaker used as the disconnecting means."

PANEL STATEMENT: The requirement should also apply to switches. Positive wording is more user-friendly.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

COMMENT ON AFFIRMATIVE:

NAUGHTON: See my Comment on Affirmative on Proposal 11-68.

(Log #353)

11- 71 - (430-107): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add:

Switches and circuit breakers in accordance with Exception No. 1 for Section 380-8 shall be considered as meeting this requirement.

SUBSTANTIATION: This section requires, in effect an additional disconnecting means where a disconnect is busway-mounted. If a motor circuit is not supplied, Exception No. 1 for Section 380-8 doesn't require the disconnect to be readily accessible. The requirement for floor operated means appears to be in lieu of readily accessible.

PANEL ACTION: Reject.

PANEL STATEMENT: It is imperative that at least one disconnecting means be readily accessible for safety reasons. The example of 380-8, Exception No. 1 is not intended to apply to motor circuits.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #906)

11- 72 - (430-107): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

At least one ~~One~~ of the disconnecting means shall be readily accessible.

SUBSTANTIATION: Editorial. Literal wording suggests that readily accessible is limited to one disconnecting means and not permitted for additional disconnecting means, where used.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

(Log #1984)

11- 73 - (430-109, FPN (New)): Reject
SUBMITTER: Gordon T. Davis, Moeller Electric Corp.
RECOMMENDATION: Add a fine print note after Section 430-109 to read as follows:
FPN: A listed combination controller consists of a magnetic or solid state controller with disconnecting means. It may also have short circuit and overload protection. The components of a listed combination controller are associated by tests and markings and are rated as a unit.
SUBSTANTIATION: Statement of Problem: There is no definition of a combination controller found in NFPA 70. Because of this lack of definition it has been and remains a concern of industry that the disconnecting means of some listed combination controllers might be unrecognizable to the authorities having jurisdiction (AHJ).
Substantiation: The proposal was accepted by CMP 11 in the 1999 Code Cycle Report on Proposal (11-104), but rejected in the Report on Comments (11-64). The comment found in the Report on Comments would indicate a more serious problem than that found in the Statement of Problem and a greater need for a definition of a combination controller.
The comment indicated that putting together devices found in Article 430 "in some type of combination fashion was not unique". We believe this to be in error and could possibly lead to a misinterpretation of the listing product standards by an authority having jurisdiction.
Many components of combination controllers are unique only to that listing. For example magnetic-only circuit breakers can only be used in a combination controller when the Type D combination tests are performed by the listing agency and suitably marked; the components of a listed Type D combination controller are unique to that listing. All combination controllers with high capacity short circuit ratings are tested, marked and listed by the listing agency; the components in the high capacity short-circuit combination controllers are unique to that listing. The listing product standards do not allow the assembly of components in just any fashion.
Although it is possible to assemble components together in a manner that simulates a combination controller, that assembly would not be listed and would have to be further evaluated by the authority having jurisdiction for suitableness. In such cases the definition of a listed combination starter would prove to be helpful to the authority having jurisdiction which is reflected in the statement of problem.
A listed combination controller is not just an assembly of components. A listed combination contoller consists by definitions found in the respective UL 508 and IEC 60947 of the following:
a. disconnecting means
b. a magnetic or solid state controller
c. optional short circuit and overload protection
d. tested ratings and markings by listing (certifying) agency.
The definition of a combination controller will help the authority having jurisdiction, installer, and user recognize the components of combinations controller its ratings, and markings.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The FPN is not necessary because listed combination motor controllers are so marked.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4230)

11- 74 - (430-109(a)(1)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
A listed motor-circuit switch rated in horsepower. For Design E motors or Design B energy efficient motors rated greater than 2 hp, the motor circuit switch shall be either (a) marked as rated for use with Design E motors or Design B energy efficient motors or (b) have a horsepower rating not less than 1.4 times the rating of a motor rated 3—100 hp, or not less than 1.3 times the rating of a motor rated over 100 hp.
SUBSTANTIATION: The added language correlates with the CMP 11 decision to treat Design B energy efficient motors the same as Design E motors for the purposes of setting instantaneous trip circuit breaker parameters in the last code cycle. That decision was substantiated on the basis of locked-rotor inrush currents equivalent to Design E motors. The provisions in this section for Design E motors (see A95 Proposal 11-91a) used identical substantiation, having to do with motor currents under locked-rotor conditions. Since identical substantiation was used in the 1996 code cycle to change both this section and Section 430-52(c)(3) Exception No. 1, it doesn't seem technically consistent to now again change the rules for one section and not the other.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception in 430-52 allows the higher setting of instantaneous trip circuit breakers for Design B energy efficient motors only if needed to start the motor. Requiring all motor-circuit switches used with Design B energy efficient motors to be marked or, perhaps, have a larger horsepower rating is not justified. The locked-rotor currents of energy efficient Design B motors are within standard switch ratings. The submitter presents no evidence of problems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
WRIGHT: See my Comment on Affirmative on Proposal 11-56.

(Log #596)

11- 75 - (430-109(a)(6)): Reject
SUBMITTER: Gordon T. Davis, Klockner-Moeller Corp.
RECOMMENDATION: Revise as follows:
Listed manual motor controllers additionally marked "Suitable as Motor Disconnect" shall be permitted as a disconnecting means where installed between the final motor branch circuit short-circuit and ground-fault protective device and the motor.
A listed manual motor controller additionally marked as "Suitable for Motor Disconnect" shall be permitted as a disconnecting means on the line side of motor branch short circuit and ground fault protective devices rated 100 amps or less.
SUBSTANTIATION: Listed manual motor controllers additionally marked as "Suitable for Motor Disconnect" have been tested by a Nationally Recognized Testing Laboratory (NRTL) and comply with the performance requirements of UL 98. Constructionally, a major difference between the distribution equipment found in UL 98 and a listed manual motor controller additionally marked as "Suitable for Motor Disconnect' is that the field wiring terminals for the manual controllers are finger safe per the intent of IEC/EN 60536. The manual controllers' terminals also comply to UL 508 spacings for industrial control equipment.
The need for finger safe disconnects is evidenced by Underwriters Laboratories proposals regarding the safety of maintenance personnel. Maintenance personnel are more vulnerable to shock hazards and energy when working in the vicinity of terminals of distribution equipment that have larger spacings and that were not designed to be finger safe.
Listed manual motor controllers additionally marked as "Suitable for Motor Disconnect" use insulation coordination (UL 840 and IEC 664) to attain a dielectric at the terminals and internal spacings equivalent to the terminals with larger spacings required by UL 98. This insulation coordination allows listed manual motor controllers to be used throughout the world on circuits rated greater than 600 VAC. The insulation coordination is determined by impulse tests that are described in IEC, UL, and NEMA standards.
Listed manual motor controllers have been tested by NRTL to be functionally equivalent to UL 98 distribution equipment (including dielectric of terminals) without the likelihood of shock hazard and energy hazards to maintenance personnel that exists for distribution equipment with the larger spacings terminals that were not designed to be finger safe.
The restriction to 100 amps reflects the actual application limitation of these devices. Because of larger conductors and fuses above 100 amps, devices with larger spacing terminals are usually required.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not support use of these devices on the line side of the motor branch-circuit short-circuit and ground-fault protective device at any level.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4231)

11- 76 - (430-109(f)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
For a cord- and plug-connected motor, a horsepower-rated attachment plug and receptacle having ratings no less than the motor ratings shall be permitted to serve as the disconnecting means for other than a Design B energy efficient or Design E motor, and for a Design B energy efficient or Design E motor rated 2 hp or less. For a Design B energy efficient or Design E motor rated more than 2 hp, an attachment plug and receptacle used as the disconnecting means shall have a horsepower rating not less than 1.4 times the motor rating. A horsepower-rated attachment plug and receptacle shall not be required for a cord- and plug-connected appliance in accordance with Section 422-32, a room air conditioner in accordance with Section 440-63, or a portable motor rated 1/3 hp or less.
SUBSTANTIATION: The added language correlates with the CMP 11 decision to treat Design B energy efficient motors the same as Design E motors for the purposes of setting instantaneous trip circuit breaker parameters in the last code cycle. That decision was substantiated on the basis of locked-rotor inrush currents equivalent to Design E motors. The provisions in this section for Design E motors (see A95 Proposal 11-92a) used identical substantiation, having to do with motor currents under locked-rotor conditions. Since identical substantiation was used in the 1996 code cycle to change both this section and Section 430-52(c)(3) Exception No. 1, it doesn't seem technically consistent to now again change the rules for one section and not the other.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception in 430-52 allows the higher setting of instantaneous trip circuit breakers for Design B energy efficient motors only if needed to start the motor. Requiring all plugs and receptacles used as disconnects for Design B energy efficient motors to perhaps, have a larger horsepower rating is not justified. The submitter provides no evidence of problems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
EXPLANATION OF NEGATIVE:
COMMENT ON AFFIRMATIVE:
HAMER: See my Comment on Affirmative on 11-12 (Log #3959).
WRIGHT: See my Comment on Affirmative on Proposal 11-56.

(Log #2812)

11- 77 - (430-112, Exception (a)): Reject
SUBMITTER: Bud Swathwood, Bud Swathwood Consulting
RECOMMENDATION: Add "conveyors" between "cranes" and "and" to read:
"... such as metal and wood machines, cranes, conveyors and hoists.
SUBSTANTIATION: This will make it clear that conveyors should be considered as these types of machines with multiple motor. Also see Section 430-102 proposal.
PANEL ACTION: Reject.
PANEL STATEMENT: Conveyors are often not a single machine. The types of machines specified are only examples, and the exception is not limited to these examples.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3782)

11- 78 - (430-113): Accept in Principle
SUBMITTER: Jack H. Zewe, Electrical Consultants, Inc.
RECOMMENDATION: Incorporate wording in section 430-113 similar to that used in section 620-52(b)regarding warning sign requirements for "foreign" voltage sources.

Warning - Foreign Voltage Present
Parts of this controller may remain energized and are not deenergized by this switch.
SUBSTANTIATION: This warning sign is required by section 620, but should also be incorporated in section 430. There is a lot of automation equipment today that is powered by more than one source of power and often, although the main disconnect is turned off, hazardous voltage is still present in the controller.
PANEL ACTION: Accept in Principle.
Add to the end of the paragraph:
"Where multiple disconnecting means are provided, a permanent warning sign shall be provided on or adjacent to each disconnecting means."
PANEL STATEMENT: The proposed wording is too vague with respect to location of the sign. The proposed sign wording too restrictive. The panel action should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
BUNCH: I vote affirmative with comment. I do not agree with trying to place warnings in the code. ANSI has standards which detail warnings and the requirements in wording. Panel members cannot cover properly these requirements to be consistent with ANSI. If a warning is needed in this section of the code, it should be worded to say that a warning in compliance with ANSI is required at stop at that point.
SCHRAM: I understand the intent is to require a warning sign or label, worded as appropriate for the particular circumstances in the installation involved. This could include "foreign" voltage sources in motors, controllers and/or in the disconnecting means, in any combination. In view of all these variables, it was not considered feasible to specify a particular wording. ANSI Z535.4-1998, Standard for Product Safety Signs and Labels, includes details as to what constitutes an adequate sign or label.
I believe further consideration should be given to the location of the marking. It would seem more appropriate to place the sign on the apparatus where the "foreign" voltage is present.

(Log #3092)

11- 79 - (430-113 Exception No. .3 (New)): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action in Article 695. This exemption to a Chapter 4 requirement should be located in the Chapter 6 article. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add a new Exception No. 3 to section 430-113 to read as follows:
430-113. Energy from More than One Source
Exception No. 3: The provisions of this section shall not apply to fire pumps where the alternate source is provided only by an on-site standby generator.
SUBSTANTIATION: Section 695-3(b) is under the purview of NFPA 20, which specifically does not require a disconnecting means under the conditions described.
This is a companion proposal to the proposal on Section 695-3(b)(1).
PANEL ACTION: Accept.
PANEL STATEMENT: The panel requests the TCC refer this action to Panel 15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2259)

11- 80 - (430-121): Accept
Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to referencing entire articles. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Revise text as follows:
Other requirements for circuits and equipment operating at over 600 volts, nominal, are in Article 300 and Article 490.
SUBSTANTIATION: Part B of Article 300 addresses the wiring methods for systems of over 600 volts and should be referenced in Section 430-121.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2973)

11- 81 - (430-123): Reject
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
"Flexible metal conduit, Liquidtight Flexible Nonmetallic Conduit, Type B (LFNC-B) or liquidtight flexible metal conduit not exceeding 6 ft (1.83 m) in length shall be permitted to be employed for raceway connection to a motor terminal enclosure.
Exception: Liquidtight Flexible Nonmetallic Conduit, Type B (LFNC-B), 3/8 Trade Size or larger, shall be permitted to be installed in lengths longer than 6 ft (1.83 m)."
SUBSTANTIATION: This proposal allows Liquidtight Flexible Nonmetallic Conduit, Type B to be used as a raceway for connection to a motor terminal enclosure. LFNC-B exceeds the physical requirements of other raceways currently listed in Section 430-123.
The Exception allows Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) to be used in lengths longer than 6 ft. Section 351-23(a)(5) permits LFNC-B toe used in lengths longer than 6 ft.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 351-23(b)(4) limits the use of this raceway to a maximum of 600 volts.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1106)

11- 81a - (430-125(a)): Accept
NOTE: The Technical Correlating Committee understands that this proposed change is to 430-125(a) Exception.
SUBMITTER: CMP 11
RECOMMENDATION: Change "is permitted" to "shall be permitted".
SUBSTANTIATION: The revision is intended to comply with the NEC Style Manual, 3.1, with respect to mandatory language.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #907)

11- 82 - (430-145): Reject
NOTE: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to referencing entire articles. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Where ~~required~~ employed, grounding shall be done in the manner specified in Article 250.
SUBSTANTIATION: Grounding should be done in a code approved manner, whether required by code, or done by choice. The lack of requirements for optional grounding could result in potential hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter should explain the potential hazard in the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1835)

11- 83 - (430-145(a), FPN): Accept
SUBMITTER: Efren Asinas, City of Orlando, FL
RECOMMENDATION: Add "equipment" before the word "grounding".
SUBSTANTIATION: Adds the correct identification covered by Section 430-12(e). This corrects the NEC and makes the code user friendly.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2040)

11- 84 - (430-145(b)): Accept in Principle
SUBMITTER: Mark O. Wise, Merritt Island, FL
RECOMMENDATION: Revise the last paragraph to read:
"Where stranded leads are used, protected as specified above, they shall not be larger than No. 10 for each strand and shall comply with other requirements of this Code for conductors to be used in raceways."
SUBSTANTIATION: To clarify that each strand should not be larger than No. 10 in order to provide for a vibration tolerant installation.
PANEL ACTION: Accept in Principle.
Revise the last paragraph to read:
"Where stranded leads are used, protected as specified above, each strand shall be not larger than 10 AWG and shall comply with other requirements of this Code for conductors to be used in raceways."
PANEL STATEMENT: Changes are for improved syntax. The panel action should meet the submitter's intent. See also the panel action on Proposal 11-4. The panel solicits public comment on the panel action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
CLOSSON: I vote negatively for the following reasons:
1. Lack of substantiation by the submitter.
2. This requirement is for limitng the size of the leads or conductors used in the separation of the junction box from the motor. It is not defining or limiting the stranding of the lead wire to be used. The third paragraph of Section 430-145(b) is difficult to interpret and, therefore, should be improved, but not as proposed by the submitter or the panel.
WRIGHT: Lack of substantiation. The submitter is changing the requirements of the present code without clear and understandable technical substantiation.

(Log #2474)

11- 85 - (430-152): Reject
SUBMITTER: Jeffrey H. Armstrong, Electrical Training and Consulting Services
RECOMMENDATION: Table 430-152 is used only with 430-52.
Place Table 430-152 with 430-52.
SUBSTANTIATION: For clarification.
PANEL ACTION: Reject.
PANEL STATEMENT: The table is also used with 430-57 and 430-62. See the panel statement on Proposal 11-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GARVEY: While the submitter is not technically correct, the intent of the proposal is clear. Place Table 430-152 within the section where the majority of references are located, 430-52. Of the 11 places Table 430-152 is referenced all but three are within 430-52.

The Panel's Action to accept Proposal 11-48 effectively makes two of the three redundant. This leaves one minor reference to sizing fuseholders in 430-57. Since the majority of the references to the Table are found in 430-52, Section 430-52 is where the Table belongs.

(Log #3163)

11- 86 - (430-152): Reject
SUBMITTER: Jeffrey H. Armstrong, Electrical Training and Consulting Services
RECOMMENDATION: Table 430-152 if used ONLY with Section 430-52.
SUBSTANTIATION: Place Table 430-152 with 430-52 for clarification.
PANEL ACTION: Reject.
PANEL STATEMENT: The table is also used with 430-57 and 430-62. See the panel statement on Proposal 11-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GARVEY: While the submitter is not technically correct, the intent of the proposal is clear. Place Table 430-152 within the section where the majority of references are located, 430-52.

(Log #3455)

11- 87 - (430-152): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Table 430-152 relocated to 430-52 Article.
SUBSTANTIATION: Change Table 430-152 to Table 430-52 to match new Article 430-52.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel has not accepted the proposed relocation of Table 430-152. See the panel action and statement on Proposal 11-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GARVEY: Acceptance of the multiple proposal on this issue will enhance usability. Place Table 430-152 within the section where the majority of references are located, 430-52.

(Log #2603)

11- 88 - (Table 430-152): Reject
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Table 430-152 relocated to 430-52 Article.
SUBSTANTIATION: Change Table 430-152 to Table 430-52 to match new Article 430-52.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel has not accepted the proposed relocation of Table 430-152. See the panel action and statement on Proposal 11-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GARVEY: See my Explanation of Negative Vote on Proposal 11-87.

(Log #3059)

11- 89 - (Table 430-152): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise the table headings as follows:
Change the Type of Motor for Squirrel cage motors designated "Other than Design E" to "Other than Design E or Design B energy efficient." Also change the Type of Motor for Squirrel cage motors designated "Design E" to "Design E or Design B energy efficient."
SUBSTANTIATION: This change correlates with similar changes made to 430-52(c)(3) Exception No. 1 in the 1999 Edition.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

Table 430-152 Maximum Rating or Setting of Motor Branch-Circuit Short-Circuit and Ground-Fault Protective Devices

Type of Motor	Percentage of Full-Load Current			
	Nontime Delay Fuse[1]	Dual Element (Time-Delay) Fuse	Instantaneous Trip Breaker	Inverse Time Breaker[2]
Single-phase motors	300	175	800	250
AC polyphase motors other than wound-rotor				
Squirrel cage— ~~Other than Design E~~	300	175	800	250
Other than Design E or Design B energy efficient ~~Design E~~ Design E or Design B energy efficient	300	175	1100	250
Synchronous[3]	300	175	800	250
Wound rotor	150	150	800	150
Direct Current (constant voltage)	150	150	250	150

Note: For certain exceptions to the values specified, see Sections 430-52 through 430-54.
[1] The values in the Nontime Delay Fuse column apply to Time-Delay Class CC fuses.
[2] The values given in the last column also cover the ratings of nonadjustable inverse time types of circuit breakers that may be modified as in Section 430-52.
[3] Synchronous motors of the low-torque, low-speed type (usually 450 rpm or lower), such as are used to drive reciprocating compressors, pumps, etc., that start unloaded, do not require a fuse rating or circuit breaker setting in excess of 200 percent of full-load current.

(Log #4232)

11- 90 - (Table 430-152): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: In the left column, change "Other than Design E" to "Other than Design E or Design B Energy Efficient" and change "Design E" to "Design E or Design B Energy Efficient."
SUBSTANTIATION: This proposal relieves a direct conflict between the table provisions and the 1999 NEC change in Section 430-52(c)(3) Exception No. 1 that puts high-efficiency Design B motors on the same playing field, in terms of short-circuit and ground-fault protection, as Design E motors. The table should have been changed to correlate with the changes in the exception, but didn't. The result is an anomaly, where if you have a high-efficiency Design B motor you literally can't protect it between 800 percent and 1100 percent, but you can from 1100 percent to 1700 percent.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 440 — AIR-CONDITIONING AND REFRIGERATION EQUIPMENT

(Log #558)

11- 91 - (440): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 440-63, replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".
2. In Section 440-64, replace "10 ft. (3.05 m)" with "3.0 m (10 ft.)".
3. In Section 440-64, replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #911)

11- 92 - (440-1): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence:
The provisions of this article apply to electric motor driven air-conditioning and refrigeration equipment <u>employing a hermetic refrigerant motor compressor,</u> and to the branch circuits and controllers for such equipment.
SUBSTANTIATION: Editorial. Section 440-3(b) assigns other than hermetic type equipment to Articles 422, 424, and 430. However, the first sentence indicates a general application to all types while the second sentence notes special consideration for hermetic types.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommended revision is too restrictive. Article 440 also applies to any air-conditioning and refrigerating equipment that is supplied from a branch circuit that also supplies a hermetic refrigerant motor-compressor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1836)

11- 93 - (440-3(c)): Accept
SUBMITTER: John L. Brantley, III, City of Orlando, FL
RECOMMENDATION: Replace the word "devices" with "equipment".
SUBSTANTIATION: Items listed carry and consume electrical current. See definition of device in Article 100.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1107)

11- 93a - (440-6(a), FPN (New)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: Delete the last sentence and make its text a FPN following Exception No. 2.
SUBSTANTIATION: The revision is intended to comply with the NEC Style Manual, 3.1, with respect to explanatory information.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1108)

11- 93b - (440-11): Accept
SUBMITTER: CMP 11
RECOMMENDATION: Delete the last sentence: See Figure 430-1.
SUBSTANTIATION: The reference is considered unnecessary and possibly confusing. It does not comply with the NEC Style Manual, 3.1, with respect to explanatory information.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #354)

11- 94 - (440-12(a)(1), Exception-(New), (b)(2) Exception (New)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add to (a)(1):
<u>Exception: A listed nonfused motor circuit switch having a horsepower rating not less than the equivalent horsepower determined in accordance with Section 440-12(a)(2) shall be permitted to have an ampere rating less than 115 percent of the specified current.</u>
Add to (b)(2):
<u>Exception: A listed nonfused motor circuit switch having a horsepower rating not less than the equivalent horsepower determined by Section 440-12(b)(1) shall be permitted to have an ampere rating less than 115 percent of the sum of all currents.</u>
SUBSTANTIATION: Since listed nonfused motor circuit switches may be excluded from the 115 percent requirement by the exceptions for Sections 430-110(a) and (c)(2) for the same conditions for other motors, it is reasonable to permit the same exceptions for this article.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #912)

11- 95 - (440-12(b)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first paragraph to read as follows:
(b) Combination Loads. Where ~~one~~ <u>the combined load of two</u> or more hermetic refrigerant motor-compressors ~~are used together or used in combination with~~ <u>or one or more hermetic refrigerant motor-compressors with other motors or loads</u> ~~and where the combined load~~ may be simultaneous on a single disconnecting means, the rating for the ~~combined load~~ <u>disconnecting means</u> shall be determined as follows:.
SUBSTANTIATION: Editorial. "One" motor cannot be used "together". The proposal is intended for clarification. The "rating" appeared to apply to the disconnect as indicated by (a) and (2), not the load.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1109)

11- 95a - (440-12(c)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: Delete the last sentence.
SUBSTANTIATION: The reference is considered unnecessary and possibly confusing. It does not comply with the NEC Style Manual, 3.1, with respect to explanatory information.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1110)

11- 95b - (440-13, FPN (New)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: Delete the last sentence and add a FPN to read as follows:
"FPN: For room air conditioners, see also 440-63."
SUBSTANTIATION: The revision is intended to comply with the NEC Style Manual, 3.1, with respect to explanatory material.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2337)

11- 96 - (440-14): Accept
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new paragraph as follows.
"The disconnecting means shall not be located on panels that are designed to allow access to the air conditioning or refrigeration equipment."
SUBSTANTIATION: This seems to be common sense, and yet there is an increasing problem with these disconnects being installed and access covers. Some have claimed by using flexible conduit that there is still access to the equipment, this may be true, but damage to the raceway and equipment is now a significant concern.
This proposal, if accepted, would give clear guidance on this topic and provide a far safer installation.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #913)

11- 97 - (440-22(c)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Where maximum protective device ratings shown on a manufacturers overload relay ~~heater~~ table for use with a motor controller... (remainder unchanged).
SUBSTANTIATION: Editorial. To provide conformance with more commonly used terminology, as in Section 430-52(c)(2). All overload relay may not utilize heaters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #590)

11- 98 - (440 Part D Heading): Reject
SUBMITTER: Vohn N. Peeler, Faith, NC
RECOMMENDATION: The new heading for part D of Article 440 would be: Conductors
~~Branch Circuit~~ Conductors.
SUBSTANTIATION: I believe that Sections 440-33 and 440-34 are intended to apply to feeders as well as branch circuits. If this is true, then the part D heading should not indicate that it covers branch circuits only.
PANEL ACTION: Reject.
PANEL STATEMENT: Part D of Article 440 applies only to branch circuit conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #4233)

11- 99 - (440-32, Exception): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc
RECOMMENDATION: Add the following exception:
Exception: For a wye-start, delta-run connected motor-compressor, the selection of branch-circuit conductors on the line side of the controller shall be based on the motor-compressor full-load current. The selection of conductors between the controller and the motor-compressor shall be permitted to be based on 58 percent of the motor full-load current.
SUBSTANTIATION: This is essentially the last paragraph of Section 430-22(a) adapted for Article 440 purposes. I received a question regarding a compressor with a rated load current of 751A, which was to be started wye-delta. The question submitter was hoping I could give him some alternative to running twelve sets of conductors figured under the normal 125 percent rule in this section. Since Article 440 amends Article 430 but not vice-versa [see Section 440-3(a)], my only choice was to send him off to the inspector under Section 90-4. I promised I would submit the appropriate proposal to clear up what seems to be a simple oversight, but one which clearly has major implications on large installations.
Editorially, I formatted this as an exception, because that's what it is, an alternate method to the general rule. It shouldn't be an unnumbered, stand-alone paragraph conflicting with what would become the first of two paragraphs otherwise. I also used expressly permissive language. If someone wants to base the conductor calculations on the full-load current all the way through, I saw no reason to forbid it.
PANEL ACTION: Accept in Principle.
Add a new paragraph:
"For a wye-start, delta-run connected motor-compressor, the selection of branch-circuit conductors between the controller and the motor-compressor shall be permitted to be based on 58 percent of either the motor-compressor rated-load current or the branch-circuit selection current, whichever is greater."
PANEL STATEMENT: No exception is needed for the conductors to the controller because the first paragraph still applies to these conductors. The proposal is revised to make the provision applicable to hermetic refrigerant motor-compressors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2956)

11- 100 - (440 Part E): Reject
SUBMITTER: Donald W. Christy, Coraopolis, PA
RECOMMENDATION: Change in code could read and be enforced as follows:
Three Phase Motors shall have all 3 phases interrupted.
Single Phase 220 volt motors shall have both legs interrupted.
Single Phase 120 volt motors shall have interruption in the hot side of line only.
If only one person's life could be saved, this would be worth while.
SUBSTANTIATION: It seems most of the Air Conditioning Companies ignore the National Electrical Code when designing the electrics of air conditioning units. They used to abide by the code, installing two pole contactors on 220 volt compressor and condenser fan circuits. But, as of late, they install single pole contactors to interrupt their circuits. This is wrong because if an installer is not knowledgeable about grounding, and the compressor or fan motor becomes grounded, you have a hot unit which could electrocute a child or person touching the unit outside, maybe even while standing on wet ground. Why they do this disturbs me. Maybe it is to save a few dollars, but at the expense of injury or death to someone at home or their business.
Please refer to the schematics I have provided for example 1 and 2, which show that both compressor and condenser fan motors are in violation of the NEC.
Also shown refers to 120 volt RV unit air conditioners on Airstream trailers. During the 1970's, they installed a relay for condenser and blower fans in the neutral side of the line, allowing the motors to be energized with power while in the off position. When a motor becomes grounded, it tries to run and heats up. This could obviously cause a fire as trailers have rubber tires and usually a block of wood under the tongue. Anyone touching the

trailer could get shocked or electrocuted. Refer to example 3 where compressor is wired correctly but fan and blower motors are interrupted in the neutral side of the line, which is again in violation of the NEC (Revision 1 shows corrections.)
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Use of 2 pole controllers on 3 phase and 1 pole controllers on 240 volt single-phase is not a Code violation. The controller is only required to open a sufficient number of conductors to stop the motor-compressor, unless the controller is also the disconnecting means. See 430-84 and 430-85, which are applicable under Article 440, per 440-3(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
COMMENT ON AFFIRMATIVE:
GARVEY: Placing a relay pole only in the grounded conductor is a violation of 430-85.

(Log #CP1111)

11- 100a - (440-41(a)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: 1. Delete parenthetical reference to Sections 440-6 and 440-7.
2. Change "Use Tables 430-148, 430-149, and 430-150 to determine" to "Tables 430-148, 430-149, and 430-150 shall be used to determine".
3. Change "Use Tables 430-151(A) and 430-151(B) to determine" to "Tables 430-151(A) and 430-151(B) shall be used to determine."
SUBSTANTIATION: 1. The reference is considered unnecessary and possibly confusing. It does not comply with the NEC Style Manual, 3.1, with respect to explanatory information.
2 and 3. The revision is intended to comply with the NEC Style Manual, 3.1, with respect to mandatory language. PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #CP1112)

11- 100b - (440-51, FPN (New)): Accept
SUBMITTER: CMP 11
RECOMMENDATION: Delete the last sentence and add a FPN to read as follows:
"FPN: See 240-3(g) for application of Parts C and F of Article 440."
SUBSTANTIATION: The revision is intended to comply with the NEC Style Manual, 3.1, with respect to explanatory information.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #914)

11- 101 - (440-62(c)): Accept in Principle in Part
NOTE: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal relative to the words "are supplied." This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(c) Where Lighting Units or Other Appliances are also Supplied. The total rating of a cord-and attachment plug-connected room air conditioner shall not exceed 50 percent of the rating of a branch circuit where lighting ~~units~~ outlets, other type appliances, or general-use receptacles are also supplied. Where the circuitry is interlocked to prevent simultaneous operation of the room air conditioner and other outlets supplied a cord- and attachment plug-connected room air conditioner shall not exceed 80 percent of the branch-circuit rating. Where more than one cord- and plug-connected room air conditioner is supplied by the same branch circuit, the provisions of Section 430-53(a) shall apply.
SUBSTANTIATION: General-use receptacles should be included as they are not considered as outlets for general lighting in all occupancies and where no load is plugged in there is no supplied load, only a computed load. Other "type" appliances is proposed to eliminate any inference that other appliances could be another room air conditioner. Where a room air conditioner and baseboard heater, for example, are supplied by the same circuit and interlocked, the 50 percent requirement seems severe since in effect, it is electrically the same as (b). Where there is no product marking specifying an individual circuit, the provisions of Section 430-53(a) appear to be reasonable and economical.
PANEL ACTION: Accept in Principle in Part.
Revise to read as follows:
"(c) Where Lighting Units or Other Appliances are also Supplied. The total rating of a cord-and attachment plug-connected room air conditioner shall not exceed 50 percent of the rating of a branch circuit where lighting ~~units~~ outlets, other appliances, or general-use receptacles are also supplied. Where the circuitry is interlocked to prevent simultaneous operation of the room air conditioner and other outlets are supplied, a cord- and attachment plug-connected room air conditioner shall not exceed 80 percent of the branch-circuit rating."
PANEL STATEMENT: The 50 percent rule should also apply where the other appliance is another cord- and plug-connected room air conditioner.
The proposal is also editorially revised for grammatical correctness.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3146)

11- 102 - (440-62(c)): Reject
SUBMITTER: Dan Mazich, E. Lansing, MI
RECOMMENDATION: Delete entire paragraph 440-62(c).
SUBSTANTIATION: The text is a duplication of 210-23(4). If it is justified to duplicate the rule in Article 440, why not duplicate it in every other appropriate Article of the Code?
PANEL ACTION: Reject.
PANEL STATEMENT: The panel assumes the reference should be to 210-23(a). This section is limited to 15 and 20 ampere branch circuits. 440-62(c) is not limited to such circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3149)

11- 103 - (440-62(c)): Reject
SUBMITTER: Evan Allardyce, Saginaw, MI
RECOMMENDATION: Delete section 440-62(c) and replace it with a fine print note as follows:
FPN: See Section 210-23(a).
SUBSTANTIATION: Unnecessary duplication of the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel assumes the reference should be to 210-23(a). This section is limited to 15 and 20 ampere branch circuits. 440-62(c) is not limited to such circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3327)

11- 104 - (440-65 (New)):
Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.
SUBMITTER: Edward A. Schiff, Technology Research Corp.
RECOMMENDATION: 440-65. Cord Sets with Leakage Current Detection and Interruption Protection
(a) Definition: Cord Sets with Leakage Current Detection and Interruption (LCDI) - a cord set intended to sense leakage currents flowing between or from the conductors of the cord set and interrupt the circuit. If leakage current is allowed to continue flowing from the conductors, risk of ignition of the surrounding combustible materials and risk of serious injury from electrical shock may result.
(b) All single phase cord and plug connected room air conditioners shall be provided with factory installed cord leakage current detection and interruption protection. The LCDI shall utilize air break contacts and be an integral part of the the attachment plug or located in the supply cord within 12 in. (305 mm) of the attachment plug.

SUBSTANTIATION: Electrical cords and plugs are responsible for 7400 fires (attended by the fire service) per year which result in 108 deaths, 539 civilian injuries and $121 million in direct property damage per year in US homes according to The US Home Product Report, 1991-1995 (Appliances and Equipment) published by the NFPA in 1998. The majority of the cord and plug fires were caused by short circuits or ground faults (54.3%). Other electrical failure (23%) and overloads (9.4%) accounted for most of the balance. Following the leadership of the Consumer Products Safety Commission, the electronics Industry Association, AHAM, NEMA, and Underwriters Laboratory, industry has made a significant effort on the development of technologies for improving the safety of electrical products.

The flexible cords on room air conditioners are subjected to excessive abuse during its product life. The power supply cord can be damaged in a number of ways. The cord can be pinched or crimped during installation or storage. The shear mass of the product can permanently damage the cord. Once installed the cord is often within harms way by being pinched by furniture, chewed by a pet or infant or kicked.

This abuse will result in series (broken conductors), parallel (degraded insulation), and/or ground faults in the cord. These conditions will lead to combustion of the cord and/or surrounding material. Examples of recent serious room air conditioner cord fires are contained in table 1 that I have provided. Room and portable air conditioners account for 1,400 fires (attended by the fire service) per year and result in 10 deaths per year, on average according to the NFPA. Considering that these products are primarily used seasonally in the North East, this would equate to approximately 10 fires per day attended by the fire service (not to mention, all the fires which are controlled without calling 911).

In addition, cord damage presents a significant risk of serious injury from shock or death by electrocution. There have also been many incidents of electric shock and even electrocution involving air conditioners. In 1997, an 18-year-old girl was electrocuted in Maryland because a damaged cord was touching the metal frame of her hotel room door. In July of 1999, a seven year old boy in Sabetha, Kansas died from electrocution when he came in contact with a dehumidifier cord on a wet kitchen counter top. Devices which meet this standard sense ground faults, thus providing protection from serious injury from shock or electrocution.

Many precedents exist for incorporating cord LCDI protection for room air conditioners into the code. The safety of service cords has long been viewed as part of the branch circuit wiring by the code for years. Examples include Section 422-49 GFCIs on high pressure spray washers, Section 422-41, Cord and Plug connected appliances subject to immersion (hair dryers), Table 400-4 defining lamp, heater, iron, range, dryer and vacuum cleaner cords, and Article 422 defines a multitude of flexible cord and plug-connected appliance requirements.

A serious safety problem continues to exist. Proven UL recognized / CSA certified cord sets are available from multiple manufacturers which provide this protection at an economical cost. The elimination of these needless deaths is immeasurable and the savings in property losses, injuries, insurance claims, and law suits will be dramatic.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle in Part.

Add a new definition to 440-2 as follows:

"Leakage Current Detection and Interruption (LCDI) Protection. A device provided in a power supply cord or cord set that senses leakage current flowing between or from the cord conductors and interrupts the circuit at a predetermined level of leakage current."

Add a new 440-65 as follows:

"Leakage Current Detection and Interruption (LCDI). Single-phase cord- and plug-connected room air conditioners shall be provided with factory-installed LCDI protection. The LCDI protection shall be an integral part of the attachment plug or be located in the power supply cord within 300 mm (12 in) of the attachment plug."

PANEL STATEMENT: The changes are to (1) comply with the NEC Style Manual; (2) include power supply cords; (3) delete the proposed requirement that air break contacts be provided, as being too restrictive and not substantiated.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 8

EXPLANATION OF NEGATIVE:

BUNCH: There is conflicting data as to actual cause of cited incidents of cord related failures. Although this CDI might lead to a product improvement, it should be regulated through the recognized testing labs and standards, not in the NEC.

COX: Devices, such as proposed, would offer protection of all available portable cord connected devices if they were installed on the branch circuits rather than on individual pieces of equipment. Article 210-12 already provides for similar devices on branch circuits for bedrooms.

HAMER: This should be handled in the product standards, not the National Electrical Code.

RASMUSSEN: The proposal should be rejected. The concept of utilizing advancements in technology to enhance the safety of appliances should be encouraged. However, the submitter's substantiation does not provide clear evidence that the incidents of cord fires cited relate to damage to the room air conditioner supply cord. The involvement of inappropriate extension cords appear to be a factor. For instance, in the Oct. 1998 El Dorado, AR incident, one of the few examples where some detail is given, it states, "The spliced cord was run under a rug across the room, when it overheated and arced." Before requiring such major change to existing room air conditioner requirements, the submitter is encouraged to provide well documented and verifiable examples of specific incidents where the product improvement being recommended would have prevented the unwanted incident from occurring.

SCHRAM: The information on fires alleged to have been caused by overheating or faults in room air conditioner power supply cords, which was presented to the panel, is vague as to the details of the actual causes of the fires. It is not clear from this material a that a LCDI in the air conditioner power supply cord or plug would have prevented any of the reported fires. The substantiation for the proposal refers to the "excessive abuse" potential for room air conditioner cords, but the material presented to the panel contains no details to support this contention. Further, no data was presented to the panel to support the statements in the substantiation concerning electric shock incidents that could have been prevented by use of a LCDI in the cord or plug.

It is my opinion that the NEC is not the proper place for a product safety requirement, such as mandating the factory installation of a LCDI in room air conditioner power supply cords or plugs. I recognize that 422-41 and 422-49 do include similar requirements, but the circumstances that resulted in these code requirements were quite different than the circumstances in this case, and the need was well supported. I would urge the manufacturers of room air conditioners to thoroughly investigate the need for and efficacy of LCDIs on room air conditioners, and if appropriate, revise UL484 to require their use.

SAPORITA: I must vote negative on the panel action. While I believe that this proposal may reduce the likelihood of cord fires, this is a product standards issue.

THOMAS: The cord set with leakage current detection and interruption seems to be a reasonable safety item but I question placing the requirement in the NEC. This is not part of the premises wiring and is not enforceable by the Authority Having Jurisdiction.

WRIGHT: The proposal should be rejected. NEMA agrees with the submitter's concept. However the proposal is too restrictive. There are other methods of providing this protection.

ARTICLE 445 — GENERATORS

(Log #CP1506)

15- 3a - (445): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: CMP 15
RECOMMENDATION: Revise Article 445 as follows:
Add new 445-1 to read as follows:
445-1 Scope. This article covers the installation of generators.
Renumber and retitle existing "445-1 General" as "445-3 Other Articles." (no change in text)
Renumber existing 445-2 through 445-10 to 445.10 through 445.18, respectively.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #1183)

15- 4 - (445-5): Accept in Principle
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Add "or distribution switchboard or panelboard" to the first sentence as follows:
"The ampacity of the conductors from the generator terminals to the first overcurrent device or distribution switchboard or panelboard shall not be less than 115 percent of the nameplate current rating of the generator."
SUBSTANTIATION: The present wording is singular, overcurrent device, and often the generator conductors terminate at a distribution switchboard or panelboard, with or without a main overcurrent device.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation to read as follows"
Revise the first sentence as follows:
"The ampacity of the conductors from the generator terminals to the first distribution device(s) containing overcurrent protection shall not be less than 115 percent of the nameplate current rating of the generator."
PANEL STATEMENT: The revised text meets the intent of the submitter and more clearly expresses the requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
VANNICE: I still have concerns that the feeder bussing in the first distribution device(s) should also be not less than 115 percent. The distribution device is the panelboard and not the feeder bus inside before the overcurrent protection device(s). I do not believe the Panel Action covers that situation.
COMMENT ON AFFIRMATIVE:
EXPLANATION OF ABSTENTION:
KOVACIK: The comments expressed in the negative ballot submitted by Mr. Vannice clearly indicate confusion exists regarding the intent of Section 445-5. The requirement for sizing not less than 115 percent of the nameplate current rating of the generator applies only to conductors. There is no technical substantiation to apply this requirement to panelboads or switchboards in the distribution circuit. This includes all components that are an integral part of panelboards or switchboards such as incoming and feeder bus. The rating on such equipment indicates it suitable without the need for overszing or derating when the rating of the circuit (in this case the generator) does not exceed that of the equipment. Further revisions to Section 445-5 are needed to clarify this.

(Log #4234)

15- 5 - (445-9): Accept
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Add the following sentence at the end:
"Where a horsepower rating is required to determine the required size, the full-load current of the generator shall be compared with comparable motors in Tables 430-147 through 430-150."
SUBSTANTIATION: Generators don't normally have horsepower ratings. The new rule doesn't tell the user how to apply its provisions when the generator doesn't exceed 11 in. in diameter, and thereby falls within Table 430-12(b), first table. This proposal clarifies the procedure.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
COMMENT ON AFFIRMATIVE:
KOVACIK: The recommended procedure should be further clarified by adding text to inform the user how to choose the correct horsepower rating when the generator amp rating is between two horsepower ratings. The text should specify that the higher hp rating shall be used as the choice of the lower hp rating may lead to inadequate generator terminal housing size.

ARTICLE 450 — TRANSFORMERS AND TRANSFORMER VAULTS (INCLUDING SECONDARY TIES)

(Log #573)

13- 2 - (450): Accept in Part
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 450-21(a), replace "12 in. (305 mm)" with "300 mm (12 in.)".
2. In Section 450-21(b) Exception No. 1, replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".
3. In Section 450-21(b) Exception No. 1, replace "12 ft. (3.66 m)" with "3.7 m (12 ft.)".
4. In Section 450-22, replace "12 in. (305 mm)" with "300 mm (12 in.)".
5. In Section 450-26 Exception No. 1, replace "4 in. (102 mm)" with "100 mm (4 in.)".
6. In Section 450-26 Exception No. 6(c), replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
7. In Section 450-42, replace "4 in. (102 mm)" with "100 mm (4 in.)".
8. In Section 450-42 Exception FPN No. 2, replace "6 in. (152 mm)" with "150 mm (6 in.)".
9. In Section 450-43(b), replace "4 in. (102 mm)" with "100 mm (4 in.)".
10. In Section 450-45(c), replace "3 in.^{2} (1936 mm^2)" with "1900 mm^2 (3 in.^{2})".
11. In Section 450-45(c), replace "1 ft.^{2} (0.093 m^2)" with "0.1 m^2 (1 ft.2)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Part.
The panel modifies the following parts of the proposal to read as follows:
1. In Section 450-21(a), replace "12 in. (305 mm)" with "305 mm (12 in.)".
2. In Section 450-21(b) Exception No. 1, replace "6 ft. (1.83 m)" with "1.83 m (6 ft.)".
3. In Section 450-21(b) Exception No. 1, replace "12 ft. (3.66 m)" with "3.7 m (12 ft.)".
4. In Section 450-22, replace "12 in. (305 mm)" with "305 mm (12 in.)".
5. In Section 450-26 Exception No. 1, replace "4 in. (102 mm)" with "100 mm (4 in.)".
6. In Section 450-26 Exception No. 6(c), replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".

7. In Section 450-42, replace "4 in. (102 mm)" with "100 mm (4 in.)".
8. In Section 450-42 Exception FPN No. 2, replace "6 in. (152 mm)" with "150 mm (6 in.)".
9. In Section 450-43(b), replace "4 in. (102 mm)" with "100 mm (4 in.)".
10. In Section 450-45(c), replace "3 in.^{2} (1936 mm^2)" with "1900 mm^2 (3 in.^{2})".
11. In Section 450-45(c), replace "1 ft.^{2} (0.093 m^2)" with "0.1 m^2 (1 ft.2)".

PANEL STATEMENT: The panel recognizes that the present NEC has minimum dimension requirements that are in the code for safety reasons. The modified parts reflect the need to maintain the minimum dimensions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #915)

13- 3 - (Table 450-3(a) Note 1 and (b)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise Table 450-3(a), Note 1 to read as follows:

Where the required fuse rating or circuit breaker setting does not correspond to a standard rating or setting a ~~the next~~ higher ~~standard~~ rating or setting that does not exceed the next higher standard rating or setting shall be permitted.

Table 450-3(b) Note 1: Where 125 percent of this current does not correspond to a standard rating of a fuse or nonadjustable circuit breaker, ~~the next~~ a higher ~~standard~~ rating that does not exceed the next higher standard rating ~~described in Section 240-6~~ shall be permitted.

SUBSTANTIATION: Editorial. While what is proposed is already routinely permitted the present wording does not literally provide for it, but only permits the next higher standard rating. If the tables result in a rating of 260-amperes a higher nonstandard rating of 275 amperes is not permitted, but 300-amperes is.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #1837)

13- 4 - (Table 450-3(a) Note 3): Accept in Principle
SUBMITTER: James D. Gray, City of Orlando, FL
RECOMMENDATION: Add word "circuit" before "breakers" in the last sentence of the table in Note 3.
SUBSTANTIATION: Adds a missing word. When used will clear up questions and make the NEC user friendly.
PANEL ACTION: Accept in Principle.
The panel modifies the proposal as follows: Add word "circuit" before "breakers" in the last sentence of the table in Note 2.
PANEL STATEMENT: There is no reference to "breakers" in Note 3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #4107)

13- 5 - (Table 450-3(a) Note 3): Reject
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Add a second sentence to Note 3 as follows:

3. A supervised location where conditions of maintenance and supervision ensure that only qualified persons will monitor and service the transformer installation. The qualified person can be either an employee at that location or an employee contracted for this purpose who is readily available.

SUBSTANTIATION: Depending upon the jurisdiction in an area, an interpretation could be made with the intent that the qualified individual must be an employee of that location. This restricts the use of highly qualified contract personnel, who are versed and trained in the installation, use, operation and maintenance of this equipment. This is already being done where qualified contractors are available.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "qualified persons" is defined in Article 100 and makes no reference to employment status.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #916)

13- 6 - (450-6): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Secondary Ties. A secondary tie is a circuit operating at 600-volts, nominal, or less between phases that connects in parallel ~~two power sources or power supply points, such as~~ the secondaries of two transformers in different locations. The tie shall be permitted to consist one of ~~or more~~ conductor~~s~~ per phase or neutral or paralleled conductors in accordance with Section 310-4. The conductors interconnecting the secondaries of adjacent transformers operating in parallel as a unit as permitted in Section 450-7 shall not be considered a secondary tie.

As used in this section, the word transformer means a transformer or a bank of transformers operating as a unit.

(a) Tie Circuits. Ungrounded conductors of ~~Tie~~ tie circuits shall be provided with overcurrent protection at each ~~end~~ supply point ~~as required~~ in ~~Article 240~~ accordance with their ampacity as specified in Section 310-15.

Under the conditions described in (a)(1) and (a)(2), the overcurrent protection shall be permitted to be in accordance with (a)(3).

(1) Loads at Transformer Supply Points Only. Where all loads are connected at the transformer supply points at each end of the tie and covercurrent protection is not provided in accordance with ~~Article 240~~ (a), the rated ampacity of the tie shall not be less than 67 percent of the rated secondary current of the largest transformer ~~connected to~~ supplying the secondary tie system.

(2) Loads Connected Between Transformer Supply Points. Where load is connected to the tie at any point between transformer supply points and overcurrent protection is not provided in accordance with ~~Article 240~~ (a), the rated ampacity of the tie shall not be less than 100 percent of the rated secondary current of the largest transformer ~~connected to~~ supplying the secondary tie system.

Exception No. 1: ~~As otherwise provided in~~ Where the tie consists of paralleled conductors the provisions of Section 450-6(a)(4) shall apply.

Exception No. 2: Neutral conductors and the conductor connected to the midpoint of one phase winding shall be permitted to have an ampacity not less than the computed load.

(3) Tie Circuit Protection. Under the conditions described in (a)(1) and (a)(2), both supply ends of each individual ungrounded or grounded phase tie conductor shall be equipped with a protective device that will open at a predetermined temperature of the tie conductor under short-circuit conditions. This protective device shall consist of one of the following: (1) a fusible link cable connector, terminal, or lug, commonly known as a limiter, each being of a size corresponding with that of the conductor and of construction and characteristics according to the operating voltage and the type of insulation on the conductor~~s~~ or (2) an automatic circuit breaker actuated by devices having comparable current-time sensing characteristics as limiters.

(4) Interconnection of ~~Phase~~ Conductors Between Transformer Supply Points. Where the tie consists of more than one conductor per phase, neutral, or midpoint of one phase winding, the conductors of each phase, neutral, or midpoint of one phase winding shall comply with one of the following provisions.

(a) Interconnected. The conductors shall be interconnected ~~in order to establish a~~ at each load supply point, and where overcurrent protection in accordance with (a) is not provided the protection specified in (a)(3) shall be provided in each

individual tie conductor at this point on both sides of the interconnection. The means of interconnection shall have an ampacity not less than the load served.

(b) The loads shall be connected to ~~one or more~~ a set of individual conductors of a paralleled conductor tie without interconnecting the conductors of each phase, neutral, or midpoint of one phase winding and without the protection specified in (a)(3) at load connection points. Where this is done, the tie conductors of each phase shall have a combined ~~capacity~~ ampacity of not less than 133 percent of the largest transformer ~~connected to~~ supplying the secondary tie system, the total load ~~of~~ supplied by such taps shall not exceed the rated secondary current of the largest transformer, and the load shall be equally divided on each phase and on the individual conductors of each phase, insofar as practicable.

(5) Tie Circuit Control. Where the operating voltage exceeds 150 volts to ground, secondary ties provided with limiters shall have a switch at each supply end, that when open will de-energize the tie conductors and limiters. The current rating of each switch shall not be less than the rated current of the tie conductors connected to the switch. It shall be capable of safely interrupting ~~opening~~ its rated current, and it shall be constructed so that it will not open under the magnetic forces resulting from short-circuit current.

(b) Overcurrent Protection for Secondary Connections. Where secondary ties are used, an overcurrent device rated or set at not more than 250 percent of the rated secondary current of the transformer~~s~~ shall be provided in the secondary connections of each transformer supplying the system. In addition, an automatic circuit breaker actuated by a reverse-~~current~~ power relay set to open the circuit at not more than the secondary rated current of the transformer shall be provided in the secondary of each transformer.

(c) Grounding. Where the secondary tie system is grounded, each transformer secondary supplying the tie system shall be grounded in accordance with the requirements of Section 250-30 for separately derived systems.

SUBSTANTIATION: This proposal is largely editorial. The title of this article relates to transformers, as does the text, however the phrase "two power sources or power supply points" is not limited to transformers and could include batteries, generators, solar photovoltaic systems, services, etc. for which this section does not appear applicable or intended.

The proposed "in parallel" and "different locations" would clarify that conductors interconnecting the secondaries of two single-phase transformers in open-delta three-phase configuration, for example are excluded. Also conductors interconnecting secondaries of transformers covered by Section 450-7 are clearly excluded. This section doesn't appear applicable to those conductors, although not specifically excluded.

In (a) overcurrent protection is referenced to Section 310-15 to avoid any inference that location of overcurrent devices such as for tap rules, and protection by primary overcurrent devices may be applied.

Transformers are indicated as "supplying" rather than "connected to", which literally applies to transformers that may be supplied from the secondary tie.

Exception No. 2 provides for conductors not explicitly addressed. While use of secondary ties once may have been primarily involved with 3-wire three-phase ungrounded systems the text does not disallow grounded systems, grounded phase systems are noted in (3).

In (a)(4) provision is made for neutrals.

In (a)(4)(a) the reference to overcurrent protection in accordance with (a) is proposed, as where this basic rule is applied the requirements of (a)(3) for limiters does not seem necessary since the paralleled conductors between the source and load supply points are essentially one conductor, where the overcurrent protection of (a) should suffice since load is not limited to one conductor, as in (4)(b).

Section (a)(1) and (2) base their requirements on noncompliance with (a).

There is no specific reference to the ampacity of the interconnection in (a)(4)(a).

In (4)(b) the present wording appears to permit a load supplied by parallel conductors to have each individual phase conductor to be tapped to each individual phase conductor of the tie, whereby the paralleled load conductors do provide an interconnection between the tie conductors at the load end where they are connected together.

Proposed (c) provides specific grounding requirements for a somewhat unique installation. Do two transformers with interconnected conductors meet the definition of separately derived systems? Section 250-20 may require the system to be grounded, but if it is not defined as separately derived, or a service, what specific rules re: bonding, grounding conductor, grounding electrode, etc. apply? It appears preferable to treat each supply transformer as a separately derived system rather than have grounding/bonding at only one which would provide the grounding/bonding for another transformer which may be at a considerable distance with perhaps a different kVA rating.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has misinterpreted the intent of Section 450-6. The requirements of Section 450-6 apply to the secondary ties of transformers as defined by the scope of Article 450. Present requirements already cover transformers in parallel and networking systems.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #2896)

13- 7 - (450-11): Reject

SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI

RECOMMENDATION: Revise Section 450-11 to read as follows:

450-11. Marking. Each transformer shall be provided with a nameplate giving the name of the manufacturer, rated kilovolt-amperes, frequency, primary and secondary or high and low voltage, impedance of transformers 25 KVA and larger, required clearances for transformers with ventilating openings, and the amount and kind of insulating liquid where used. In addition, the nameplate of each dry-type transformer shall include the temperature class for the insulation system.

SUBSTANTIATION: Transformers may be listed and labeled as primary and secondary - which must be connected in that manner. They may also be Listed and Labeled as High Votlage and Low Votlage - In which case the transformer may be reverse connected. This change will provide wording acknowledging this reverse connection capability.

PANEL ACTION: Reject.

PANEL STATEMENT: The primary winding is defined as the winding on the energy input side by ANSI/IEEE C57. The submitter has misinterpreted the marking requirements of national recognized standards.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #416)

13- 8 - (450-21(a), Exception): Reject

SUBMITTER: Shree G. Khaitan, Pennell & Wiltberger, Inc.

RECOMMENDATION: Revise to read as follows:

This rule shall not apply to transformers ~~rated for 600 volts, nominal, or less,~~ completely enclosed, with or without ventilating openings, provided:

(i) The transformers are rated for 600 volts nominal or less; or

(ii) The transformers are with Class 155 or higher insulation systems.

SUBSTANTIATION: There does not appear to be any logical justification to exclude transformers like fire pump transformers, which are over 600 volts and rated 112 1/2 kva or less, from the benefit of rule 450-21(b), Exception No. 2.

The proposed change will correct this anomaly.

PANEL ACTION: Reject.

PANEL STATEMENT: The higher fault energy available in supply systems rated above 600 volts warrants transformers with windings rated above 600 volts to have greater separation from combustible materials.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #2434)

13- 9 - (450-21(d) (New)): Reject
SUBMITTER: Dennis Kaunzner, City of Sierra-Vista, AZ
RECOMMENDATION: Add new text to read:
450-21(d) All transformers shall be required to maintain the same clearances as light fixtures in clothes closets (410-8). This would include all signaling, doorbell, security, alarm signaling, transformers.
SUBSTANTIATION: These small transformers create enough heat that if they are against something such as tissue paper they will start fires. A doorbell transformer where the button sticks has caused two known fires in our area.
PANEL ACTION: Reject.
PANEL STATEMENT: The installation defined by the submitter is covered in Section 450-21(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #3744)

13- 10 - (450-23(a)(1)(c)): Reject
SUBMITTER: C. Patrick McShane, Cooper Power Systems
RECOMMENDATION: Delete requirement c:
"A liquid containment area is provided."
SUBSTANTIATION: Statement of Problem:
1) The requirement has proven to be unnecessary for fire protection and safety for indoor installations of less-flammable liquid-filled transformers.
2) The inclusion of requirement of a liquid confinement area, item "c" of Section 450-23 (a)(1) goes beyond the stated purpose of the NEC per Section 90-1.
Substantiation:
1) FMRC dropped transformer clearance requirements based on expectations of pool fires and related heat release from their Loss Prevention Data Sheet 5-4/14-8, October 1994 and subsequent revisions. This change was based on the fire safety history of less-flammable dielectric liquids, and on no ignition of pools of these liquids in worse case scenario testing.
2) FMRC dropped testing and publishing listed approved dielectric fluids heat release ratings, effective in the May 1999 - FMRC Approval Guide for Electrical Equipment.
3) The pool fire scenario for less-flammable liquid-filled transformers was never incorporated by Underwriters Laboratories in their listing (Classification) requirements.
4) There has never been a pool fire reported involving less-flammable dielectric fluids since their introduction in 1975, with over two hundred-thousand transformers in service.
5) Prior to the 1981 NEC, containment was not a requirement in 450-23. There have been no reports of problems with such indoor installations. (The push for the 1981 NEC Article 450 to add the requirement for a containment area was based on the concept of having a pool fire.)
6) High temperature, high fault current, high voltage "worse case scenario" tests performed under Underwriters Laboratories witnessing resulted in no ignition of a pool of any listed less-flammable dielectric liquid tested.
7) High temperature, sustained high current, low voltage tests "worse case scenario" designed and performed under Factory Mutual Laboratories witnessing resulted in no ignition of a pool of any listed less-flammable dielectric liquid.
8) Field case histories of less-flammable liquid-filled transformers that have experienced severe internal arcing faults also provide interesting insight. Even when the arcing has been so severe as to burn through the tank walls, no ignition of the liquid has occurred.
9) Arguments for the need for the containment for indoor installations based on either environmental issues or for elimination of physical nuisance in the unlikely case of significant leakage are beyond the scope of NEC 70. No listed less-flammable liquid is listed as a hazardous material by the EPA. (See Article 90-1).
References:
1. Factory Mutual Property Loss Prevention Data Sheets 5-4, 14-8. January 1997.
2. CPS Bulletin 96059, Factory Mutual Drops Heat Release Criteria.
3. Excerpt from the May 1999 FMRC Approval Guide - Electrical Equipment.
4. CPS Bulletin 96016 UL Classification Marking 35H9
5. Dale A. Hallerberg, P.E., Underwriters Laboratories, Inc., Less-Flammable Liquids Used in Transformers.
6. C. Patrick McShane, CPS, Introduction of the First Listing Standard for Liquid-Filled Distribution and Power Transformers, presented to the 28th International conference on Fire Safety, July 27, 1999.
7. S. D. Northrup, RTE, Protection of Transformers for the Prevention of Rupture, Explosion and Fire, presented to the Edison Electric Institute, January 17, 1985.
8. C. Patrick McShane, Transformer Fluid Flammability Studies, presented at the 1997 Doble Client International Conference, Doble Publication 64PAIC97, pp. 5-3.1 through 5-3.6.
9. Garrett P. McCormick, Final Report on FMRC Pool Fire Tests, January 11, 1995
10. CPS Bulletin 92047, Case History, August 1998.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The scope of Section 90-1, states: " The purpose of this code is the practical safeguarding of persons and property from hazards arising from the use of electricity." If the installation of liquid filled electrical equipment can result in damage to property or hazards to individuals by the release of liquid, then the requirement for containing liquid electrical insulating materials should stand.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #CP1302)

13- 10a - (450-27): Accept
SUBMITTER: CMP 13
RECOMMENDATION: Modify the second paragraph of Section 450-27 to read as follows:
"450-27. Oil-Insulated Transformers Installed Outdoors. In cases where the transformer installation presents a fire hazard, one or more of the following safeguards shall be applied according to the degree of hazard involved:
(1) Space separations
(2) Fire-resistant barriers
(3) Automatic fire suppression systems
(4) Enclosures that confine the oil of a ruptured transformer tank "
SUBSTANTIATION: The text was modified to change the wording from explanatory to mandatory language. The phrase "water spray" was changed to "fire suppression" to recognize other acceptable types of automatic fire suppression systems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

ARTICLE 455 — PHASE CONVERTERS

(Log #2809)

13- 11 - (455-6): Accept in Principle
SUBMITTER: Bud Swathwood, Bud Swathwood Consulting
RECOMMENDATION: Add second sentence to read:
The marking shall be consistent throughout the system and premises.
SUBSTANTIATION: This will make it clear that their facilities system will be consistent as to the identified phase.
PANEL ACTION: Accept in Principle.
Add second sentence to Section 455-6(b) to read:
"The marking shall be consistent throughout the system and premises."
PANEL STATEMENT: The submitter did not specify location in Section 455-6.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

ARTICLE 460 — CAPACITORS

(Log #574)

13- 12 - (460-2(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Replace "3 gal. (11.36 L)" with "11 L (3 gal.)" in two locations.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #CP1304)

13- 12a - (460-8(b)(1), and (2)): Accept
SUBMITTER: CMP 13
RECOMMENDATION: Modify Section 460-8B to read as follows:
"(b) Overcurrent Protection. An overcurrent device shall be provided in each ungrounded conductor for each capacitor bank. The rating or setting of the overcurrent device shall be as low as practicable.
Exception: A separate overcurrent device shall not be required for a capacitor connected on the load side of a motor overload protective device."
SUBSTANTIATION: Section 460-8(b) was modified to conform with NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #2248)

13- 13 - (460-8(b)(2)): Reject
SUBMITTER: Steven R. Musial, II, Pittsburgh, PA
RECOMMENDATION: Revise text as follows:
460-8(b)(2) "The rating or setting of the overcurrent device shall be ~~as low as practicable~~ at or above the ampacity of the branch circuit conductors to be protected."
SUBSTANTIATION: The words "as low as practicable" have the implication of protecting the capacitor at its rated current rather than at 135 percent of rated current.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wording would not provide an upper limit on the overcurrent protective device.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #CP1305)

13- 13a - (460-8(c)(1), through (4)): Accept
SUBMITTER: CMP 13
RECOMMENDATION: Revise Section 460-8(c) to read as follows:
"(C) Disconnecting Means. A disconnecting means shall be provided in each ungrounded conductor for each capacitor bank and shall meet the following requirements:
1. The disconnecting means shall open all ungrounded conductors simultaneously.
2. The disconnecting means shall be permitted to disconnect the capacitor from the line as a regular operating procedure.
3. The rating of the disconnecting means shall not be less than 135 percent of the rated current of the capacitor.
Exception: A separate disconnecting means shall not be required where a capacitor is connected on the load side of a motor controller."
SUBSTANTIATION: The existing text was rearranged and edited to meet the requirements of NEC Style manual paragraph 2.1.5.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #575)

13- 14 - (460-12): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In the first sentence replace "amount of liquid in gallons" to "liquid capacity".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
In the first sentence replace "amount of liquid in gallons" with "volume of liquid".
PANEL STATEMENT: Proposal changes the requirement from actual volume to capacity and the capacity may be higher than the volume required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #CP1306)

13- 14a - (460-24(b)(1), through 3): Accept
SUBMITTER: CMP 13
RECOMMENDATION: Revise section 460-24(b) to read as follows:
"(B) Isolation
1. General. A means shall be installed to isolate from all sources of voltage each capacitor, capacitor bank, or capacitor installation that will be removed from service as a unit. The isolating means shall provide a visible gap in the electrical circuit adequate for the operating voltage.
2. Isolating or disconnecting switches with no interrupting rating. Isolating or disconnecting switches with no interrupting rating shall be interlocked with the load-interrupting device or shall be provided with prominently displayed caution signs in accordance with Section 490-22 to prevent switching load current."
SUBSTANTIATION: The existing text was reformatted and edited to meet the requirements of the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #917)

13- 15 - (460-25(b)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Single-~~Phase~~ Pole or Multipole ~~Multiphase~~ Devices. Single-~~phase~~ pole or ~~multiphase~~ multipole devices shall be permitted for this purpose.
SUBSTANTIATION: Editorial. Devices such as fuses are not generally designated as single-phase or multiphase.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #576)

13- 16 - (460-26): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Replace the wording "amount of liquid in gallons" with "liquid capacity".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.

Replace the wording "amount of liquid in gallons" with "volume of liquid".
PANEL STATEMENT: Proposal changes the requirement from actual volume to capacity and the capacity may be higher than the volume required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

ARTICLE 470 — RESISTORS AND REACTORS

(Log #577)

13- 17 - (470): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In Section 470-3, replace "12 in. (305 mm)" with "300 m (12 in.)".
In Section 470-18(c), replace "1 ft. (305 mm)" with "300 m (12 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Principle.
In Section 470-3, replace "12 in. (305 mm)" with "305 mm (12 in.)".
In Section 470-18(c), replace "1 ft. (305 mm)" with "305 mm (12 in.)".
PANEL STATEMENT: The spacing requirement is to prevent hazardous conditions. A soft metric conversion is required to obtain the proper spacing requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

ARTICLE 480 — STORAGE BATTERIES

(Log #40)

15- 6 - (480-3): Reject
NOTE: The following proposal consists of Comment 15-6 on Proposal 15-13 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 15-13 was:
Revise Article 480 as follows:
Article 480 - Storage Batteries
The provisions of this article shall apply to all stationary installations of storage batteries.
480-2. Definitions.
Storage Battery: A battery comprised of one or more rechargeable cells of the lead-acid, nickel-cadmium, or other rechargeable electrochemical types.
Sealed Cell or Battery: A sealed cell or battery is one that has no provision for the addition of water or electrolyte or for external measurement of electrolyte specific gravity. The individual cells shall be permitted to contain a venting arrangement as described in Section 480-9(b).
Nominal Battery Voltage: The voltage computed on the basis of 2.0 volts per cell for the lead-acid type and 1.2 volts per cell for the alkali type.
480-3. Wiring and Equipment Supplied from Batteries.
Wiring and equipment supplied from storage batteries shall be subject to the requirements of this Code applying to wiring and equipment operating at the same voltage.
480-4 Disconnecting Means. A means shall be provided and shall be capable of disconnecting all batteries from the circuit. A disconnecting means shall not be required between individual groups of cells.
480-45. Grounding.
The requirements of Article 250 shall apply.
480-56. Insulation of Batteries of Not Over ~~250~~300 Volts. This section shall apply to storage batteries having cells so connected as to operate at a nominal battery voltage of not over ~~250~~ 300 volts.
(a) Vented Lead-Acid Batteries. Cells and multicompartment batteries with covers sealed to containers of nonconductive, heat-resistant material shall not require additional insulating support.
(b) Vented Alkaline-type Batteries. Cells with covers sealed to jars of nonconductiveheat-resistant material shall require no additional insulation support. Cells in jars of conductive material shall be installed in trays of nonconductive material with not more than 20 cells (24 volts, nominal) in the series circuit in any one tray.
(c) Rubber Jars. Cells in rubber or composition containers shall require no additional insulating support where the total nominal voltage of all cells in series does not exceed 150 volts. Where the total voltage exceeds 150 volts, batteries shall be sectionalized into groups of 150 volts or less, and each group shall have the individual cells installed in trays or on racks.
(d) Sealed Cells or Batteries. Sealed cells and multicompartment sealed batteries constructed of nonconductive, heat-resistant material shall not require additional insulating support. Batteries constructed of a conducting container shall have insulating support if a voltage is present between the container and ground.
480-67. Insulation of Batteries over ~~250~~300 Volts. The provisions of Section 480-5 shall apply to storage batteries having the cells so connected as to operate at a nominal voltage not exceeding ~~250~~300 volts and, in addition, the provisions of this section shall also apply to such batteries.
(1) Cells in each group shall be series connected.
(2) Cells shall be installed in groups having a total nominal voltage of not over 250300 volts.
(3) Groups shall be separated by a minimum of 12 in. of air or by barrier of suitable insulating material. ~~Insulation which can be air, shall be provided between groups and shall have a minimums~~
(4) Groups shall be of equal potential.
(5) Separation shall be maintained between live battery parts of opposite polarity of 2 in. (50.8 mm) for battery voltages not exceeding 300 volts.
(6) Batteries or cells in a group shall be series connected.
480-8. Working Space. Racks and Trays shall be readily accessible with a minimum of 36 in. of clear working space on one side.
(1) Where racks or trays are readily accessible from the front only, the depth shall not exceed 36 in. with a minimum of 36 in. of clear working space on one side.
(2) Where racks or trays are readily accessible from both sides the depth shall not exceed 60 in. with a minimum of 36 in. of clear working space on both sides.
480-79 Racks and Trays. Racks and trays shall comply with (a) and (b) below.
(a) Racks. Racks, as required in this article, are rigid frames designed to support cells or trays. They shall be substantial and made of:
(1) Metal, so treated as to be resistant to deteriorating action by the electrolyte and provided with nonconducting members directly supporting the cells or with continuous insulating material other than paint or conducting members; or
(2) Other construction such as fiberglass or other suitable nonconductive materials.
(b) Trays. Trays are frames, such as crates or shallow boxes usually of wood or other nonconductive material, so constructed or treated as to be resistant to deteriorating action by the electrolyte.
480-810. Battery Locations. Battery locations shall conform to (a) and (b) below.
(a) Ventilation. Provisions shall be made for sufficient diffusion and ventilation of the gases from the battery to prevent the accumulation of an explosive mixture.
(b) Live Parts. Guarding of live parts shall comply with Section 110-17.
480-911. Vents.
(a) Vented Cells. Each vented cell shall be equipped with a flame arrester designed to prevent destruction of the cell due to ignition of gases within the cell by an external spark or flame under normal operating conditions.
(b) Sealed Cells. Sealed battery/cells shall be equipped with a pressure-release vent to prevent excessive accumulation of gas pressure, or the battery/cell shall be designed to prevent scatter of cell parts in event of a cell explosion.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in principle in part, revised as follows:

480-3 Wiring and equipment supplied from batteries. Wiring and equipment supplied from storage batteries shall be subject to the requirements of this Code applying to wiring and equipment at the same voltage.

Exception. Overcurrent protection shall not be required for circuit conductors supplied by a battery rated 50 volts or less where used for starting, ignition, or control of prime movers and the conductors are short as practicable. Such conductors shall not be required to comply with Section 300-3(a).

SUBSTANTIATION: Section 240-1 indicates Section 240-3 Part A through G provides requirements for conductor overcurrent protection, 600 volts or less. While I don't believe Article 720 is intended to apply nevertheless Section 720-1 indicates battery circuits of less than 50 volts are not exempted from Article 720. Section 720-8 indicates overcurrent protection shall comply with Article 240. There does not appear to be any specifics in Articles 445, 517, 700, 701, or 702 which modify Sections 240-3 or 300-3(a). Section 300-1(b) does not apply since these conductor installations are generally made in the field. Since Chapters 1 through 4 apply generally an Exception is warranted to legitimize an accepted practice which does not comply with Code rules.

If this comment is accepted a correlating exception may be desirable for Sections 240-1 and 300-3(a).

PANEL ACTION: Reject.

PANEL STATEMENT: Normally the batteries addressed by the submitter's proposal are part of a unit and therefore not subject to individual requirements of the code as suggested by the proposer.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

COMMENT ON AFFIRMATIVE:

JOHNSON: It should be understood that the panel agrees with the proposer that engine cranking battery cables should not be required to have overcurrent protecton. While the battery cables are usually furnished with the unit, they may not be.

(Log #918)

15- 7 - (480-3 Exception No. 1 and No. 2 (New)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add exceptions to read as follows:

Exception No. 1: Overcurrent protection shall not be required for conductors supplied by a battery rated less than 50 volts where the battery provides power for starting, ignition, or control of prime movers and the conductors are as short as practicable. Such conductors shall not be required to comply with Section 300-3.

Exception No. 2: Overcurrent protection shall not be required for conductors that interconnect terminals of batteries or battery cells provided the conductors are as short as practicable and the conductors supplied by the battery are protected in accordance with Section 240-3. Conductors that interconnect batteries or battery cells shall not be required to comply with Section 300-3.

SUBSTANTIATION: Section 240-1 indicates Article 240 Parts A through G provides requirements for conductor overcurrent protection, 600 volts or less. While I don't believe Article 720 is intended to apply to the installation proposed in Exception No. 1, nevertheless Section 720-1 does not indicate such installations are exempt.

Section 720-8 indicates overcurrent protection shall comply with Article 240.

This section also indicates wiring is subject to other code requirements (e.g., Sections 240-3 and 300-3). There does not appear to be any specifics in this article or Articles 517, 695, 700, 701, or 702 re: battery systems wiring for engine generators which modify Sections 240-3 or 300-3. Section 300-1(b) does not apply to wiring done in the field, which is the case for most installations covered in the proposal.

PANEL ACTION: Reject.

PANEL STATEMENT: Normally the batteries addressed by the submitter's proposal are part of a unit and therefore not subject to individual requirements of the code as suggested by the proposer.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #316)

15- 8 - (480-3(a) (New)): Reject

SUBMITTER: Christopher M. Johnston, R. L. Daniell & Assoc., P.C.

RECOMMENDATION: Add a new paragraph (a) to 480-3 to read as follows:

(a) Short-Time Ampacity. Where the application ensures that the period of maximum battery discharge does not exceed 60 minutes, the allowable ampacities of conductors shall be as shown in Table 610-14(a).

SUBSTANTIATION: Uninterruptible power supply systems typically include storage batteries with discharge times of 60 minutes or less. Using Table 610-14(a) ampacities for these situations results in smaller conductor sizing. This smaller conductor sizing reduces mechanical stress on battery terminal plates and battery posts to which the conductors attach. The reduced stress enhances battery service life.

PANEL ACTION: Reject.

PANEL STATEMENT: The conductors in the proposal are typically part of a unit which is tested by a Nationally Recognized Testing Laboratory with different guidelines.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

PASTERNACK: The Panel Statement indicates that units are tested by a NRTL with battery conductors included.

This is true for small UPS systems. It is normally not true for systems over 100 kVA. In these large systems the battery backup is normally supplied as an input service to the UPS.

The passage of the original request or at least reconsideration seems justified.

(Log #477)

15- 9 - (480-6): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Change “2 in. (50.8 mm)” to “50 mm (2 in.)”

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #2478)

15- 10 - (480-8(d) (New)):

Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to the word “such” in the last sentence of the Panel Action. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Gordon S. Johnson, Dundee, FL

RECOMMENDATION: Add new paragraph (d) to read as follows:

Where the total free electrolyte in a single battery installation exceeds 50 gallons, each rack of batteries, or group of racks, shall be provided with a liquid-tight, 100 mm spill containment barrier which extends at least 25 mm beyond the battery rack in all directions.

SUBSTANTIATION: Battery electrolyte is an extremely hazardous material that if spilled due to a leaky cell can cause damage to surrounding equipment and serious injury to personnel. Where not contained the cleanup of such spills can be difficult.

Battery Electrolyte Spill Containment. This proposal is the result of a proposal for change to NFPA 111, Stored Energy Emergency and Standby Power Systems, that was accepted by the committee and then sent back to the committee by the NFPA Fall Meeting. Subsequently the proposal was rejected by the committee without any action for further development. That proposal was not well thought out and should not have been accepted in the first place, however, it stirred up much interest in the industry. The present proposal is essentially what was recommended by the Battery Council International. It is based upon a requirement in the Universal Fire Code (UFC) Section 64

with one essential difference. Section 64 of the UFC does not differentiate on the type of electrolyte. Therefore, some inspectors apply it to VLRA batteries, which do not have free electrolyte and containment serves no function. The current proposal applies only to batteries with free electrolyte. I have been informed that the UFC is considering making that change.

I am proposing adding this requirement to NEC Article 480 because the NEC, not NFPA 111, is responsible for installation. Further, the NEC is required in virtually all jurisdictions in the USA, while the Universal Fire Code is not widely known in many parts of the country.

The Institute of Electrical and Electronics Engineers under their Standards Coordinating Committee 29 has set up a working group to study battery electrolyte spill containment. The report of that working group, of which I am a member, will not be available until after the deadline for proposals but according to schedule should be available by the January code panel meeting.

PANEL ACTION: Accept in Principle.

Revise the submitter's recommendation to read as follows:

Add new paragraph (d) to read as follows:

(d) Electrolyte Containment. Where the total free electrolyte in a single battery installation exceeds 190 liters (50 gallons), each rack of batteries, or group of racks, shall be provided with a liquid-tight, 100 mm (4 in.) spill containment barrier which extends at least 25 mm (1 in.) beyond the battery rack in all directions.

Steel encased NiCad batteries shall have a containment system such that there is no contact between the spilled electrolyte and the steel casing of adjacent cells.

PANEL STATEMENT: The added second paragraph addresses the concerns of steel contained NiCad batteries to prevent shorting cells through the spilled electrolyte.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

TRIFFO: "The CMA agrees in principle that a spill containment barrier be required under the conditions specified (50 gallons free electrolyte in a single battery installation), however, the proposed wording defining requirements for such a barrier does not adequately convey their intent. Is it intended to contain the volume of electrolyte from one cell in the rack, or for all cells? Either way, can it be demonstrated that the proposed dimensions are adequate for every installation? It would be more appropriate simply to require the containment barrier dimensions to be adequate to contain a specific electrolyte volume."

COMMENT ON AFFIRMATIVE:

JOHNSON: Battery spill containment takes care of only a part of the problem. Disposal and neutralization of the spilled liquid need to be considered.

ARTICLE 490 — EQUIPMENT, OVER 600 VOLTS, NOMINAL

(Log #578)

13- 18 - (490): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 1. In Section 490-3, replace "10 gal. (37.85 L)" with "38 L (10 gal.)".

2. In Section 490-21(d)(7), replace "5 ft. (1.52 m)" with "1.5 m (5 ft.)".

3. In Section 490-38, replace "12 ft.^{2} (1.11 m^2)" with "1.1 m^2 (12 ft.^{2})".

4. In Section 490-38, replace "60 lb. (27.22 kg)" with "27 kg (60 lb.)".

5. In Section 490-41(a), replace "78 in. (1.98 m)" with "2.0 m (78 in.)".

6. In Section 490-41(a) Exception, replace "50 lb.(22.68 kg)" with "23 kg (50 lb.)".

7. In Section 490-41(a) Exception, replace "66 in. (1.68 m)" with "1.7 m (66 in.)

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #CP1301)

13- 18a - (490-1): Accept

NOTE: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee directs the Panel to add a Title for the standard identified in the Fine Print Note. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 13

RECOMMENDATION: Modify Section 490-1 as follows:

Change existing FPN to read FPN #1.

Add FPN No. 2 to read: "For further information on hazard signs and labels see ANSI Z535."

SUBSTANTIATION: The reference to ANSI Z535 is being addressed in FPN #2 of Section 490-1 to avoid redundancy throughout the rest of the Article where hazard signs are addressed.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #2193)

13- 19 - (490-2): Accept

NOTE: The Technical Correlating Committee advises that "high voltage" is acceptable as presently used in the NEC.

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

For the purposes of this article, high voltage is ~~shall be defined as~~ more than 600 volts, nominal.

SUBSTANTIATION: This is a definition. It should be stated in a declarative sentence and should not use mandatory rule language, such as "shall be." Definitions shall not contain requirements. See the NEC Style Manual 2.2.2 and 3.1.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel recommends that TCC review the term "high voltage". The term is not consistent with other ANSI standards as used in the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #4444)

13- 20 - (490-4): Reject

SUBMITTER: Frants Marvin Jensen, Consolidated Engr Labs

RECOMMENDATION: Add new paragraph 490-4:

Workspace required by 110-34 shall be flat.

SUBSTANTIATION: Should be self evident.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal should have addressed changes to Section 110-34, not Article 490.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #3271)

13- 21 - (490-4(b)): Accept in Principle

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise 490-44(b) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

(b) Backfeed. Where fuses can be energized by backfeed, a sign shall be placed on the enclosure door ~~reading~~ with the following words or equivalent:

WARNING - FUSES MAY BE ENERGIZED BY BACKFEED.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what

should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.or equivalent" would allow a warning sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Accept in Principle.

Modify Section 490-44(b) to read as follows:

"(b) Backfeed. Where fuses can be energized by backfeed, a sign shall be placed on the enclosure door identifying this hazard." Delete the words "WARNING-FUSES MAY BE ENERGIZED BY BACKFEED."

PANEL STATEMENT: The specific wording is removed to permit appropriate hazard sign development. A FPN is proposed in Section 490-1 for reference to ANSI Z535 for sign development.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #CP1307)

13- 21a - (490-21(a)(1), through 9): Accept

SUBMITTER: CMP 13

RECOMMENDATION: Modify Section 490-21(a) 1 through 9 to read as follows:

"490-21 Circuit-Interrupting Devices

(A) Circuit Breakers.

(1) Location.

(a) Circuit breakers installed indoors shall be mounted either in metal-enclosed units or fire-resistant cell-mounted units, or they shall be permitted to be open mounted in locations accessible to qualified persons only.

(b) Circuit breakers used to control oil-filled transformers shall be located either outside the transformer vault or be capable of operation from outside the vault.

(c) Oil circuit breakers shall be arranged or located so that adjacent readily combustible structures or materials are safeguarded in an approved manner.

(2) Operating Characteristics. Circuit breakers shall have the following equipment or operating characteristics.

(a) An accessible mechanical or other approved means for manual tripping, independent of control power.

(b) Be release free (trip free).

(c) If capable of being opened or closed manually while energized, the main contacts shall operate independently of the speed of the manual operation.

(d) A mechanical position indicator at the circuit breaker to show the open or closed position of the main contacts.

(e) A means of indicating the open and closed position of the breaker at the point(s) from which they may be operated.

(3) Nameplate. A circuit breaker shall have a permanent and legible nameplate showing manufacturer's name or trademark, manufacturer's type or identification number, continuous current rating, interrupting rating in megavolt-amperes (MVA) or amperes, and maximum voltage rating. Modification of a circuit breaker affecting its rating(s) shall be accompanied by an appropriate change of nameplate information.

(4) Rating. Circuit breakers shall have the following ratings:

(a) The continuous current rating of a circuit breaker shall not be less than the maximum continuous current through the circuit breaker.

(b) The interrupting rating of a circuit breaker shall not be less than the maximum fault current the circuit breaker will be required to interrupt, including contributions from all connected sources of energy.

(c) The closing rating of a circuit breaker shall not be less than the maximum asymmetrical fault current into which the circuit breaker can be closed.

(d) The momentary rating of a circuit breaker shall not be less than the maximum asymmetrical fault current at the point of installation.

(e) The rated maximum voltage of a circuit breaker shall not be less than the maximum circuit voltage."

SUBSTANTIATION: The existing text was reformatted and edited to meet the requirements of the NEC Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #430)

13- 22 - (490-21(a)(4)f): Accept

SUBMITTER: David Staley, Raytheon Infrastructure Inc.

RECOMMENDATION: Revise as follows:

"..., interrupting rating in ~~millivolt~~ Megavolt-amperes ~~(mVA)~~ (MVA) or amperes,...".

SUBSTANTIATION: The proper SI prefix is Mega (10^6), not milli (10^{-3}) for the nominal interrupting class of HV circuit breakers.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #3268)

13- 23 - (490-21(b)(7), Exception): Accept in Principle

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise 490-21(b)(7) Exception with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

Exception: More than one switch shall be permitted as the disconnecting means for one set of fuses where the switches are installed to provide connection to more than one set of supply conductors. The switches shall be mechanically or electrically interlocked to permit access to the fuses only when all switches are open. A conspicuous sign shall be placed at the fuses ~~reading~~ with the following words or equivalent:

WARNING - FUSES MAY BE ENERGIZED FROM MORE THAN ONE SOURCE.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formatted in accordance with Z535.4.

PANEL ACTION: Accept in Principle.

Modify Section 490-21(b)(7) Exception to read as follows:

"Exception: More than one switch shall be permitted as the disconnecting means for one set of fuses where the switches are installed to provide connection to more than one set of supply conductors. The switches shall be mechanically or electrically interlocked to permit access to the fuses only when all switches are open. A conspicuous sign shall be placed at the fuses identifying the presence of more than one source."

Revise wording to delete : "WARNING - FUSES MAY BE ENERGIZED FROM MORE THAN ONE SOURCE."

PANEL STATEMENT: The specific wording is removed to permit appropriate hazard sign development. A FPN is proposed in Section 490-1 for reference to ANSI Z535 for sign development.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #3269)

13- 24 - (490-21(c)(2)): Accept in Principle

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise 490-21(c)(2) Exception with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

Exception: More than one switch shall be permitted as the disconnecting means for one set of fuses where the switches are installed to provide connection to more than one set of supply conductors. The switches shall be mechanically or electrically interlocked to permit access to the fuses only when all switches

are open. A conspicuous sign shall be placed at the fuses ~~reading~~ with the following words or equivalent:

WARNING - FUSES MAY BE ENERGIZED FROM MORE THAN ONE SOURCE.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formatted in accordance with Z535.4.

PANEL ACTION: Accept in Principle.

Modify 490-21(c)(2) to read as follows:

"(2) Operation. Where fused cutouts are not suitable to interrupt the circuit manually while carrying full load, an approved means shall be installed to interrupt the entire load. Unless the fused cutouts are interlocked with the switch to prevent opening of the cutouts under load, a conspicuous sign shall be placed at such cutouts identifying that they shall not be operated under load." Delete the following text in Section 490-21(c)(2): "WARNING-DO NOT OPEN UNDER LOAD"

PANEL STATEMENT: The specific wording is removed to permit appropriate hazard sign development. A FPN is proposed in Section 490-1 for reference to ANSI Z535 for sign development.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #3270)

13- 25 - (490-21(e)): Accept in Principle

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise the second paragraph of 490-21(e) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

Where more than one switch is installed with interconnected load terminals to provide for alternate connection to different supply conductors, each switch shall be provided with a conspicuous sign ~~reading~~ with the following words or equivalent:

WARNING - SWITCH MAY BE ENERGIZED BY BACKFEED.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formatted in accordance with Z535.4.

PANEL ACTION: Accept in Principle.

Modify Section 490-21(e) to read as follows:

"Where more than one switch is installed with interconnected load terminals to provide for alternate connection to different supply conductors, each switch shall be provided with a conspicuous sign identifying this hazard."

Delete the following text in Section 490-21(e): "WARNING - SWITCH MAY BE ENERGIZED BY BACKFEED."

PANEL STATEMENT: The specific wording is removed to permit appropriate hazard sign development. A FPN is proposed in Section 490-1 for reference to ANSI Z535 for sign development.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Davis

(Log #579)

13- 26 - (Table 490-24): Accept in Part

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Table 490-24 to add the metric values, and delete the note regarding unit conversions.

Table 490-24. Minimum Clearance of Live Parts*

Nominal Voltage	Impulse Withstand, B.I.L. kv		Minimum Clearance of Live Parts							
			Phase to Phase				Phase to Ground			
Rating kv	Indoors	Outdoors	Indoors		Outdoors		Indoors		Outdoors	
			mm	in.	mm	in.	mm	in.	mm	in.
2.4–4.16	60	95	115	4.5	175	7	75	3.0	150	6
7.2	75	95	140	5.5	175	7	100	4.0	150	6
13.8	95	110	190	7.5	300	12	125	5.0	175	7
14.4	110	110	225	9.0	300	12	165	6.5	175	7
23	125	150	265	10.5	375	15	190	7.5	250	10
34.5	150	150	315	12.5	375	15	240	9.5	250	10
—	200	200	450	18.0	450	18	330	13.0	325	13
46	—	200	—	—	450	18	—	—	325	13
	—	250	—	—	525	21	—	—	425	17
69	—	250	—	—	525	21	—	—	425	17
	—	350	—	—	775	31	—	—	625	25
115	—	550	—	—	1300	53	—	—	1000	42
138	—	550	—	—	1300	53	—	—	1000	42
	—	650	—	—	1600	63	—	—	1300	50
161	—	650	—	—	1600	63	—	—	1300	50
	—	750	—	—	1800	72	—	—	1500	58
230	—	750	—	—	1800	72	—	—	1500	58
	—	900	—	—	2300	89	—	—	1800	71
	—	1050	—	—	2700	105	—	—	2100	83

Note: ~~For SI units, 1 in. = 25.4 mm.~~

*The values given are the minimum clearance for rigid parts and bare conductors under favorable service conditions. They shall be increased for conductor movement or under unfavorable service conditions or wherever space limitations permit. The selection of the associated impulse withstand voltage for a particular system voltage is determined by the characteristics of the surge protective equipment.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept in Part.
Revise Table 490-24 as follows. Add existing footnote from present table to new Table 490-24.

Table 490-24. Minimum Clearance of Live Parts*

Nominal Voltage	Impulse Withstand, B.I.L. kv		Minimum Clearance of Live Parts							
			Phase to Phase				Phase to Ground			
Rating	Indoors	Outdoors	Indoors		Outdoors		Indoors		Outdoors	
kv			mm	in.	mm	in.	mm	in.	mm	in.
2.4–4.16	60	95	115	4.5	180	7	80	3.0	160	6
7.2	75	95	140	5.5	180	7	110	4.0	160	6
13.8	95	110	190	7.5	310	12	130	5.0	180	7
14.4	110	110	230	9.0	310	12	165	6.5	180	7
23	125	150	270	10.5	385	15	190	7.5	260	10
34.5	150	150	320	12.5	385	15	250	9.5	260	10
	200	200	460	18.0	460	18	330	13.0	330	13
46		200			460	18			330	13
		250			535	21			440	17
69		250			535	21			440	17
		350			785	31			640	25
115		550			1350	53			1070	42
138		550			1350	53			1070	42
		650			1600	63			1280	50
161		650			1600	63			1280	50
		750			1830	72			1480	58
230		750			1830	72			1480	58
		900			2270	89			1810	71
		1050			2670	105			2110	83

*** Note: ~~For SI units, 1 in. = 25.4 mm.~~**
***The values given are the minimum clearance for rigid parts and bare conductors under favorable service conditions. They shall be increased for conductor movement or under unfavorable service conditions or wherever space limitations permit. The selection of the associated impulse withstand voltage for a particular system voltage is determined by the characteristics of the surge protective equipment.**

PANEL STATEMENT: The dimensions in this table are minimum clearances for electrical BIL. The metric conversions must be rounded higher to assure minimum clearances are maintained.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #919)

13- 27 - (490-34, FPN (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add a fine print note to read as follows:
FPN: See Section 300-34 for minimum bending radius for conductors.
SUBSTANTIATION: Editorial. A fine print note would be useful to code users by referencing specific requirements in addition to the general requirement of this section.
PANEL ACTION: Reject.
PANEL STATEMENT: One of the objectives of the Usability Task Group was to eliminate unnecessary fine print notes. Since the requirements in Section 300-34 already apply there is no need for a fine print note.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #CP1308)

13- 27a - (490-35(a), and b): Accept
SUBMITTER: CMP 13
RECOMMENDATION: Modify Section 490-35 (a) and (b) to read as follows:
"(A) High Voltage Equipment. Doors that would provide unqualified persons access to high-voltage energized parts shall be locked.
(B) Low Voltage Control Equipment. Low-voltage control equipment, relays, motors, and the like shall not be installed in compartments with exposed high-voltage energized parts or high-voltage wiring unless either of the following conditions is met:
(1) The access means is interlocked with the high-voltage switch or disconnecting means to prevent the access means from being opened or removed
(2) The high-voltage switch or disconnecting means is in the isolating position.
(C) High Voltage Instruments or Control Transformers and Space Heaters. High-voltage instrument or control transformers and space heaters shall be permitted to be installed in the high-voltage compartment without access restrictions beyond those that apply to the high-voltage compartment generally."
SUBSTANTIATION: The existing text was reformatted, rewritten in positive language, and edited to meet the requirements of the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #CP1309)

13- 27b - (490-45(a), and b): Accept
SUBMITTER: CMP 13
RECOMMENDATION: Modify Section 490-45 to read as follows:
"490-45. Circuit Breakers-Interlocks.
(A) Circuit Breakers. Circuit breakers equipped with stored energy mechanisms shall be designed to prevent the release of the stored energy unless the mechanism has been fully charged.
(B) Mechanical Interlocks. Mechanical interlocks shall be provided in the housing to prevent the complete withdrawal of the circuit breaker from the housing when the stored energy mechanism is in the fully charged position, unless a suitable device is provided to block the closing function of the circuit breaker before complete withdrawal."
SUBSTANTIATION: The existing text was edited to meet the requirements of the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #3960)

13- 28 - (490-46 (New)): Reject
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: Add a new Section 490-46 to Part C of Article 490 as follows:

490-46. Metal Enclosed and Metalclad Service Equipment.

(a) General. Metal enclosed and metalclad switchgear installed as high-voltage service equipment shall have separation between service and feeder or branch circuit equipment

FPN: Local serving utilities may have additional requirements for high-voltage service equipment. See ANSI/IEEE C2-1997 Sections 18 and 38 for further information.

(b) Service Conductor Termination Compartment. The high-voltage service conductors shall terminate in a separate compartment with the following:

(1) A solid hinged door, which is latched or bolted, shut and has provisions for padlocking with a sign marked: "DANGER - High Voltage Within - Keep Out - Access Restricted to Qualified Persons Only".

FPN: Most local serving utilities require to be contacted to enter this line connection compartment.

(2) Provisions to mount and connect surge arresters.

(3) Live front construction shall have an inner barrier marked "DANGER ____ Volts" allowing inspection without opening. Each phase bus shall have a bare bus bar extension for potential checks and application of safety grounds. Clearances of these bus extension shall comply with Table 490-24. The cable termination shall permit the service cable to be supported to minimize forces applied to conductor terminals.

(4) Dead front construction shall be equipped with elbow ports, and provisions for parking station.

(5) Provisions for a ground bus extension to connect service cable termination shields and a safety ground attachment meeting local supplying utility requirements.

(6) Only the following high-voltage equipment may be installed in this compartment; service conductors and terminations, surge arresters, utility metering transformers, insulators, bus, and associated line side primary parts of the main disconnecting device, including current transformers for protective relaying.

(c) Service Overcurrent Protective Device. Access for maintenance of the service fuses, circuit breaker or circuit interrupter shall not expose personnel to live parts connected to the service conductors. Barriers rack-out mechanisms and interlocks with disconnect or isolating switches are recognized safeguards to provide this isolation.

(d) Access. Access to exposed live parts in excess of 600 V shall require (1) the opening of a door or barrier that is locked or otherwise secured against unauthorized entry and (2) by either the opening of a door or the removal of a barrier.

FPN: A prominent and appropriate safety sign should be visible when the first door or barrier is opened or removed. Note: ANSI Z535.1-1991, ANSI Z535.2-1991; ANSI Z535.3-1991; ANSI Z535.4-1991, and ANSI Z535.5-1991 contain information regarding safety signs.

SUBSTANTIATION: This proposal will establish a minimum requirement for high-voltage service equipment, identifying and isolating the service conductors and associated equipment which must be de-energized by the serving utility from the load related equipment which is under the control of the premise management. Provisions are also made for applications of safety grounds or electrical isolation during maintenance procedures for both the utility and the customer.
PANEL ACTION: Reject.
PANEL STATEMENT: Most of the issues presented by the submitter are product requirements which should be addressed by proposals to the product standards. Serving utilities have differing requirements which may not be addressed by the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Davis

EXPLANATION OF NEGATIVE:
FOGARTY: Current high-voltage product standards do not address minimum requirements for metal enclosed and metalclad equipment to be installed as high-voltage service entrance equipment. This proposal is an attempt to establish minimum performance based requirements that would satisfy user, utility and manufacturer concerns. These areas include but are not limited to the following:

- Utility access to service terminations for isolation, grounding and or testing
- Separation between service and feeder or branch circuit equipment
- A minimum standard to facilitate listing and labeling of this equipment for use as high-voltage service entrance equipment.

This negative comment is offered to foster public comment and encourage utilities, users, and manufacturers to submit recommendations to assist in the development and acceptance of this new section.

(Log #2169)

13- 29 - (490-51(a)): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise to read as follows:
490-51(a) ~~Covered~~ Scope. The provisions of this part...
SUBSTANTIATION: It is common practice to use scope as the title of a subsection rather than covered. The NEC Style Manual foreword states, "It is vitally important ... that maximum consistency be achieved in the language of the text.
PANEL ACTION: Reject.
PANEL STATEMENT: The NEC Style Manual Section 2.2.1 states: "Each article shall have a scope, which shall be the first section of the article."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

(Log #2173)

13- 30 - (490-51(b)): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Other Articles ~~Requirements.~~

... those prescribed in Articles 100 through 725 of this code especially ~~special attention shall be paid to~~ Article 250.

SUBSTANTIATION: As written, this section is possibly unenforceable because of the vague expression "special attention shall". The authority having jurisdiction can not judge "special attention". This section should be rewritten to be consistent with many other similar articles in the code, for example, 320-2 and 324-2.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of the term "especially" does not improve the enforceability of the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Davis

ARTICLE 500 — HAZARDOUS (CLASSIFIED) LOCATIONS, CLASSES I, II, AND III, DIVISIONS 1 AND 2

(Log #CP1401)

14- 2a - (500): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. Further, it was the action of the Technical Correlating Committe this this Proposal be reconsidered by the Panel, with further consideration given to the comments expressed in the voting, specifically with respect to comments that the accepted Proposal does not accurately reflect what was agreed upon by the Panel. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-4a, 14-6, 14-20, 14-21, 14-33, 14-34, 14-38, 14-39, 14-42, 14-43, 14-44, 14-45, 14-46, 14-47, 14-48, and 14-57a. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 14

RECOMMENDATION: Revise Article 500 as shown:

Entire 500 with recommended changes would appear as follows:

ARTICLE 500 –
Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2

500-1. Scope — Articles 500 through 504
Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2; Class II, Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitible fibers or flyings.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, or flammable liquids, refer to Article 505.

500-2 Definitions. For purposes of Articles 500 through 504 and Articles 506 through 516, the following definitions apply.

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where prescribed in a particular Code requirement.

FPN: Suitability of equipment for a specific purpose, environment, or application may be determined by:

1. equipment listing or labeling;
2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or
3. other evidence acceptable to the authority having jurisdiction such as a manufacturer's self evaluation or an owner's engineering judgement.

(See definitions of *Labeled* and *Listed*)

Unclassified Locations. Locations that have been evaluated by the classification process defined in Section 500-~~3~~5(a) or Section 505-~~3~~-5 (a) and determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.

Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-~~3~~-5 (a) or 505-~~3~~5(a).

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation, as well as any portable or transportable device having a battery or other electrical power source. (14-6)

Dust-ignitionproof. Equipment enclosed in a manner that will exclude dusts and will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

FPN: For further information on dust-ignitionproof enclosures, see Type 9 enclosure in Enclosures for Electrical Equipment, ANSI/NEMA 250-1991, and Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Dusttight. Enclosures constructed so that dust will not enter under specified test conditions.

FPN: See Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994, and Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified) Locations, UL 1604-1994.

Explosionproof Apparatus. Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

FPN: For further information, see Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Purged and Pressurized. The process of supplying an enclosure with a protective gas, at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level.

FPN: For further information, see Purged and Pressurized Enclosures for Electrical Equipment, ANSI/NFPA 496-1998.

Nonincendive Circuit. A circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas–, vapor–, or dust–air mixture.

FPN: For further information see Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA-S12.12-1994.

Nonincendive Field Wiring. Wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting the flammable gas–, vapor–, or dust–air mixture. Normal operation includes opening, shorting, or grounding the field wiring.

Nonincendive Equipment. Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–, vapor–, or dust–air mixture due to arcing or thermal means.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA-S12.12-1994.

Nonincendive Component. A component having contacts for making or breaking an incendive circuit and the contacting mechanism shall be constructed so that the component is incapable of igniting the specified flammable gas– or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.

FPN: For further information, see Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations, UL 1604-1994.

Oil Immersion. Electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: For further information, see Industrial Control Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 698-1995.

Hermetically Sealed. Equipment sealed against the entrance of an external atmosphere where the seal is made by

fusion, e.g., soldering, brazing, welding, or the fusion of glass to metal.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.

500-~~2~~3. Other Articles
Except as modified in Articles 500 through 504, all other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

500-~~3~~4 General
(a) Documentation All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

(b) Reference Standards.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with the standards of the National Fire Protection Association, the American Petroleum Institute, and the Instrument Society of America that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.

FPN No. 2: For further information on the classification of locations, see Flammable and Combustible Liquids Code, NFPA 30-1996; Standard for Drycleaning Plants, NFPA 32-1996; Standard for Spray Application Using Flammable or Combustible Materials, NFPA 33-1995; Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids, NFPA 34-1995; Standard for the Manufacture of Organic Coatings, NFPA 35-1995; Standard for Solvent Extraction Plants, NFPA 36-1997; Standard on Fire Protection for Laboratories Using Chemicals, NFPA 45-1996; Standard for Gaseous Hydrogen Systems at Consumer Sites, NFPA 50A-1994; Standard for Liquefied Hydrogen Systems at Consumer Sites, NFPA 50B-1994; Liquefied Petroleum Gas Code, NFPA 58-1998; Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, NFPA 59-1998; Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997; Standard for Fire Protection in Wastewater Treatment and Collection Facilities, NFPA 820-1995; Recommended Practice for Classification of Locations of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, ANSI/API RP500-1997; Area Classification In Hazardous (Classified) Dust Locations, ANSI/ISA-S12.10-1988.

FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.

FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996; and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, API RP 500-1997, Section 4.6.

FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1 and Division 2 Locations, ANSI/API RP 14F-1999.

500-~~4~~5. Classifications of Locations
(a) Classifications of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified. Each room, section, or area shall be considered individually in determining its classification.

FPN: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in reduced level of classification or in an unclassified location ~~less hazardous or in nonhazardous locations~~ and, thus, to reduce the amount of special equipment required.

Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations.

FPN: For further information regrading classification and ventilaton of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989 (14-37)

(b) Class I Locations
Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations shall include those specified in (1) and (2).

(1) Class I, Division 1. A Class I, Division 1 location is a location
(a) In which ignitible concentrations of flammable gases or vapors can exist under normal operating conditions, or
(b) In which ignitible concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage, or
(c) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of flammable gases or vapors, and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

FPN No. 1: This classification usually includes the following locations:

a. Where volatile flammable liquids or liquefied flammable gases are transferred from one container to another
b. Interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used
c. Locations containing open tanks or vats of volatile flammable liquids
d. Drying rooms or compartments for the evaporation of flammable solvents
e. Locations containing fat and oil extraction equipment using volatile flammable solvents
f. Portions of cleaning and dyeing plants where flammable liquids are used
g. Gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape
h. Inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids
i. The interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers
j. All other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

FPN No. 2: In some Division 1 locations, ignitible concentrations of flammable gases or vapors may be present continuously or for long periods of time. Examples include the following:

a. The inside of inadequately vented enclosures containing instruments normally venting

flammable gases or vapors to the interior of the enclosure
b. The inside of vented tanks containing volatile flammable liquids
c. The area between the inner and outer roof sections of a floating roof tank containing volatile flammable fluids
d. Inadequately ventilated areas within spraying or coating operations using volatile flammable fluids
e. The interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors.

Experience has demonstrated the prudence of avoiding the installation of instrumentation or other electric equipment in these particular areas altogether or where it cannot be avoided because it is essential to the process and other locations are not feasible [see Section 500-~~4~~5(a), FPN], using electric equipment or instrumentation approved for the specific application or consisting of intrinsically safe systems as described in Article 504.

(2) Class I, Division 2. A Class I, Division 2 location is a location
(a) In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment, or
(b) In which ignitible concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or
(c) That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN No. 1: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used but that, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

FPN No. 2: Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Depending on factors such as the quantity and size of the containers and ventilation, locations used for the storage of flammable liquids or liquefied or compressed gases in sealed containers may either be considered hazardous (classified) or nonhazardous locations. See Flammable and Combustible Liquids Code, NFPA 30-1996, and Liquefied Petroleum Gas Code, NFPA 58-1998.

(c) Class II Locations
Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations shall include those specified in (a) and (b).
(1) Class II, Division 1. A Class II, Division 1 location is a location
(a) In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitible mixtures, or
(b) Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
(c) In which combustible dusts of an electrically conductive nature may be present in hazardous quantities.

FPN: Combustible dusts that are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and wood-flour, oil meal from beans and seed, dried hay, and other organic materials that may produce combustible dusts when processed or handled. Only Group E dusts are considered to be electrically conductive for classification purposes. Dusts containing magnesium or aluminum are particularly hazardous, and the use of extreme precaution will be necessary to avoid ignition and explosion.

(2) Class II, Division 2. A Class II, Division 2 location is a location (a) Where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitible mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment and

(b) Where combustible dust accumulations on, in, or in the vicinity of the electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or may be ignitible by abnormal operation or failure of electrical equipment.

FPN No. 1: The quantity of combustible dust that may be present and the adequacy of dust removal systems are factors that merit consideration in determining the classification and may result in an nonhazardous area.

FPN No. 2: Where products such as seed are handled in a manner that produces low quantities of dust, the amount of dust deposited may not warrant classification.

(d) Class III Locations
Class III locations are those that are hazardous because of the presence of easily ignitible fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations shall include those specified in (a) and (b).
(1) Class III, Division 1. A Class III, Division 1 location is a location in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.

FPN No. 1: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.

FPN No. 2: Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(2) Class III, Division 2. A Class III, Division 2 location is a location in which easily ignitible fibers are stored or handled other than in the process of manufacture.

500-~~5~~6 Material Groups
For purposes of testing, approval, and area classification, various air mixtures (not oxygen-enriched) shall be grouped in accordance with Sections 500-~~5~~6(a) and 500-~~5~~6(b).

Exception: Equipment approved for a specific gas, vapor, or dust.

FPN: This grouping is based on the characteristics of the materials. Facilities are available for testing and identifying equipment for use in the various atmospheric groups.

(a) Class I Group Classifications . Class I groups shall be as follows.
(1) Group A. Acetylene.
(2) Group B. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40.

FPN: A typical Class I, Group B material is hydrogen.

Exception No. 1: Group D equipment shall be permitted to be used for atmospheres containing butadiene provided all conduit runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.
Exception No. 2: Group C equipment shall be permitted to be used for atmospheres containing allyl glycidyl ether, n-butyl glycidyl ether, ethylene oxide, propylene oxide, and acrolein provided all conduit runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.

(3) Group C. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80.

FPN: A typical Class I, Group C material is ethylene.

(4) Group D. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN No. 1: A typical Class I, Group D material is propane.
FPN No. 2: For classification of areas involving ammonia atmosphere, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.

~~*Exception: For atmospheres containing ammonia, the authority having jurisdiction for enforcement of this Code shall be permitted to reclassify the location to a reduced level of classification or to an unclassified hazardous location or a nonhazardous location.(14.37)*~~

~~FPN No. 1: For additional information on the properties and group classification of Class I materials, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997, and Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994.~~

The following FPN's apply to section (a):
FPN No. 1: The explosion characteristics of air mixtures of gases or vapors vary with the specific material involved. For Class I locations, Groups A, B, C, and D, the classification involves determinations of maximum explosion pressure and maximum safe clearance between parts of a clamped joint in an enclosure. It is necessary, therefore, that equipment be approved not only for class but also for the specific group of the gas or vapor that will be present.
FPN No. 2: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the above groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [100ºC (212ºF)] and the small joint clearance permitted to arrest its flame.
~~FPN No. 3: For classification of areas involving ammonia atmosphere, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.~~

(b) Class II Group Classifications. Class II groups shall be as follows.

(1) Group E. Atmospheres containing combustible metal dusts, including aluminum, magnesium, and their commercial alloys, or other combustible dusts whose particle size, abrasiveness, and conductivity present similar hazards in the use of electrical equipment.

FPN: Certain metal dusts may have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium, thorium, and uranium dusts have extremely low ignition temperatures [as low as 20ºC (68ºF)] and minimum ignition energies lower than any material classified in any of the Class I or Class II Groups.

(2) Group F. Atmospheres containing combustible carbonaceous dusts that have more than 8 percent total entrapped volatiles (see Standard Test Method for Volatile Material in the Analysis Sample for Coal and Coke, ASTM D3175-89, for coal and coke dusts) or that have been sensitized by other materials so that they present an explosion hazard. Coal, carbon black, charcoal, and coke dusts are examples of carbonaceous dusts.

(3) Group G. Atmospheres containing combustible dusts not included in Group E or F, including flour, grain, wood, plastic, and chemicals.

FPN No. 1: For additional information on group classification of Class II materials, see Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997.

FPN No. 2: The explosion characteristics of air mixtures of dust vary with the materials involved. For Class II locations, Groups E, F, and G, the classification involves the tightness of the joints of assembly and shaft openings to prevent the entrance of dust in the dust-ignitionproof enclosure, the blanketing effect of layers of dust on the equipment that may cause overheating, and the ignition temperature of the dust. It is necessary, therefore, that equipment be approved not only for the class, but also for the specific group of dust that will be present.

FPN No. 3: Certain dusts may require additional precautions due to chemical phenomena that can result in the generation of ignitible gases. See National Electrical Safety Code, ANSI C2-1997, Section 127A, Coal Handling Areas.

500 ~~6~~-7 Protection Techniques
The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

(a) Explosionproof Apparatus. This protection technique shall be permitted for equipment in Class I, Division 1 or 2 locations.

(b) Dust Ignitionproof. This protection technique shall be permitted for equipment in Class II, Division 1 or 2 locations.

(c) Dusttight. This protection technique shall be permitted for equipment in Class II, Division 2 or Class III locations.

(d) Purged and Pressurized. This protection technique shall be permitted for equipment in any hazardous (classified) location for which it is approved.

(e) Intrinsic Safety. This protection technique shall be permitted for equipment in Class I, Division 1 or 2, or Class II, Division 1 or 2, or Class III, Division 1 or 2 locations. The provisions of Articles 501 through 503 and 510 through 516 shall not be considered applicable to such installations, except as required by Article 504, and installation of intrinsically safe apparatus and wiring shall be in accordance with the requirements of Article 504.

(f) Nonincendive Circuit. This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, Division 2 locations.

(g) Nonincendive Equipment. This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, and Division 2 locations.

(h) Nonincendive Component This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, Division 2 locations.

(i) Nonincendive Component. This protection technique shall be permitted for current-interrupting contacts in those Class I, Division 2 locations for which the component is approved.

(j) Oil Immersion. This protection technique shall be permitted for current-interrupting contacts in Class I, Division 2 locations as described in Section 501-~~6~~7(b)(1)(b).

(k) Hermetically Sealed. This protection technique shall be permitted for equipment in Class I and II, Division 2, and Class III, Division 1 and 2 locations.

(l) Other Protection Techniques. Other protection techniques used in equipment listed for use in hazardous (classified) locations.

500 ~~-7~~ 8 Equipment

Articles 500 through 504 require equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to installation and maintenance.

FPN No. 2: Low ambient conditions require special consideration. Explosionproof or dust-ignitionproof equipment may not be suitable for use at temperatures lower than -25ºC (-13ºF) unless they are identified for low-temperature service. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Division 1 at normal ambient temperature.

(a) Approval for Class and Properties.

(1) Equipment shall be approved not only for the class of location but also for the explosive, combustible, or ignitible properties of the specific gas, vapor, dust, fiber, or flyings that will be present. In addition, Class I equipment shall not have any exposed surface that operates at a temperature in excess of the ignition temperature of the specific gas or vapor. Class II equipment shall not have an external temperature higher than that specified in Section 500-~~7~~8(2). Class III equipment shall not exceed the maximum surface temperatures specified in Section 503-1.

(2) Equipment that has been approved for a Division 1 location shall be permitted in a Division 2 location of the same class and group.

(3) Where specifically permitted in Articles 501 through 503, general-purpose equipment or equipment in general-purpose enclosures shall be permitted to be installed in Division 2 locations if the equipment does not constitute a source of ignition under normal operating conditions.

(4) Equipment, regardless of the classification of the location in which it is installed, that depends on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the equipment, shall be approved for a Class I, Division 2 location.

Exception: Equipment installed in a Class I, Division 1 location shall be suitable for the Division 1 location.

FPN: See Section 501-5(f)(3) for additional requirements.

(5) Unless otherwise specified, normal operating conditions for motors shall be assumed to be rated full-load steady conditions.

(6) Where flammable gases or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

FPN: The characteristics of various atmospheric mixtures of gases, vapors, and dusts depend on the specific material involved.

(b) Marking. Equipment shall be marked to show the class, group, and operating temperature or temperature class ~~range~~ referenced to a 40ºC ambient.

Exception No. 1: Equipment of the non-heat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature class ~~range~~

Exception No. 2: Fixed lighting fixtures marked for use in Class I, Division 2 or Class II, Division 2 locations only shall not be required to be marked to indicate the group.

Exception No. 3: Fixed general-purpose equipment in Class I locations, other than fixed lighting fixtures, that is acceptable for use in Class I, Division 2 locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 4: Fixed dusttight equipment other than fixed lighting fixtures that are acceptable for use in Class II, Division 2 and Class III locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 5: Electric equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature class ~~range~~ at that ambient temperature.

FPN: Equipment not marked to indicate a division, or marked "Division 1" or "Div. 1," is suitable for both Division 1 and 2 locations. Equipment marked "Division 2" or "Div. 2" is suitable for Division 2 locations only.

The temperature ~~-~~ class ~~range~~, if provided, shall be indicated using the temperature class (T Codes) ~~in identification numbers, as~~ shown in Table 500-~~7~~8(b).

The temperature class (T Code) ~~Identification numbers~~ marked on equipment nameplates shall be in accordance with Table 500-8~~7~~(b).

Equipment ~~that is approved~~ for Class I and Class II shall be marked with the maximum safe operating temperature, as determined by simultaneous exposure to the combinations of Class I and Class II conditions.

FPN: Since there is no consistent relationship between explosion properties and ignition temperature, the two are independent requirements.

Table 500-8(b). Classification of Maximum Surface Temperature ~~Identification Numbers~~

Maximum Temperature		~~Identification Number~~ Temperature Class (T Code)
ºC	ºF	
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

(c) Temperature

(1) Class I Temperature. The temperature marking specified in (b) shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of flammable gases, etc. and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997.

(2) Class II Temperature. The temperature marking specified in (b) shall be less than the ignition temperature of the specific dust to be encountered. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165ºC (329ºF).

FPN: See Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997, for minimum ignition temperatures of specific dusts.

The ignition temperature for which equipment was approved prior to this requirement shall be assumed to be as shown in Table 500-5(c) (2).

Table 500-5(c) (2).

	Equipment (Such as Motors or Power Transformers) that May Be Overloaded				
	Equipment that Is Not Subject to Overloading		Normal Operation	Abnormal Operation	
Class II Group	ºC	ºF	ºC	ºF	ºC ºF
E	200	392	200	392	200 392
F	200	392	150	302	200 392
G	165	329	120	248	165 329

(d) Threading

All threaded conduit referred to herein shall be threaded with an National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides _-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable.

Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Threading specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1:1980, and Metric Screw Threads, ISO 965/3:1980.

(e) Fiber Optic Cable Assembly.

Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with the requirements of Articles 500, 501, 502, or 503, as applicable.

500-9. Specific Occupancies

Articles 510 through 517 cover garages, aircraft hangars, gasoline dispensing and service stations, bulk storage plants, spray application, dipping and coating processes, and health care facilities.

SUBSTANTIATION: This complete revision of Article 500 editorially revises the text to make it more easily understood and also incorporates numerous technical and editorial improvements made via other proposals.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

BRIESCH: While the Panel Action to accept the rewrite of Article 500 is supported, the NFPA-Circulated Panel Proposal does not include all of the changes agreed to at the meeting. The e-mail sent by Dave Wechsler subsequent to the meeting is more complete in reflecting the Panel Actions from the meeting.

COOK: I agree with Proposal 14-2a and the substantiation, however, it does not incorporate all of the changes made via other proposals. An updated version that was emailed from Dave Wechsler on 1-26-2000 seems to be more complete with respect to including Panel Actions from the meeting in Hilton Head. I agree with the proposals submitted to change the term "nonhazardous" to "unclassified". During the panel discussion, the term "nonhazardous" was defined and also used in certain applications. After considering discussion and reviewing written ballots, I believe that some evaluation is done on every installation and a determination is made to use ordinary electrical equipment, or continue more extensive evaluation and possibly use some special equipment. I believe that defining and using two terms would complicate the issue. I believe we should define and use the term "unclassified" and drop "nonhazardous."

ENGLER: Not all of the changes made it into the draft circulated with this ballot, vote is to affirm the text with all of the necessary changes made to it.

GOODMAN: Part 1, Rewritten Article is inconsistent with other Panel Actions and has missing or incorrect information. Rewritten Article requires additional backchecking.

Examples: Panel Action to Proposal 14-20 to "Purged and Pressurized" (new Section 500-7(d)) was to use "Identified" but is shown in draft as "Approved"; redundant paragraphs numbered 500-7(h) and 500-7(i); added text of Proposal 14-30 and 14-31 is missing from draft, and new text or modified text is not identified accurately in the margin.

Part 2, this comment recommends change to a specific part of the rewritten Article. In the new Section 500-2 Definitions, the term "Nonhazardous" has been included. This comment recommends the removal of this term, definition, and use for the following reasons:

1. This term was added as part of the Panel Chairman assigned Task Group responsible for reorganizing the information in Article 500. This term and definition are new material and beyond the scope of the Panel Chair's direction.
2. The added term and definition was not part of any Proposal made to the Panel and has no substantiation for its inclusion.
3. Several Proposals (14-8, 14-40, 14-315, and 14-316) specifically requested that the term "nonhazardous" currently used in the Article be deleted and substituted with the term "unclassified".
4. This term adds an additional area classification location that does not currently exist in related standards and practices (API 500 and 505 for example) or in most company documentation systems.
5. The term is misleading. The implication of "nonhazardous" is that there are no hazards. There are hazards other than electrical area classification such as caustics, acids, radiation, etc. Using the term "unclassified" is becoming widely accepted and recognized as specific to electrical area classification. "Nonhazardous" is much too broad.
6. The term is not needed. An area is either "Classified", requiring specifically identified or approved equipment suitable for the location or "Unclassified", not requiring equipment so identified or approved. The term will only add confusion and potential misapplication.
7. By its definition, "Nonhazardous Locations. Locations which are not required to have been evaluated". Whoever makes the determination that the location is not required to be evaluated has just evaluated the location. It is also not at all clear how or who would make that determination.

For the above reasons, the term "Nonhazardous", its definition and use should be removed from Article 500 and (505).

JAGUNICH: The definitions of "nonincendive field wiring apparatus" and "associated nonincendive field wiring apparatus" were established by CMP14 and do not appear in panel proposal 14-2a as sent in the ballot. These definition should included.

LAWRENCE: Due to the large number of public proposals received and acted upon, and also due to time constraints, the panel was not able to compile and correlate all aspects of the rewrites of the affected article. Please see David Wechsler's ballot

OMEARA: Please see the comments on the ballot for David Wechsler.

WECHSLER: While attempts were made to provide NFPA staff with corrected revisions of this text before the end of the CMP 14 panel meeting, a detailed review of this balloted draft version has indicated that this does not reflect the correct committee actions and is not correct.

We attribute the problems with this draft to the following:

a) the use of several earlier drafts that were consistently being revised to keep pace with changes made due to committee actions on public proposals,

b) the limited time available to proof and develop this work,

c) the extremely large number of public proposals,

d) the complex nature of the interaction of affected texts within Articles 500, 501, 502, and 505, and the desire of the panel to maintain consistency, and

e) human errors in transcribing this information.

The following text provides a correct revision of this complete work effort for Article 500. This text should be the panel document of record and not that provided with the panel ballot.

Entire 500 with recommended changes would appear as follows:

ARTICLE 500 –

Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2

500-1. Scope — Articles 500 through 504

Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2; Class II, Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitible fibers or flyings.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, or flammable liquids, refer to Article 505.

500-2 Definitions. For purposes of Articles 500 through 504 and Articles 506 through 516, the following definitions apply.

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where prescribed in a particular Code requirement.

FPN: Suitability of equipment for a specific purpose, environment, or application may be determined by:

~~1.~~2. equipment listing or labeling;

2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or

3. other evidence acceptable to the authority having jurisdiction such as a manufacturer's self evaluation or an owner's engineering judgement.

(See definitions of *Labeled* and *Listed*)

Unclassified Locations. Locations that have been evaluated by the classification process defined in Section 500-~~3~~5(a) or Section 505-~~3~~5(a) and determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.

Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-~~3~~5 (a) or 505-~~3~~5(a).

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation, as well as any portable or transportable device having a battery or other electrical power source. (14-6)

Dust-ignitionproof. Equipment enclosed in a manner that will exclude dusts and will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

FPN: For further information on dust-ignitionproof enclosures, see Type 9 enclosure in Enclosures for Electrical Equipment, ANSI/NEMA 250-1991, and Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Dusttight. Enclosures constructed so that dust will not enter under specified test conditions.

FPN: See Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994, and Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified) Locations, UL 1604-1994.

Explosionproof Apparatus. Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

FPN: For further information, see Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Purged and Pressurized. The process of supplying an enclosure with a protective gas, at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level.

FPN: For further information, see Purged and Pressurized Enclosures for Electrical Equipment, ANSI/NFPA 496-1998.

Nonincendive Circuit. A circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas–, vapor–, or dust–air mixture.

FPN: For further information see Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA-S12.12-1994.

Nonincendive Field Wiring. Wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting the flammable gas–, vapor–, or dust–air mixture. Normal operation includes opening, shorting, or grounding the field wiring.

Nonincendive Equipment. Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–, vapor–, or dust–air mixture due to arcing or thermal means.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA-S12.12-1994.

Nonincendive Component. A component having contacts for making or breaking an incendive circuit and the contacting mechanism shall be constructed so that the component is incapable of igniting the specified flammable gas– or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.

FPN: For further information, see Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations, UL 1604-1994.

Oil Immersion. Electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: For further information, see Industrial Control Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 698-1995.

Hermetically Sealed. Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, e.g., soldering, brazing, welding, or the fusion of glass to metal.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.

500-~~2~~3. Other Articles

Except as modified in Articles 500 through 504, all other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

500-~~3~~4 General

(a) Documentation All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

(b) Reference Standards.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with the standards of the National Fire Protection Association, the American Petroleum Institute, and the Instrument Society of America that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.

FPN No. 2: For further information on the classification of locations, see Flammable and Combustible Liquids Code, NFPA 30-1996; Standard for Drycleaning Plants, NFPA 32-1996; Standard for Spray Application Using Flammable or Combustible Materials, NFPA 33-1995; Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids, NFPA 34-1995; Standard for the Manufacture of Organic Coatings, NFPA 35-1995; Standard for Solvent Extraction Plants, NFPA 36-1997; Standard on Fire Protection for Laboratories Using Chemicals, NFPA 45-1996; Standard for Gaseous Hydrogen Systems at Consumer Sites, NFPA 50A-1994; Standard for Liquefied Hydrogen Systems at Consumer Sites, NFPA 50B-1994; Liquefied Petroleum Gas Code,

NFPA 58-1998; Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, NFPA 59-1998; Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997; Standard for Fire Protection in Wastewater Treatment and Collection Facilities, NFPA 820-1995; Recommended Practice for Classification of Locations of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, ANSI/API RP500-1997; Area Classification In Hazardous (Classified) Dust Locations, ANSI/ISA-S12.10-1988.

FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.

FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996; and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, API RP 500-1997, Section 4.6.

FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1 and Division 2 Locations, ANSI/API RP 14F-1999.

500-45. Classifications of Locations

(a) Classifications of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified. Each room, section, or area shall be considered individually in determining its classification.

FPN: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in reduced level of classification or in an unclassified location ~~less hazardous or in nonhazardous locations~~ and, thus, to reduce the amount of special equipment required.

Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations.

FPN: For further information regrading classification and ventilaton of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989 (14-37)

(b) Class I Locations

Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations shall include those specified in (1) and (2).

(1) Class I, Division 1. A Class I, Division 1 location is a location
(a) In which ignitible concentrations of flammable gases or vapors can exist under normal operating conditions, or
(b) In which ignitible concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage, or
(c) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of flammable gases or vapors, and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

FPN No. 1: This classification usually includes the following locations:

a. Where volatile flammable liquids or liquefied flammable gases are transferred from one container to another
b. Interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used
c. Locations containing open tanks or vats of volatile flammable liquids
d. Drying rooms or compartments for the evaporation of flammable solvents
e. Locations containing fat and oil extraction equipment using volatile flammable solvents
f. Portions of cleaning and dyeing plants where flammable liquids are used
g. Gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape
h. Inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids
i. The interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers
j. All other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

FPN No. 2: In some Division 1 locations, ignitible concentrations of flammable gases or vapors may be present continuously or for long periods of time. Examples include the following:

a. The inside of inadequately vented enclosures containing instruments normally venting flammable gases or vapors to the interior of the enclosure
b. The inside of vented tanks containing volatile flammable liquids
c. The area between the inner and outer roof sections of a floating roof tank containing volatile flammable fluids
d. Inadequately ventilated areas within spraying or coating operations using volatile flammable fluids
e. The interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors.

Experience has demonstrated the prudence of avoiding the installation of instrumentation or other electric equipment in these particular areas altogether or where it cannot be avoided because it is essential to the process and other locations are not feasible [see Section 500-45(a), FPN], using electric equipment or instrumentation approved for the specific application or consisting of intrinsically safe systems as described in Article 504.

(2) Class I, Division 2. A Class I, Division 2 location is a location
(a) In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment, or
(b) In which ignitible concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or
(c) That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN No. 1: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used but that, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating

condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

FPN No. 2: Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Depending on factors such as the quantity and size of the containers and ventilation, locations used for the storage of flammable liquids or liquefied or compressed gases in sealed containers may either be considered hazardous (classified) or nonhazardous locations. See Flammable and Combustible Liquids Code, NFPA 30-1996, and Liquefied Petroleum Gas Code, NFPA 58-1998.

(c) Class II Locations
Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations shall include those specified in (a) and (b).
(1) Class II, Division 1. A Class II, Division 1 location is a location
(a) In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitible mixtures, or
(b) Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
(c) In which combustible dusts of an electrically conductive nature may be present in hazardous quantities.

FPN: Combustible dusts that are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and wood-flour, oil meal from beans and seed, dried hay, and other organic materials that may produce combustible dusts when processed or handled. Only Group E dusts are considered to be electrically conductive for classification purposes. Dusts containing magnesium or aluminum are particularly hazardous, and the use of extreme precaution will be necessary to avoid ignition and explosion.

(2) Class II, Division 2. A Class II, Division 2 location is a location
(a) Where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitible mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment and

(b) Where combustible dust accumulations on, in, or in the vicinity of the electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or may be ignitible by abnormal operation or failure of electrical equipment.

FPN No. 1: The quantity of combustible dust that may be present and the adequacy of dust removal systems are factors that merit consideration in determining the classification and may result in an nonhazardous area.

FPN No. 2: Where products such as seed are handled in a manner that produces low quantities of dust, the amount of dust deposited may not warrant classification.

(d) Class III Locations
Class III locations are those that are hazardous because of the presence of easily ignitible fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations shall include those specified in (a) and (b).
(1) Class III, Division 1. A Class III, Division 1 location is a location in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.

FPN No. 1: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.

FPN No. 2: Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(2) Class III, Division 2. A Class III, Division 2 location is a location in which easily ignitible fibers are stored or handled other than in the process of manufacture.

500-~~5~~6 Material Groups
For purposes of testing, approval, and area classification, various air mixtures (not oxygen-enriched) shall be grouped in accordance with Sections 500-~~5~~6(a) and 500-~~5~~6(b).

Exception: Equipment approved for a specific gas, vapor, or dust.

FPN: This grouping is based on the characteristics of the materials. Facilities are available for testing and identifying equipment for use in the various atmospheric groups.

(a) Class I Group Classifications . Class I groups shall be as follows.
(1) Group A. Acetylene.
(2) Group B. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40.

FPN: A typical Class I, Group B material is hydrogen.

Exception No. 1: Group D equipment shall be permitted to be used for atmospheres containing butadiene provided all conduit runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.
Exception No. 2: Group C equipment shall be permitted to be used for atmospheres containing allyl glycidyl ether, n-butyl glycidyl ether, ethylene oxide, propylene oxide, and acrolein provided all conduit runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.

(3) Group C. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80.
FPN: A typical Class I, Group C material is ethylene.

(4) Group D. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80.
FPN No. 1: A typical Class I, Group D material is propane.
FPN No. 2: For classification of areas involving ammonia atmosphere, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.

~~*Exception: For atmospheres containing ammonia, the authority having jurisdiction for enforcement of this Code shall be permitted to reclassify the location to a reduced level of classification or to an unclassified or nonhazardous location or a nonhazardous location.(14.37)*~~

~~FPN No. 1: For additional information on the properties and group classification of Class I materials, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997, and Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994.~~

The following FPN's apply to section (a):
FPN No. 1: The explosion characteristics of air mixtures of gases or vapors vary with the specific material involved. For Class I locations, Groups A, B, C, and D, the classification involves determinations of maximum explosion pressure and maximum safe clearance between parts of a clamped joint in an enclosure. It is necessary, therefore, that equipment be approved not only for class but also for the specific group of the gas or vapor that will be present.
FPN No. 2: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the above groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [100ºC (212ºF)] and the small joint clearance permitted to arrest its flame.
~~FPN No. 3: For classification of areas involving ammonia atmosphere, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.~~

(b) Class II Group Classifications. Class II groups shall be as follows.

(1) Group E. Atmospheres containing combustible metal dusts, including aluminum, magnesium, and their commercial alloys, or other combustible dusts whose particle size, abrasiveness, and conductivity present similar hazards in the use of electrical equipment.

FPN: Certain metal dusts may have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium, thorium, and uranium dusts have extremely low ignition temperatures [as low as 20ºC (68ºF)] and minimum ignition energies lower than any material classified in any of the Class I or Class II Groups.

(2) Group F. Atmospheres containing combustible carbonaceous dusts that have more than 8 percent total entrapped volatiles (see Standard Test Method for Volatile Material in the Analysis Sample for Coal and Coke, ASTM D3175-89, for coal and coke dusts) or that have been sensitized by other materials so that they present an explosion hazard. Coal, carbon black, charcoal, and coke dusts are examples of carbonaceous dusts.

(3) Group G. Atmospheres containing combustible dusts not included in Group E or F, including flour, grain, wood, plastic, and chemicals.

FPN No. 1: For additional information on group classification of Class II materials, see Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997.

FPN No. 2: The explosion characteristics of air mixtures of dust vary with the materials involved. For Class II locations, Groups E, F, and G, the classification involves the tightness of the joints of assembly and shaft openings to prevent the entrance of dust in the dust-ignitionproof enclosure, the blanketing effect of layers of dust on the equipment that may cause overheating, and the ignition temperature of the dust. It is necessary, therefore, that equipment be approved not only for the class, but also for the specific group of dust that will be present.

FPN No. 3: Certain dusts may require additional precautions due to chemical phenomena that can result in the generation of ignitible gases. See National Electrical Safety Code, ANSI C2-1997, Section 127A, Coal Handling Areas.

500 ~~-6~~-7 Protection Techniques
The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

(a) Explosionproof Apparatus. This protection technique shall be permitted for equipment in Class I, Division 1 or 2 locations.

(b) Dust Ignitionproof. This protection technique shall be permitted for equipment in Class II, Division 1 or 2 locations.

(c) Dusttight. This protection technique shall be permitted for equipment in Class II, Division 2 or Class III locations.

(d) Purged and Pressurized. This protection technique shall be permitted for equipment in any hazardous (classified) location for which it is approved.

(e) Intrinsic Safety. This protection technique shall be permitted for equipment in Class I, Division 1 or 2, or Class II, Division 1 or 2, or Class III, Division 1 or 2 locations. The provisions of Articles 501 through 503 and 510 through 516 shall not be considered applicable to such installations, except as required by Article 504, and installation of intrinsically safe apparatus and wiring shall be in accordance with the requirements of Article 504.

(f) Nonincendive Circuit. This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, Division 2 locations.

(g) Nonincendive Equipment. This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, and Division 2 locations.

(h) Nonincendive Component This protection technique shall be permitted for equipment in Class I, Division 2, Class II, Division 2, Class III, Division 2 locations.

(i) Nonincendive Component. This protection technique shall be permitted for current-interrupting contacts in those Class I, Division 2 locations for which the component is approved.

(j) Oil Immersion. This protection technique shall be permitted for current-interrupting contacts in Class I, Division 2 locations as described in Section 501-~~6~~7(b)(1)(b).

(k) Hermetically Sealed. This protection technique shall be permitted for equipment in Class I and II, Division 2, and Class III, Division 1 and 2 locations.

(l) Other Protection Techniques. Other protection techniques used in equipment listed for use in hazardous (classified) locations.

500 ~~-7~~-8 Equipment
Articles 500 through 504 require equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to installation and maintenance.
FPN No. 2: Low ambient conditions require special consideration. Explosionproof or dust-ignitionproof equipment may not be suitable for use at temperatures lower than -25ºC (-13ºF) unless they are identified for low-temperature service. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Division 1 at normal ambient temperature.

(a) Approval for Class and Properties.
(1) Equipment shall be approved not only for the class of location but also for the explosive, combustible, or ignitible properties of the specific gas, vapor, dust, fiber, or flyings that will be present. In addition, Class I equipment shall not have any exposed surface that operates at a temperature in excess of the ignition temperature of the specific gas or vapor. Class II equipment shall not have an external temperature higher than that specified in Section 500-~~7~~8(2). Class III equipment shall not exceed the maximum surface temperatures specified in Section 503-1.
(2) Equipment that has been approved for a Division 1 location shall be permitted in a Division 2 location of the same class and group.
(3) Where specifically permitted in Articles 501 through 503, general-purpose equipment or equipment in general-purpose enclosures shall be permitted to be installed in Division 2 locations if the equipment does not constitute a source of ignition under normal operating conditions.
(4) Equipment, regardless of the classification of the location in which it is installed, that depends on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the equipment, shall be approved for a Class I, Division 2 location.

Exception: Equipment installed in a Class I, Division 1 location shall be suitable for the Division 1 location.

FPN: See Section 501-5(f)(3) for additional requirements.

(5) Unless otherwise specified, normal operating conditions for motors shall be assumed to be rated full-load steady conditions.
(6) Where flammable gases or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

FPN: The characteristics of various atmospheric mixtures of gases, vapors, and dusts depend on the specific material involved.

(b) Marking. Equipment shall be marked to show the class, group, and operating temperature or temperature class ~~range~~ referenced to a 40ºC ambient.

Exception No. 1: Equipment of the non-heat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature class ~~range~~

Exception No. 2: Fixed lighting fixtures marked for use in Class I, Division 2 or Class II, Division 2 locations only shall not be required to be marked to indicate the group.

Exception No. 3: Fixed general-purpose equipment in Class I locations, other than fixed lighting fixtures, that is acceptable for use in Class I, Division 2 locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 4: Fixed dusttight equipment other than fixed lighting fixtures that are acceptable for use in Class II, Division 2 and Class III locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 5: Electric equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature class ~~range~~ at that ambient temperature.

FPN: Equipment not marked to indicate a division, or marked "Division 1" or "Div. 1," is suitable for both Division 1 and 2 locations. Equipment marked "Division 2" or "Div. 2" is suitable for Division 2 locations only.

The temperature ~~-~~ class ~~range~~, if provided, shall be indicated using the temperature class (T Codes) ~~in identification numbers, as~~ shown in Table 500-~~7~~8(b).

The temperature class (T Code) ~~Identification numbers~~ marked on equipment nameplates shall be in accordance with Table 500-~~8~~7(b).

Equipment ~~that is approved~~ for Class I and Class II shall be marked with the maximum safe operating temperature, as determined by simultaneous exposure to the combinations of Class I and Class II conditions.

FPN: Since there is no consistent relationship between explosion properties and ignition temperature, the two are independent requirements.

Table 500-8(b). Classification of Maximum Surface Temperature ~~Identification Numbers~~

Maximum Temperature		~~Identification~~ Temperature ~~Number~~ Class (T Code)
ºC	ºF	
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

(c) Temperature

(1) Class I Temperature. The temperature marking specified in (b) shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of flammable gases, etc. and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997.

(2) Class II Temperature. The temperature marking specified in (b) shall be less than the ignition temperature of the specific dust to be encountered. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165ºC (329ºF).

FPN: See Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997, for minimum ignition temperatures of specific dusts.

The ignition temperature for which equipment was approved prior to this requirement shall be assumed to be as shown in Table 500-5(c) (2).

Table 500-5(c) (2).

Equipment (Such as Motors or Power Transformers) that May Be Overloaded					
	Equipment that Is Not Subject to Overloading		Normal Operation		Abnormal Operation
Class II Group	ºC	ºF	ºC	ºF	ºC ºF
E	200	392	200	392	200 392
F	200	392	150	302	200 392
G	165	329	120	248	165 329

(d) Threading

All threaded conduit referred to herein shall be threaded with an National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides _-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable.

Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

~~(1)~~ (2) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Threading specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1:1980, and Metric Screw Threads, ISO 965/3:1980.

(e) Fiber Optic Cable Assembly.

Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with the requirements of Articles 500, 501, 502, or 503, as applicable.

500-9. Specific Occupancies

Articles 510 through 517 cover garages, aircraft hangars, gasoline dispensing and service stations, bulk storage plants, spray application, dipping and coating processes, and health care facilities.

(Log #2128)

14- 3 - (500): Accept in Principle
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Reorganize Article 500 as indicated below per NEC CMA Proposal 14-1. With the exception of minor titling changes and a rearrangement of sentences as indicated within one section, this proposal contains no new words, concepts or requirements.
Revise Article 500 as follows:
1) Relocate 500-3 (a) as 500- 4 (a) and renumber 500-3 with existing 500 -3 (b) (c) section. Relocate 500-3 (d) and 500 -3 (e) to new sections under 500-7.

With change:
500-3 General.
(a) Documentation All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

(b) Reference Standards.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with the standards of the National Fire Protection Association, the American Petroleum Institute, and the Instrument Society of America that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.

FPN No. 2: For further information on the classification of locations, see Flammable and Combustible Liquids Code, NFPA 30-1996; Standard for Drycleaning Plants, NFPA 32-1996; Standard for Spray Application Using Flammable or Combustible Materials, NFPA 33-1995; Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids, NFPA 34-1995; Standard for the Manufacture of Organic Coatings, NFPA 35-1995; Standard for Solvent Extraction Plants, NFPA 36-1997; Standard on Fire Protection for Laboratories Using Chemicals, NFPA 45-1996; Standard for Gaseous Hydrogen Systems at Consumer Sites, NFPA 50A-1994; Standard for Liquefied Hydrogen Systems at Consumer Sites, NFPA 50B-1994; Liquefied Petroleum Gas Code, NFPA 58-1998; Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, NFPA 59-1998; Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997; Standard for Fire Protection in Wastewater Treatment and Collection Facilities, NFPA 820-1995; Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, ANSI/API RP500-1997; Area Classification In Hazardous (Classified) Dust Locations, ANSI/ISA-S12.10-1988.

FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.

FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996; and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, API RP 500-1997, Section 4.6.

FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Offshore Production Platforms, ANSI/API RP 14F-1991.

2) Move the entire sections 500-7, 500-8 and 500- 9 under new 500 - 4: this will result in a discussion of the classification of locations all under a single new titled section as follows:

With change:

500-4. Classifications of Locations.
(a) Classifications of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified. Each room, section, or area shall be considered individually in determining its classification.

FPN: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in less hazardous or in nonhazardous locations and, thus, to reduce the amount of special equipment required.

(b) Class I Locations(500-7.) Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations shall include those specified in (1) and (2).

(1) Class I, Division 1. A Class I, Division 1 location is a location
(a) In which ignitible concentrations of flammable gases or vapors can exist under normal operating conditions, or
(b) In which ignitible concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage, or
(c) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of flammable gases or vapors, and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

FPN No. 1: This classification usually includes the following locations:

a. Where volatile flammable liquids or liquefied flammable gases are transferred from one container to another
b. Interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used
c. Locations containing open tanks or vats of volatile flammable liquids
d. Drying rooms or compartments for the evaporation of flammable solvents
e. Locations containing fat and oil extraction equipment using volatile flammable solvents
f. Portions of cleaning and dyeing plants where flammable liquids are used
g. Gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape
h. Inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids
i. The interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers
j. All other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

FPN No. 2: In some Division 1 locations, ignitible concentrations of flammable gases or vapors may be present continuously or for long periods of time. Examples include the following:

a. The inside of inadequately vented enclosures containing instruments normally venting flammable gases or vapors to the interior of the enclosure
b. The inside of vented tanks containing volatile flammable liquids
c. The area between the inner and outer roof sections of a floating roof tank containing volatile flammable fluids

d. Inadequately ventilated areas within spraying or coating operations using volatile flammable fluids
e. The interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors.

Experience has demonstrated the prudence of avoiding the installation of instrumentation or other electric equipment in these particular areas altogether or where it cannot be avoided because it is essential to the process and other locations are not feasible [see Section 500-4(a), FPN], using electric equipment or instrumentation approved for the specific application or consisting of intrinsically safe systems as described in Article 504.

(2) Class I, Division 2. A Class I, Division 2 location is a location
(a) In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment, or
(b) In which ignitible concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or
(c) That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN No. 1: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used but that, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

FPN No. 2: Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Depending on factors such as the quantity and size of the containers and ventilation, locations used for the storage of flammable liquids or liquefied or compressed gases in sealed containers may either be considered hazardous (classified) or nonhazardous locations. See Flammable and Combustible Liquids Code, NFPA 30-1996, and Liquefied Petroleum Gas Code, NFPA 58-1998.

(c) Class II Locations. Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations shall include those specified in (a) and (b).
(1) Class II, Division 1. A Class II, Division 1 location is a location
(a) In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitible mixtures, or
(b) Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
(c) In which combustible dusts of an electrically conductive nature may be present in hazardous quantities.

FPN: Combustible dusts that are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and wood-flour, oil meal from beans and seed, dried hay, and other organic materials that may produce combustible dusts when processed or handled. Only Group E dusts are considered to be electrically conductive for classification purposes. Dusts containing magnesium or aluminum are particularly hazardous, and the use of extreme precaution will be necessary to avoid ignition and explosion.

(2) Class II, Division 2. A Class II, Division 2 location is a location
(a) Where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitible mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment and

(b) Where combustible dust accumulations on, in, or in the vicinity of the electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or may be ignitible by abnormal operation or failure of electrical equipment.

FPN No. 1: The quantity of combustible dust that may be present and the adequacy of dust removal systems are factors that merit consideration in determining the classification and may result in an nonhazardous area.

FPN No. 2: Where products such as seed are handled in a manner that produces low quantities of dust, the amount of dust deposited may not warrant classification.

(d) Class III Locations. Class III locations are those that are hazardous because of the presence of easily ignitible fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations shall include those specified in (a) and (b).
(1) Class III, Division 1. A Class III, Division 1 location is a location in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.

FPN No. 1: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.

FPN No. 2: Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(2) Class III, Division 2. A Class III, Division 2 location is a location in which easily ignitible fibers are stored or handled other than in the process of manufacture.

3) Provide new 500 -5 consisting of existing sections 500-5 (a) (b) and (c)

500-5 Material Groups. For purposes of testing, approval, and area classification, various air mixtures (not oxygen-enriched) shall be grouped in accordance with Sections 500-5(a) and 500-5(b).

Exception: Equipment approved for a specific gas, vapor, or dust.

FPN: This grouping is based on the characteristics of the materials. Facilities are available for testing and identifying equipment for use in the various atmospheric groups.

(a) Class I Group Classifications. Class I groups shall be as follows.
(1) Group A. Acetylene.
(2) Group B. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40.

FPN: A typical Class I, Group B material is hydrogen.

Exception No. 1: Group D equipment shall be permitted to be used for atmospheres containing butadiene provided all conduit runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.

Exception No. 2: Group C equipment shall be permitted to be used for atmospheres containing allyl glycidyl ether, n-butyl glycidyl ether, ethylene oxide, propylene oxide, and acrolein provided all conduit runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.

(3) Group C. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80.

FPN: A typical Class I, Group C material is ethylene.

(4) Group D. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN: A typical Class I, Group D material is propane.

Exception: For atmospheres containing ammonia, the authority having jurisdiction for enforcement of this Code shall be permitted to reclassify the location to a less hazardous location or a nonhazardous location.

FPN No. 1: For additional information on the properties and group classification of Class I materials, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997, and Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994.

FPN No. 2: The explosion characteristics of air mixtures of gases or vapors vary with the specific material involved. For Class I locations, Groups A, B, C, and D, the classification involves determinations of maximum explosion pressure and maximum safe clearance between parts of a clamped joint in an enclosure. It is necessary, therefore, that equipment be approved not only for class but also for the specific group of the gas or vapor that will be present.

FPN No. 3: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the above groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [100ºC (212ºF)] and the small joint clearance permitted to arrest its flame.

FPN No. 4: For classification of areas involving ammonia atmosphere, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.

(b) Class II Group Classifications. Class II groups shall be as follows.

(1) Group E. Atmospheres containing combustible metal dusts, including aluminum, magnesium, and their commercial alloys, or other combustible dusts whose particle size, abrasiveness, and conductivity present similar hazards in the use of electrical equipment.

FPN: Certain metal dusts may have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium, thorium, and uranium dusts have extremely low ignition temperatures [as low as 20ºC (68ºF)] and minimum ignition energies lower than any material classified in any of the Class I or Class II Groups.

(2) Group F. Atmospheres containing combustible carbonaceous dusts that have more than 8 percent total entrapped volatiles (see Standard Test Method for Volatile Material in the Analysis Sample for Coal and Coke, ASTM D3175-89, for coal and coke dusts) or that have been sensitized by other materials so that they present an explosion hazard. Coal, carbon black, charcoal, and coke dusts are examples of carbonaceous dusts.

(3) Group G. Atmospheres containing combustible dusts not included in Group E or F, including flour, grain, wood, plastic, and chemicals.

FPN No. 1: For additional information on group classification of Class II materials, see Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997.

FPN No. 2: The explosion characteristics of air mixtures of dust vary with the materials involved. For Class II locations, Groups E, F, and G, the classification involves the tightness of the joints of assembly and shaft openings to prevent the entrance of dust in the dust-ignitionproof enclosure, the blanketing effect of layers of dust on the equipment that may cause overheating, and the ignition temperature of the dust. It is necessary, therefore, that equipment be approved not only for the class, but also for the specific group of dust that will be present.

FPN No. 3: Certain dusts may require additional precautions due to chemical phenomena that can result in the generation of ignitible gases. See National Electrical Safety Code, ANSI C2-1997, Section 127A, Coal Handling Areas.

5) Renumber 500-4 as 500-6.

With change:

500 -6 Protection Techniques. The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

(a) Explosionproof Apparatus. This protection technique shall be permitted for equipment in those Class I, Division 1 and 2 locations for which it is approved.

FPN: Explosionproof apparatus is defined in Article 100. For further information, see Explosionproof and Dust-Ignitionproof Electrical Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 1203-1994.

(b) Dust Ignitionproof. This protection technique shall be permitted for equipment in those Class II, Division 1 and 2 locations for which it is approved.

FPN: Dust-ignitionproof equipment is defined in Article 100. For further information, see Explosionproof and Dust-Ignitionproof Electrical Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 1203-1994.

(c) Dusttight. This protection technique shall be permitted for equipment in those Class II, Division 2 and Class III locations for which it is approved.

FPN No. 1: Dusttight enclosures are constructed so that dust will not enter the enclosing cases under specified test conditions.

FPN No. 2: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994, and Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified) Locations, UL 1604-1994.

FPN No. 3: For further information on test conditions for equipment other than rotating equipment, see Enclosures for Electrical Equipment (1000 volts Maximum), ANSI/NEMA 250-1991.

(d) Purged and Pressurized. This protection technique shall be permitted for equipment in any hazardous (classified) location for which it is approved.

FPN No. 1: In some cases, hazards may be reduced or hazardous (classified) locations limited or eliminated by adequate positive-pressure ventilation from a source of clean air in conjunction with effective safeguards against ventilation failure.

FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(e) Intrinsically Safe Systems. Intrinsically safe apparatus and wiring shall be permitted in any hazardous (classified) location for which it is approved, and the provisions of Articles 501 through 503 and 510 through 516 shall not be considered applicable to such installations, except as required by Article 504.

Installation of intrinsically safe apparatus and wiring shall be in accordance with the requirements of Article 504.

FPN: For further information, see Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous Locations, ANSI/UL 913-1997.

(f) Nonincendive. A protective technique where, under normal operating conditions, any arcing or thermal effects are not capable of igniting the flammable gas, vapor, or dust-in-air mixture. This protection technique shall be permitted for equipment in those Class I, Division 2; Class II, Division 2; and Class III locations for which it is approved.

(1) Nonincendive Circuit. A circuit in which any arc or thermal effect produced, under intended operating conditions of the equipment or due to opening, shorting, or grounding of field wiring, is not capable, under specified test conditions, of igniting the flammable gas–, vapor–, or dust–air mixture.

FPN No. 1: For test conditions, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.

FPN No. 2: Nonincendive circuit is defined in Article 100. For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.

(2) Nonincendive Equipment. Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–, vapor–, or dust–air mixture due to arcing or thermal means.

FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA-S12.12-1994.

(3) Nonincendive Component. A component having contacts for making or breaking an incendive circuit and the contacting mechanism shall be constructed so that the component is incapable of igniting the specified flammable gas– or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.

This protection technique shall be permitted for current-interrupting contacts in those Class I, Division 2 locations for which the component is approved.

FPN: For further information, see Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations, UL 1604-1994.

(g) Oil Immersion. This protection technique shall be permitted for current-interrupting contacts in Class I, Division 2 locations as described in Section 501-6(b)(1)(b).

FPN: See Sections 501-3(b)(1), Exception (a); 501-5(a)(1), Exception (b), 501-6(b)(1); 501-14(b)(1), Exception (a); 502-14(a)(2), Exception; and 502-14(a)(3), Exception. For further information, see Industrial Control Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 698-1995.

(h) Hermetically Sealed. A hermetically sealed device shall be sealed against the entrance of an external atmosphere and the seal shall be made by fusion, e.g., soldering, brazing, welding, or the fusion of glass to metal.

This protection technique shall be permitted for current-interrupting contacts in Class I, Division 2 locations.

FPN: See Sections 501-3(b)(1), Exception (b); 501-5(a)(1), Exception (a); 501-6(b)(1)(a); and 501-14(b)(1), Exception (b). For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.

(i) Other Protection Techniques. Other protection techniques used in equipment listed for use in hazardous (classified) locations.

4) Renumber 500-5 and 500-7, change the order of paragraphs in 500-5(c) and insert it as new 500-7 (a).

With change:

500 -7 Equipment. Articles 500 through 504 require equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to installation and maintenance.

FPN No. 2: Low ambient conditions require special consideration. Explosionproof or dust-ignitionproof equipment may not be suitable for use at temperatures lower than -25ºC (-13ºF) unless they are identified for low-temperature service. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Division 1 at normal ambient temperature.

(a) Approval for Class and Properties.

(1) Equipment shall be approved not only for the class of location but also for the explosive, combustible, or ignitible properties of the specific gas, vapor, dust, fiber, or flyings that will be present. In addition, Class I equipment shall not have any exposed surface that operates at a temperature in excess of the ignition temperature of the specific gas or vapor. Class II equipment shall not have an external temperature higher than that specified in Section 500-7(2). Class III equipment shall not exceed the maximum surface temperatures specified in Section 503-1.

(2) Equipment that has been approved for a Division 1 location shall be permitted in a Division 2 location of the same class and group.

(3) Where specifically permitted in Articles 501 through 503, general-purpose equipment or equipment in general-purpose enclosures shall be permitted to be installed in Division 2 locations if the equipment does not constitute a source of ignition under normal operating conditions.

(4) Equipment, regardless of the classification of the location in which it is installed, that depends on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the equipment, shall be approved for a Class I, Division 2 location.

Exception: Equipment installed in a Class I, Division 1 location shall be suitable for the Division 1 location.

FPN: See Section 501-5(f)(3) for additional requirements.

(5) Unless otherwise specified, normal operating conditions for motors shall be assumed to be rated full-load steady conditions.

(6) Where flammable gases or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

FPN: The characteristics of various atmospheric mixtures of gases, vapors, and dusts depend on the specific material involved.

(b) Marking. Approved equipment shall be marked to show the class, group, and operating temperature or temperature range referenced to a 40ºC ambient.

Exception No. 1: Equipment of the non-heat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature range.

Exception No. 2: Fixed lighting fixtures marked for use in Class I, Division 2 or Class II, Division 2 locations only shall not be required to be marked to indicate the group.

Exception No. 3: Fixed general-purpose equipment in Class I locations, other than fixed lighting fixtures, that is acceptable for use in Class I, Division 2 locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 4: Fixed dusttight equipment other than fixed lighting fixtures that are acceptable for use in Class II, Division 2 and Class III locations shall not be required to be marked with the class, group, division, or operating temperature.

Exception No. 5: Electric equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature range at that ambient temperature.

FPN: Equipment not marked to indicate a division, or marked "Division 1" or "Div. 1," is suitable for both Division 1 and 2 locations. Equipment marked "Division 2" or "Div. 2" is suitable for Division 2 locations only.

The temperature range, if provided, shall be indicated in identification numbers, as shown in Table 500-7(b).

Identification numbers marked on equipment nameplates shall be in accordance with Table 500-7(b).

Equipment that is approved for Class I and Class II shall be marked with the maximum safe operating temperature, as determined by simultaneous exposure to the combinations of Class I and Class II conditions.

FPN: Since there is no consistent relationship between explosion properties and ignition temperature, the two are independent requirements.

Table 500-5(d). Identification Numbers

Maximum Temperature °C	Maximum Temperature °F	Identification Number
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

(c) Temperature.
(1) Class I Temperature. The temperature marking specified in (b) shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997, and Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994.

(2) Class II Temperature. The temperature marking specified in (b) shall be less than the ignition temperature of the specific dust to be encountered. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165ºC (329ºF).

FPN: See Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997, for minimum ignition temperatures of specific dusts.

The ignition temperature for which equipment was approved prior to this requirement shall be assumed to be as shown in Table 500-5(f).

Table 500-5(f).

Class II Group	Equipment that Is Not Subject to Overloading °C	Equipment that Is Not Subject to Overloading °F	Equipment (Such as Motors or Power Transformers) that May Be Overloaded Normal Operation °C	Normal Operation °F	Abnormal Operation °C	Abnormal Operation °F
E	200	392	200	392	200	392
F	200	392	150	302	200	392
G	165	329	120	248	165	329

d) Threaded Conduit. All threaded conduit referred to herein shall be threaded with an NPT standard conduit cutting die that provides _-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and ensure the explosionproof or dust-ignitionproof integrity of the conduit system where applicable. For equipment provided with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1:1980 and Metric Screw Threads, ISO 965/3:1980.

(e) Fiber Optic Cable Assembly. Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with the requirements of Articles 500, 501, 502, or 503, as applicable.
6) Renumber 500-6 to 500 -8

With change:

500-8. Specific Occupancies. Articles 510 through 517 cover garages, aircraft hangars, gasoline dispensing and service stations, bulk storage plants, spray application, dipping and coating processes, and health care facilities.

Entire 500 with recommended changes would appear as follows:

ARTICLE 500 –Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2

500-1. Scope — Articles 500 through 504. Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2; Class II, Divisions 1 and 2; and Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitible fibers or flyings.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, or flammable liquids, refer to Article 505.

500-2. Other Articles. Except as modified in Articles 500 through 504, all other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

500-3 General
(a) Documentation All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

(b) Reference Standards.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with the standards of the National Fire Protection Association, the American Petroleum Institute, and the Instrument Society of America that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.
FPN No. 2: For further information on the classification of locations, see Flammable and Combustible Liquids Code, NFPA 30-1996; Standard for Drycleaning Plants, NFPA 32-1996; Standard for Spray Application Using Flammable or Combustible Materials, NFPA 33-1995; Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids, NFPA 34-1995; Standard for the Manufacture of Organic Coatings, NFPA 35-1995; Standard for Solvent Extraction Plants, NFPA 36-1997; Standard on Fire Protection for Laboratories Using Chemicals, NFPA 45-1996; Standard for Gaseous Hydrogen Systems at Consumer Sites, NFPA 50A-1994; Standard for Liquefied Hydrogen Systems at Consumer Sites, NFPA 50B-1994; Liquefied Petroleum Gas Code, NFPA 58-1998; Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, NFPA 59-1998; Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997; Standard for Fire Protection in Wastewater Treatment and Collection Facilities, NFPA 820-1995; Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, ANSI/API RP500-1997; Area Classification In Hazardous (Classified) Dust Locations, ANSI/ISA-S12.10-1988.
FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.
FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996; and Recommended Practice for Classification of

Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2, API RP 500-1997, Section 4.6.
FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Offshore Production Platforms, ANSI/API RP 14F-1991.

500-4. Classifications of Locations.
(a) Classifications of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified. Each room, section, or area shall be considered individually in determining its classification.

FPN: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in less hazardous or in nonhazardous locations and, thus, to reduce the amount of special equipment required.

(b) Class I Locations. Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations shall include those specified in (1) and (2).

(1) Class I, Division 1. A Class I, Division 1 location is a location
(a) In which ignitible concentrations of flammable gases or vapors can exist under normal operating conditions, or
(b) In which ignitible concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage, or
(c) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of flammable gases or vapors, and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

FPN No. 1: This classification usually includes the following locations:

a. Where volatile flammable liquids or liquefied flammable gases are transferred from one container to another
b. Interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used
c. Locations containing open tanks or vats of volatile flammable liquids
d. Drying rooms or compartments for the evaporation of flammable solvents
e. Locations containing fat and oil extraction equipment using volatile flammable solvents
f. Portions of cleaning and dyeing plants where flammable liquids are used
g. Gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape
h. Inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids
i. The interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers
j. All other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

FPN No. 2: In some Division 1 locations, ignitible concentrations of flammable gases or vapors may be present continuously or for long periods of time. Examples include the following:

a. The inside of inadequately vented enclosures containing instruments normally venting flammable gases or vapors to the interior of the enclosure
b. The inside of vented tanks containing volatile flammable liquids
c. The area between the inner and outer roof sections of a floating roof tank containing volatile flammable fluids
d. Inadequately ventilated areas within spraying or coating operations using volatile flammable fluids
e. The interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors.

Experience has demonstrated the prudence of avoiding the installation of instrumentation or other electric equipment in these particular areas altogether or where it cannot be avoided because it is essential to the process and other locations are not feasible [see Section 500-4(a), FPN], using electric equipment or instrumentation approved for the specific application or consisting of intrinsically safe systems as described in Article 504.

(2) Class I, Division 2. A Class I, Division 2 location is a location
(a) In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment, or
(b) In which ignitible concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or
(c) That is adjacent to a Class I, Division 1 location, and to which ignitible concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN No. 1: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used but that, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.
FPN No. 2: Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Depending on factors such as the quantity and size of the containers and ventilation, locations used for the storage of flammable liquids or liquefied or compressed gases in sealed containers may either be considered hazardous (classified) or nonhazardous locations. See Flammable and Combustible Liquids Code, NFPA 30-1996, and Liquefied Petroleum Gas Code, NFPA 58-1998.

(c) Class II Locations. Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations shall include those specified in (a) and (b).
(1) Class II, Division 1. A Class II, Division 1 location is a location
(a) In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitible mixtures, or
(b) Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
(c) In which combustible dusts of an electrically conductive nature may be present in hazardous quantities.

FPN: Combustible dusts that are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and wood-flour, oil meal from beans and seed, dried hay, and other organic materials that may produce combustible dusts when processed or handled. Only Group E dusts are considered to be electrically conductive for classification purposes. Dusts containing magnesium or aluminum are particularly hazardous, and the use of extreme precaution will be necessary to avoid ignition and explosion.

(2) Class II, Division 2. A Class II, Division 2 location is a location (a) Where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitible mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment and

(b) Where combustible dust accumulations on, in, or in the vicinity of the electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or may be ignitible by abnormal operation or failure of electrical equipment.

FPN No. 1: The quantity of combustible dust that may be present and the adequacy of dust removal systems are factors that merit consideration in determining the classification and may result in an nonhazardous area.
FPN No. 2: Where products such as seed are handled in a manner that produces low quantities of dust, the amount of dust deposited may not warrant classification.

(d) Class III Locations. Class III locations are those that are hazardous because of the presence of easily ignitible fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations shall include those specified in (a) and (b).

(1) Class III, Division 1. A Class III, Division 1 location is a location in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.

FPN No. 1: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.
FPN No. 2: Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(2) Class III, Division 2. A Class III, Division 2 location is a location in which easily ignitible fibers are stored or handled other than in the process of manufacture.

500-5 Material Groups. For purposes of testing, approval, and area classification, various air mixtures (not oxygen-enriched) shall be grouped in accordance with Sections 500-5(a) and 500-5(b).

Exception: Equipment approved for a specific gas, vapor, or dust.

FPN: This grouping is based on the characteristics of the materials. Facilities are available for testing and identifying equipment for use in the various atmospheric groups.

(a) Class I Group Classifications . Class I groups shall be as follows.
(1) Group A. Acetylene.
(2) Group B. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40.

FPN: A typical Class I, Group B material is hydrogen.

Exception No. 1: Group D equipment shall be permitted to be used for atmospheres containing butadiene provided all conduit runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.
Exception No. 2: Group C equipment shall be permitted to be used for atmospheres containing allyl glycidyl ether, n-butyl glycidyl ether, ethylene oxide, propylene oxide, and acrolein provided all conduit runs into explosionproof equipment are provided with explosionproof seals installed within 18 in. (457 mm) of the enclosure.

(3) Group C. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80.

FPN: A typical Class I, Group C material is ethylene.

(4) Group D. Flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN: A typical Class I, Group D material is propane.

Exception: For atmospheres containing ammonia, the authority having jurisdiction for enforcement of this Code shall be permitted to reclassify th location to a less hazardous location or a nonhazardous location.

FPN No. 1: For additional information on the properties and group classification of Class I materials, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997, and Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994.
FPN No. 2: The explosion characteristics of air mixtures of gases or vapors vary with the specific material involved. For Class I locations, Groups A, B, C, and D, the classification involves determinations of maximum explosion pressure and maximum safe clearance between parts of a clamped joint in an enclosure. It is necessary, therefore, that equipment be approved not only for class but also for the specific group of the gas or vapor that will be present.
FPN No. 3: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the above groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [100ºC (212ºF)] and the small joint clearance permitted to arrest its flame.
FPN No. 4: For classification of areas involving ammonia atmosphere, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989.

(b) Class II Group Classifications. Class II groups shall be as follows.

(1) Group E. Atmospheres containing combustible metal dusts, including aluminum, magnesium, and their commercial alloys, or other combustible dusts whose particle size, abrasiveness, and conductivity present similar hazards in the use of electrical equipment.

FPN: Certain metal dusts may have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium, thorium, and uranium dusts have extremely low ignition temperatures [as low as 20ºC (68ºF)] and minimum ignition energies lower than any material classified in any of the Class I or Class II Groups.

(2) Group F. Atmospheres containing combustible carbonaceous dusts that have more than 8 percent total entrapped volatiles (see Standard Test Method for Volatile Material in the Analysis Sample for Coal and Coke, ASTM D3175-89, for coal and coke dusts) or that have been sensitized by other materials so that they present an explosion hazard. Coal, carbon black, charcoal, and coke dusts are examples of carbonaceous dusts.

(3) Group G. Atmospheres containing combustible dusts not included in Group E or F, including flour, grain, wood, plastic, and chemicals.

FPN No. 1: For additional information on group classification of Class II materials, see Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997.
FPN No. 2: The explosion characteristics of air mixtures of dust vary with the materials involved. For Class II locations, Groups E, F, and G, the classification involves the tightness of the joints of assembly and shaft openings

to prevent the entrance of dust in the dust-ignitionproof enclosure, the blanketing effect of layers of dust on the equipment that may cause overheating, and the ignition temperature of the dust. It is necessary, therefore, that equipment be approved not only for the class, but also for the specific group of dust that will be present.
FPN No. 3: Certain dusts may require additional precautions due to chemical phenomena that can result in the generation of ignitible gases. See National Electrical Safety Code, ANSI C2-1997, Section 127A, Coal Handling Areas.

500 -6 Protection Techniques. The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.
(a) Explosionproof Apparatus. This protection technique shall be permitted for equipment in those Class I, Division 1 and 2 locations for which it is approved.
FPN: Explosionproof apparatus is defined in Article 100. For further information, see Explosionproof and Dust-Ignitionproof Electrical Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 1203-1994.

(b) Dust Ignitionproof. This protection technique shall be permitted for equipment in those Class II, Division 1 and 2 locations for which it is approved.
FPN: Dust-ignitionproof equipment is defined in Article 100. For further information, see Explosionproof and Dust-Ignitionproof Electrical Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 1203-1994.

(c) Dusttight. This protection technique shall be permitted for equipment in those Class II, Division 2 and Class III locations for which it is approved.
FPN No. 1: Dusttight enclosures are constructed so that dust will not enter the enclosing cases under specified test conditions.
FPN No. 2: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994, and Electrical Equipment for Use in Class I and II, Division 2 and Class III Hazardous (Classified) Locations, UL 1604-1994.
FPN No. 3: For further information on test conditions for equipment other than rotating equipment, see Enclosures for Electrical Equipment (1000 volts Maximum), ANSI/NEMA 250-1991.
(d) Purged and Pressurized. This protection technique shall be permitted for equipment in any hazardous (classified) location for which it is approved.
FPN No. 1: In some cases, hazards may be reduced or hazardous (classified) locations limited or eliminated by adequate positive-pressure ventilation from a source of clean air in conjunction with effective safeguards against ventilation failure.
FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.
(e) Intrinsically Safe Systems. Intrinsically safe apparatus and wiring shall be permitted in any hazardous (classified) location for which it is approved, and the provisions of Articles 501 through 503 and 510 through 516 shall not be considered applicable to such installations, except as required by Article 504.
Installation of intrinsically safe apparatus and wiring shall be in accordance with the requirements of Article 504.
FPN: For further information, see Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous Locations, ANSI/UL 913-1997.
(f) Nonincendive. A protective technique where, under normal operating conditions, any arcing or thermal effects are not capable of igniting the flammable gas, vapor, or dust-in-air mixture. This protection technique shall be permitted for equipment in those Class I, Division 2; Class II, Division 2; and Class III locations for which it is approved.
(1) Nonincendive Circuit. A circuit in which any arc or thermal effect produced, under intended operating conditions of the equipment or due to opening, shorting, or grounding of field wiring, is not capable, under specified test conditions, of igniting the flammable gas–, vapor–, or dust–air mixture.
FPN No. 1: For test conditions, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.
FPN No. 2: Nonincendive circuit is defined in Article 100. For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.
(2) Nonincendive Equipment. Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–, vapor–, or dust–air mixture due to arcing or thermal means.
FPN: For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, ANSI/ISA-S12.12-1994.
(3) Nonincendive Component A component having contacts for making or breaking an incendive circuit and the contacting mechanism shall be constructed so that the component is incapable of igniting the specified flammable gas– or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.
This protection technique shall be permitted for current-interrupting contacts in those Class I, Division 2 locations for which the component is approved.
FPN: For further information, see Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations, UL 1604-1994.
(g) Oil Immersion. This protection technique shall be permitted for current-interrupting contacts in Class I, Division 2 locations as described in Section 501-6(b)(1)(b).
FPN: See Sections 501-3(b)(1), Exception (a); 501-5(a)(1), Exception (b), 501-6(b)(1); 501-14(b)(1), Exception (a); 502-14(a)(2), Exception; and 502-14(a)(3), Exception. For further information, see Industrial Control Equipment for Use in Hazardous (Classified) Locations, ANSI/UL 698-1995.
(h) Hermetically Sealed. A hermetically sealed device shall be sealed against the entrance of an external atmosphere and the seal shall be made by fusion, e.g., soldering, brazing, welding, or the fusion of glass to metal.
This protection technique shall be permitted for current-interrupting contacts in Class I, Division 2 locations.
FPN: See Sections 501-3(b)(1), Exception (b); 501-5(a)(1), Exception (a); 501-6(b)(1)(a); and 501-14(b)(1), Exception (b). For further information, see Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations, ANSI/ISA S12.12-1994.
(i) Other Protection Techniques. Other protection techniques used in equipment listed for use in hazardous (classified) locations.

500 -7 Equipment. Articles 500 through 504 require equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.
FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to installation and maintenance.
FPN No. 2: Low ambient conditions require special consideration. Explosionproof or dust-ignitionproof equipment may not be suitable for use at temperatures lower than -25°C (-13°F) unless they are identified for low-temperature service. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Division 1 at normal ambient temperature.

(a) Approval for Class and Properties.
(1) Equipment shall be approved not only for the class of location but also for the explosive, combustible, or ignitible properties of the specific gas, vapor, dust, fiber, or flyings that will be present. In addition, Class I equipment shall not have any exposed surface that operates at a temperature in excess of the ignition temperature of the specific gas or vapor. Class II equipment shall not have an external temperature higher than that specified in Section 500-7(2). Class III equipment shall not exceed the maximum surface temperatures specified in Section 503-1.
(2) Equipment that has been approved for a Division 1 location shall be permitted in a Division 2 location of the same class and group.

(3) Where specifically permitted in Articles 501 through 503, general-purpose equipment or equipment in general-purpose enclosures shall be permitted to be installed in Division 2 locations if the equipment does not constitute a source of ignition under normal operating conditions.
(4) Equipment, regardless of the classification of the location in which it is installed, that depends on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the equipment, shall be approved for a Class I, Division 2 location.
Exception: Equipment installed in a Class I, Division 1 location shall be suitable for the Division 1 location.

FPN: See Section 501-5(f)(3) for additional requirements.

(5) Unless otherwise specified, normal operating conditions for motors shall be assumed to be rated full-load steady conditions.
(6) Where flammable gases or combustible dusts are or may be present at the same time, the simultaneous presence of both shall be considered when determining the safe operating temperature of the electrical equipment.

FPN: The characteristics of various atmospheric mixtures of gases, vapors, and dusts depend on the specific material involved.

(b) Marking. Approved equipment shall be marked to show the class, group, and operating temperature or temperature range referenced to a 40ºC ambient.
Exception No. 1: Equipment of the non-heat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature range.
Exception No. 2: Fixed lighting fixtures marked for use in Class I, Division 2 or Class II, Division 2 locations only shall not be required to be marked to indicate the group.
Exception No. 3: Fixed general-purpose equipment in Class I locations, other than fixed lighting fixtures, that is acceptable for use in Class I, Division 2 locations shall not be required to be marked with the class, group, division, or operating temperature.
Exception No. 4: Fixed dusttight equipment other than fixed lighting fixtures that are acceptable for use in Class II, Division 2 and Class III locations shall not be required to be marked with the class, group, division, or operating temperature.
Exception No. 5: Electric equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature range at that ambient temperature.

FPN: Equipment not marked to indicate a division, or marked "Division 1" or "Div. 1," is suitable for both Division 1 and 2 locations. Equipment marked "Division 2" or "Div. 2" is suitable for Division 2 locations only.

The temperature range, if provided, shall be indicated in identification numbers, as shown in Table 500-7(b).
Identification numbers marked on equipment nameplates shall be in accordance with Table 500-7(b).
Equipment that is approved for Class I and Class II shall be marked with the maximum safe operating temperature, as determined by simultaneous exposure to the combinations of Class I and Class II conditions.

FPN: Since there is no consistent relationship between explosion properties and ignition temperature, the two are independent requirements.

Table 500-7(b). Identification Numbers

Maximum Temperature ºC	Maximum Temperature ºF	Identification Number
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

(c) Temperature.
(1) Class I Temperature. The temperature marking specified in (b) shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997, and Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994.

(2) Class II Temperature. The temperature marking specified in (b) shall be less than the ignition temperature of the specific dust to be encountered. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165ºC (329ºF).

FPN: See Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 499-1997, for minimum ignition temperatures of specific dusts.

The ignition temperature for which equipment was approved prior to this requirement shall be assumed to be as shown in Table 500-7(2) below.

Table 500-7(2)

Class II Group	Equipment that Is Not Subject to Overloading °C	Equipment that Is Not Subject to Overloading °F	Equipment (Such as Motors or Power Transformers) that May Be Overloaded Normal Operation °C	Equipment (Such as Motors or Power Transformers) that May Be Overloaded Normal Operation °F	Equipment (Such as Motors or Power Transformers) that May Be Overloaded Abnormal Operation °C	Equipment (Such as Motors or Power Transformers) that May Be Overloaded Abnormal Operation °F
E	200	392	200	392	200	392
F	200	392	150	302	200	392
G	165	329	120	248	165	329

(**d) Threaded Conduit.** All threaded conduit referred to herein shall be threaded with an NPT standard conduit cutting die that provides 3/4-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and ensure the explosionproof or dust-ignitionproof integrity of the conduit system where applicable. For equipment provided with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1:1980 and Metric Screw Threads, ISO 965/3:1980.

(e) Fiber Optic Cable Assembly. Where a fiber optic cable assembly contains conductors that are capable of carrying current, the fiber optic cable assembly shall be installed in accordance with the requirements of Articles 500, 501, 502, or 503, as applicable.

500-8. Specific Occupancies. Articles 510 through 517 cover garages, aircraft hangars, gasoline dispensing and service stations, bulk storage plants, spray application, dipping and coating processes, and health care facilities.
SUBSTANTIATION: Currently, the introduction to Hazardous (Classified) Locations is presented with little regard to clarity and understanding. The text jumps from "classifications" to documentation to threaded conduit, to protection techniques, without ever providing groundwork as to the need for the protection techniques. Under the proposed revision, the reader is moved in a logical sequence, that defines general needs, addresses the classifications of locations, discusses material groups, before ever mentioning equipment. Then with protection techniques, equipment, equipment approvals, equipment markings and equipment designs are addressed. This provides a flow into the more specific sections beyond Article 500.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

Log #1545)

14- 4 - (500-1-Hazardous Classified Locations): Reject
SUBMITTER: Thomas J. Conlan, Conlan's "The Electrician Inc."
RECOMMENDATION: For simplicity add definitions to the nomenclature for Hazardous Classified Locations as H = Hazardous Classified, the next number if the Class and next number is the Division.
H11 = Class 1 Division 1
H12 = Class 1 Division 2
H21 = Class 2 Division 1
H22 = Class 2 Division 2
H31 = Class 3 Division 1
H32 = Class 3 Division 2
Addresses using short version of the "H" system provides clarity as to exactly where the discussion is and where the location is.
SUBSTANTIATION: This will simplify the practical applications to all H locations specifically among many others. For example 502-7(3) resistors and resistance devices shall have dust-ignitionproof enclosures approved for Class II locations. (Class II locations is specifically addressed to Section (a) Division I which requires one to look back to see where they were and this can cause confusion)
So now the section would read:
For example 502-7(3) Resistors and resistance devices shall have dust-ignitionproof enclosures approved for H21 locations.
[Where H21 means Hazardous/Class 2/ Division 1 real simple and easy to understand immediately]
PANEL ACTION: Reject.
PANEL STATEMENT: The technical substantiation does not support the use of arabic numerals for the Class designation. Thus, the use of arabic numerals would be contrary to the NEC style manual. Additionally, there is no substantiation that a problem exists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #CP1405)

14- 4a - (500-2 and 505-2): Accept
Note: The Technical Correlating Committee directs that this Proposal be reconsidered and directs the Code-Making Panel to use the definition currently in Article 100.
The Technical Correlating Committee further directs that this Proposal be referred to Code-Making Panel 1 for action relative to the elimination of the existing Fine Print Note in the definition of "Identified" because the Fine Print Note contains permissive language and is not permitted by the NEC Style Manual. This action will be considered by Code-Making Panels 1 and 14 as a Public Comment.
SUBMITTER: CMP 14
RECOMMENDATION: Add the following definition to 500-2 and 505-2:
"Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where prescribed in a particular Code requirement.
FPN: Suitability of equipment for a specific purpose, environment, or application may be determined by:
1. equipment listing or labeling;
2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or
3.other evidence acceptable to the authority having jurisdiction such as a manufacturer's self evaluation or an owner's engineering judgement.
(See definitions of Labeled and Listed)"
SUBSTANTIATION: This definition clarifies the intent for approval of equipment.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
BRIESCH: The Panel Action to include this definition in the special situations presented by hazardous locations is supported. However, it should be noted that it would be inappropriate to apply it generally to all chapters of the Code.
JAGUNICH: See ballot for David Wechsler.
WECHSLER: This was just one of the many Cook/Cox "identified, approved, listed, other" proposals in which the committee acted to develop a new definition for "identified" with a new fine print note (FPN) in Articles 500 and 505. This action was incorporated into the panel action rewrites for Articles 500 and 505, as noted in CP1401 and CP1402.

(Log #2264)

14- 5 - (500-2 (New)): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
RECOMMENDATION: Add the following new second paragraph:
Portable electrical or electronic devices or equipment shall not be required to comply with Chapter 5.
SUBSTANTIATION: "500-1 Scope" indicates that "Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2..." The term "equipment" is defined in Article 100 as "A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like used as a part of, or in connection with, an electrical installation." "Installation" is not an NEC defined term, but has as its meaning the concept of setting in place and being connected. As such, portable devices or equipment which are not part of an electrical installation are not addressed within Chapter 5 of the NEC and thus there are no requirements that such devices must comply with Chapter 5 of the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal conflicts with the action on Proposal 14-2a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2263)

14- 6 - (500-2-Electrical and Electronic Equipment): Accept in Principle

SUBMITTER: David Wechsler, Union Carbide Corp.

RECOMMENDATION: Add the following new section "Definitions" and renumber all existing paragraphs/sections accordingly:

Definitions. The following definition applies for Chapter 5:

Electrical and Electronic Equipment – Includes material, fittings, devices, appliances, fixtures, apparatus, and the like that is part of, or in connection with, an electrical installation, as well as any portable or transportable device having a battery or other electrical power source.

SUBSTANTIATION: It may be inferred that because "500-1 Scope" indicates that "Articles 500 through 504 cover the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Divisions 1 and 2..." and the term "equipment" as defined in Article 100 applies only to installed electrical/electronic devices, appliances, fixtures, apparatus, etc. that portable electrical devices are excluded from the requirements of Chapter 5. With this new definition, this ambiguity is removed and portable electrical devices are required to comply with Chapter 5.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Proposal 14-2a addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 3

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

GOODMAN: Although I agree with the intent that all equipment including "portable or transportable devices having a battery or other electrical power source" should be properly rated for the location in which it will be used, there is a practical element that makes this unenforceable and unrealistic.

First, without an actual "installation", there is some question as to whether this is within the scope of the NEC at all.

Secondly, there are classified areas in public places, such as at gasoline dispensers, where this code provision as written would apply, but is totally unenforceable. For example, I would be in violation of the NEC whenever I pump gas because my battery powered watch is not approved (or identified) for the classified areas. Within operating plants and other company facilities that do not have public access, safety rules banning the use of nonapproved equipment in classifed areas or specifying the necessary permitting and safety requirements to ensure their safe operation are typical throughout the affected industries.

Adding all these battery powered equipment items, without exception, is unrealistic and does not add anything substantial to the NEC which is an installation-based document.

OMEARA: The proposal needs to be rejected because the definition is too broad.

ZIPSE: I agree with Mr. Goodman's Explanation of Negative Vote.

(Log #2309)

14- 7 - (500-3(a)): Reject

SUBMITTER: Sukanta Sengupta, FMC Corp.

RECOMMENDATION: Revise the last line of the first paragraph as follows.

"Locations with Oxygen enriched atmospheres or locations where pyrophoric materials are the only materials used or handled shall not be classified."

SUBSTANTIATION: This statement will be compatible to NFPA 497 paragraph 1-1.5 which includes "Oxygen enriched atmosphere" in defining areas not to be classified.

PANEL ACTION: Reject.

PANEL STATEMENT: Locations where oxygen is the only material present are already excluded by 500-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #2146)

14- 8 - (500-3(a), FPN (New)): Accept in Principle

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Replace "nonhazardous" with "unclassified".

SUBSTANTIATION: This is a companion to other proposals which provide a definition of unclassified in Articles 100, 500, and 505, and provides correlation. The term "Classified" refers to the type of material/hazard potential involved, i.e., Class I, Division 1, Class II, Division 2, etc. Terms such as nonhazardous and unclassified are used in both the NEC, the Uniform Building Code (UBC) and other NFPA documents. The term nonhazardous infers that the area has "no" hazards while the term "unclassified" more clearly correlates with the condition of being reviewed but found not to need classification. This action provides needed correlation with other NFPA documents, such as NFPA 497. Additionally the term "nonhazardous" is used 7 times within various parts of the NEC and in at least one place in the NEC the meaning of nonhazardous applies to voltages and not classification. A companion proposal has been made to change the term "nonhazardous" to "unclassified" as appropriate elsewhere in the NEC.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Proposal 14-2a addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #2384)

14- 9 - (500-3(b)): Reject

SUBMITTER: William E. Bickner, Stillwater, MN

RECOMMENDATION: Revise Section 500-3(b) as shown below:

500-3(b). Documentation. ~~All areas designated as hazardous (classified) locations shall be properly documented.~~ Where, in the judgement of the authority having jurisdiction, flammable gases or vapors, volatile flammable liquids, combustible dust, or ignitable fibers or flyings are or may be present in potentially hazardous quantity or concentration in any indoor or outdoor location, upon written request of the authority having jurisdiction, a person responsible for the installation of wiring or equipment in such location shall provide documentation, prepared by or under the supervision of a qualified person acceptable to the authority having jurisdiction, which delineates the extent, class, division or zone, and group, of any classified locations, or certifies the absence thereof. Where a classification depends on factors such as mechanical ventilation, atmospheric pressure differentials, or determination of lower flammable limit percentages, the relevant data shall be included in the documentation. This documentation shall be available to those authorized to design, install, inspect, maintain or operate electrical equipment at the location.

SUBSTANTIATION: This section fails to state what must be documented. The present requirement is too vague to be enforceable and becomes onerous if broadly interpreted and applied to all potentially hazardous locations. However, it would be generally useful with the changes proposed, which empower the authority having jurisdiction to require documentation where appropriate, but forgo it where not needed. For example, Articles 511 to 517 generally define classified areas in the covered occupancies, but such documentation would be useful for other types of occupancies, or where the extent of a classified area is undefined or uncertain or it is proposed to reduce or eliminate a classification by suitable means.

PANEL ACTION: Reject.

PANEL STATEMENT: Area classification criteria is covered in other sections of the code. The existing text is adequate. Format and requirements for documentation may vary from authority having jurisdiction to authority having jurisdiction and other compliance requirements, such as process safety management, may apply.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1258)

14- 10 - (500-3(d) and 500-5(a)(2)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: In 500-3(d), change the first sentence to read:

"All threaded conduit referred to herein shall be threaded with an NPT standard cutting die that provides ~~3/4 in.~~ a taper of 1 in 16 ~~per foot.~~"

In 500-5(a)(2) Exception No. 1 and Exception No. 2, in both exceptions, change "18 in. (457 mm)" to "450 mm (18 in.)"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Reject.

PANEL STATEMENT: CMP 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

KUCZKA: Panel Action should have been Accept in Principle. Metric conversion should be exact rather than rounded.

OMERA: The proposal should be accepted to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.

ZIPSE: The Institute of Electrical and Electronics Engineers, Inc. policy is SI units are to be used.

(Log #2842)

14- 11 - (500-3(d)): Accept in Principle

Note: It was the action of the Technical Correlating Committee that the Panel Statement be modified to also refer to 500-8(d) of the rewrite of Article 500 in Proposal 14-2a.

SUBMITTER: Melvin K. Sanders, Ankeny, IA

RECOMMENDATION: Provide the name for the "NPT" acronym so it would read when first encountered, remaining text as in the 1999 Edition:

(d) Threaded Conduit. All threaded conduit referred to herein shall be threaded with a National Pipe Thread (NPT) standard conduit cutting die that provides 3/4-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and ensure the explosionproof or dust-ignitionproof integrity of the conduit system where applicable.

For equipment provided with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1:1980 and Metric Screw Threads, ISO 965/3:1980.

SUBSTANTIATION: Standard practice is to not use an acronym unless accompanied the first time by the full name to avoid confusion that the pipe thread in question is for a conduit thread taper per foot and not a plumbing thread taper per foot to ensure the five full threads required by Section 501-4(a) are fully engaged.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel agrees with the submitter, but has used the correct term, as taken from ANSI/ASME B1.20.1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3234)

14- 12 - (500-3(d) and (e)): Reject

SUBMITTER: Sukanta Sengupta, FMC Corp.

RECOMMENDATION: Move these two sections to Article 501, Article 502 and Article 503.

SUBSTANTIATION: Editorial change. Application related topics like these should not be mixed up with general topics.

PANEL ACTION: Reject.

PANEL STATEMENT: These are general requirements that belong in the "General" section of the chapter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1546)

14- 13 - (500-4(a)): Accept in Principle

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise to read as follows:

(a) Explosionproof Apparatus. This protection technique shall be permitted for equipment in those Class I, Division 1 and 2 locations for which it is ~~approved.~~ (identified.).

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Principle.

G**PANEL STATEMENT:** Proposal 14-2a addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: I am voting negative at this time on all the proposals to change "approved". I will change my vote at the comment stage if the acceptance of the definition found in Proposal 14-4a, Sections 500-2 and 505-2 is accepted by the Panel and the Technical Correlating Committee.

If the definition is rejected by the Panel or the Technical Correlating Committee, then all proposals to change "approve" by Mr. Cook and Mr. Cox will remain rejected.

COMMENT ON AFFIRMATIVE:

LAWRENCE: The panel needs to review the use of "Approved," "Listed," and "Identified" throughout Articles 500 through 516 to confirm that the use of these terms correlates through all of the text and cross-references. As one example of a correlation problem, 505-8(b) uses "Approved" for the protection technique of purged and pressurized. 505-9(a) refers to equipment being "identified". The term in 505-8(b) should have been revised to "Identified" as part of the action to revise 505-9(a).

WECHSLER: Clarification for Cook/Cox proposals - addressing "identified, approved, listed, other" — all these proposals were acted upon based upon committee action to provide a new definition for "identified" with a new fine print note (FPN) in Articles 500 and 505. It was my understanding that all these proposals and not just those with the change to "identified" were to be contingent upon this definition of "identified" with its fine print note, as reflected in CP1405. Only those with the word identified appear to have the statement "Acceptance of this proposal is contingent upon acceptance of the fine print note to the definition of "Identified" in Proposal 14-4a (Log #CP1405).

(Log #4482)

14- 14 - (500-4(a)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Explosionproof Apparatus. This protection technique shall be permitted for equipment in those Class I, Division 1 and 2 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1547)

14- 15 - (500-4(b)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(b) Dust Ignitionproof. This protection technique shall be permitted for equipment in those Class II, Division 1 and 2 locations for which it is ~~approved.~~ (identified.))
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3456)

14- 16 - (500-4(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(b) Dust Ignitionproof. This protection technique shall be permitted for equipment in those Class II, Division 1 and 2 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3814)

14- 17 - (500-4(b), FPN): Accept in Principle
SUBMITTER: Douglas Hansen, Codecheck
RECOMMENDATION: Revise the FPN to read as follows:
FPN: Dust-ignitionproof equipment is defined in ~~Article 100~~ Section 502-1.
SUBSTANTIATION: There is no definition of dust-ignitionproof in Article 100.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1548)

14- 18 - (500-4(c)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(c) Dusttight. This protection technique shall be permitted for equipment in those Class II, Division 2 and Class III locations for which it ~~is approved.~~ (identified.)
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3457)

14- 19 - (500-4(c)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(c) Dusttight. This protection technique shall be permitted for equipment in those Class II, Division 2 and Class III locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1549)

14- 20 - (500-4(d)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(d) Purged and Pressurized. This protection technique shall be permitted for equipment in any hazardous (classified) location for which it ~~is approved.~~ (identified.)

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: This was just one of the many Cook/Cox "identified, approved, listed, other" proposals in which the committee acted to develop a new definition for "identified" with a new fine print note (FPN) in Articles 500 and 505. This action was incorporated into the panel action rewrites for Articles 500 and 505, as noted in CP1401 and CP1402.
See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3458)

14- 21 - (500-4(d)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(d) Purged and Pressurized. This protection technique shall be permitted for equipment in any hazardous (classified) location for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1550)

14- 22 - (500-4(e)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(e) Intrinsically Safe Systems. Intrinsically safe apparatus and wiring shall be permitted in any hazardous (classified) locations for which it is ~~approved~~ (identified), and the provisions of Articles 501 through 503 and 510 through 516 shall not be considered applicable to such installations, except as required by Article 504.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3334)

14- 23 - (500-4(e)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Revise the first paragraph as follows:
(e) Intrinsically Safe System. Intrinsically safe apparatus and wiring shall be permitted in any hazardous (classified) locations for which it is approved.
SUBSTANTIATION: I. Let Article 504 be the only article for details. It addresses the integral parts of intrically safe system's wiring like associated apparatus wiring.
II. Only Articles 501, 502, 503 and 505 are coverd in article 505 not 510 through 516 as shown in the first line.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter offers no substantiation to remove this provision as it is currently worded.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3459)

14- 24 - (500-4(e)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(e) Intrinsically Safe Systems. Intrinsically safe apparatus and wiring shall be permitted in any hazardous (classified) location for which it is ~~approved~~ (identified), and the provisions of Articles 501 through 503 and 510 through 516 shall not be considered applicable to such installations, except as required by Article 504.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1970)

14- 25 - (500-4(f)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the first paragraph, second sentence to read as follows:
This protection technique shall be permitted for equipment in those Class I, Division 2; Class II, Division 2; and Class III locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3460)

14- 26 - (500-4(f)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise paragraph one, sentence two to read as follows:
"This protection technique shall be permitted for equipment in those Class I, Division 2: Class II, Division 2: and Class III locations for which it is ~~approved~~ (identified)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #4235)

14- 27 - (500-4(f)): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Delete paragraph (1) and (1) (FPN No. 1). Redesignate (FPN No. 2) as (FPN), applying only to the initial paragraph of Section 500-4(f), and ahead of the subsequent paragraphs. Change "(2)" to "(1)" and "(2)a." to "(2)".
SUBSTANTIATION: The 1999 NEC contains a direct conflict between the definition of "Nonincendive Circuit" as it appears in Article 100 and the version that appears in Section 500-4(f)(1). The version in Article 100 is correct, and technically threatened with noneffectiveness because the wrong definition appears in Chapter 5. This was the result of a panel error that this proposal corrects.
The other changes are editorial and properly format a subsection that just lost one of its two subsections by promoting the two paragraphs in "a." to a number item "(2)". This can be done safely because although nonincendive components are part of equipment, both they and the equipment will stand as part of the general concept of nonincendive. In addition, the second paragraph of NEC "(2)a." adequately restrains its application to current-interrupting contacts, and the network of fine print notes that will remain refer to both the definition of "Nonincendive Circuit" in Article 100 and also to all the relevant product standards.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1551)

14- 28 - (500-4(f)(2)a): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise paragraph two to read as follows:
This protection technique shall be permitted for current-interrupting contacts in those Class I, Division 2 locations for which the component is ~~approved~~ (identified.)
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3461)

14- 29 - (500-4(f)(2)(a)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"This protection technique shall be permitted for current-interrupting contacts in those Class I, Division 2 locations for which the component is ~~approved~~ (identified)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1492)

14- 30 - (500-4(f)(3)-Associated Nonincendive Field Wiring Apparatus): Accept in Principle
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Associated Nonincendive Field Wiring Apparatus. Apparatus in which the circuits are not necessarily nonincendive themselves, but that affect the energy in the nonincendive field wiring circuits and are relied on to maintain nonincendive safety. Associated nonincendive field wiring apparatus may be either of the following:
1. Electrical apparatus that has an alternative-type protection for use in the appropriate hazardous (classified) location, or
2. Electrical apparatus not so protected that shall not be used within a hazardous (classified) location
FPN No. 1: Associated nonincendive field wiring apparatus has identified associated nonincendive field wiring apparatus connections for nonincendive field wiring apparatus and also may have connections for other electrical apparatus.
SUBSTANTIATION: The above definition would be required if the other proposed text on nonincendive field wiring is accepted.
PANEL ACTION: Accept in Principle.
Add the following definition to 500-2:
"Associated Nonincendive Field Wiring Apparatus. Apparatus in which the circuits are not necessarily nonincendive themselves, but that affect the energy in the nonincendive field wiring circuits and are relied on to maintain nonincendive energy levels. Associated nonincendive field wiring apparatus may be either of the following:
1. Electrical apparatus that has an alternative-type protection for use in the appropriate hazardous (classified) location, or
2. Electrical apparatus not so protected that shall not be used within a hazardous (classified) location
FPN: Associated nonincendive field wiring apparatus has designated associated nonincendive field wiring apparatus connections for nonincendive field wiring apparatus and also may have connections for other electrical apparatus."

PANEL STATEMENT: The editorial changes shown as underlined text are for clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1493)

14- 31 - (500-4(f)(4)-Nonincendive Field Wiring Apparatus): Accept in Principle
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Nonincendive Field Wiring Apparatus. A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed normal operating conditions.
FPN: Conditions are described in ISA S12.12.01:1994 Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.
SUBSTANTIATION: The above definition would be required if the other proposed text on nonincendive field wiring is accepted.
PANEL ACTION: Accept in Principle.
Add the following definition to 500-2:
"Nonincendive Field Wiring Apparatus. Apparatus intended to be connected to nonincendive field wiring.
FPN: Conditions are described in ISA S12.12:1994 Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations."
PANEL STATEMENT: The definition has been reworded for clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1490)

14- 32 - (500-4(j)-Ex Component): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Ex Component. Part of electrical apparatus for use in hazardous (classified) locations, which is not to be used alone in such locations and which requires additional evaluation of any electrical apparatus with which it is used.
SUBSTANTIATION: This definition is based on the definition in ANSI/ISA S12.0.01-1998 (IEC 79-0 Mod) for an Ex component. Although this is not a type of protection in its own right, manufacturers could get components listed which would be marked with the appropriate information in 505-10. The definition is required to reinforce the proposed FPN to 505-10(b), and the proposed change to 505-10(3). The above definition is based on that of the ISA standard with 'IEC' wording revised to align with that of the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a product certification issue, not an installation issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1972)

14- 33 - (500-5, Exception): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception: Equipment ~~approved~~ (identified) for a specific gas, vapor, or dust.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3462)

14- 34 - (500-5, Exception): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception: Equipment ~~approved~~ (identified) for a specific gas, vapor, or dust.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2880)

14- 35 - (500-5(a)(1)): Reject
SUBMITTER: Phillip Fields, Denver, CO
RECOMMENDATION: Revise text to read as follows:
Any liquid or gaseous material which is liquid under pressure and have a flash point below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C)
SUBSTANTIATION: Class 1 "A" is undefined.
PANEL ACTION: Reject.
PANEL STATEMENT: Group A is defined by NFPA 497 as acetylene.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2038)

14- 36 - (500-5(a)(4)): Reject
SUBMITTER: Mark O. Wise, Merritt Island, FL
RECOMMENDATION: Revise text to read a follows:
x(4) Group D. Flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor liquid oxygen, mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80.
SUBSTANTIATION: Add liquid oxygen as a Class 1, Group D commodity in order to comply with NFPA 30, and to enhance Article 500.
PANEL ACTION: Reject.
PANEL STATEMENT: Liquid oxygen is not a flammable material per NFPA 497.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #4418)

14- 37 - (500-5(a)(4)): Accept in Principle

SUBMITTER: Jeffrey M. Shapiro, Int'l Code Consultants/Rep. Int'l Inst. of Ammonia Refrigeration

RECOMMENDATION: Revise text to read as follows:

500.5(a)(4) Group D. Flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN: A typical Class I, Group D material is propane.

Exception: Areas containing ammonia refrigeration equipment shall be permitted to be classified as nonhazardous locations when (1) continuous mechanical ventilation is provided and failure of the ventilation system actuates and alarm, or (2) vapor detection is provided to automatically activate a mechanical ventilation system and sound an alarm at a detection threshold of 1,000 parts-per-million or less. ~~For atmospheres containing ammonia, the authority having jurisdiction for enforcement of this Code shall be permitted to reclassify the location to a less hazardous location or a nonhazardous location.~~

FPN No. 1: For additional information on the properties and group classification of Class I materials, see NFPA 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, 1997 edition and NFPA 325, Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, 1994 edition.

FPN No. 2: The explosion characteristics of air mixtures of gases or vapors vary with the specific material involved. For Class I locations, Groups A, B, C, and D, the classification involves determinations of maximum explosion pressure and maximum safe clearance between parts of a clamped joint in an enclosure. It is necessary, therefore, that equipment be approved not only for class but also for the specific group of the gas or vapor that will be present.

FPN No. 3: Certain chemical atmospheres may have characteristics that require safeguards beyond those required for any of the above groups. Carbon disulfide is one of these chemicals because of its low ignition temperature [100°C (212°F)] and the small joint clearance permitted to arrest its flame.

FPN No. 4: For classification of areas involving ammonia atmosphere, see ANSI/ASHRAE 15-1994, Safety Code for Mechanical Refrigeration, and ANSI/CGA G2.1-1989, Safety Requirements for the Storage and Handling of Anhydrous Ammonia.

SUBSTANTIATION: The purpose of this proposal is to clarify application of the code. The text of the existing exception unnecessarily complicates enforcement and introduces the opportunity for inconsistent application of the code for cases involving ammonia refrigeration systems. The intent of the exception, which is established through FPN No. 4, is to permit a reduction in the hazard classification for ammonia based on prescriptive allowance in ASHRAE 15.

The referenced provisions in ASHRAE 15 are set forth in Sections 8.14(g) and (h) of that document, which provide the following:

"(g) When refrigerants of Groups A2, A3, B2, and B3 are used, the machinery room shall conform to Class I, Division 2 of the National Electrical Code. When refrigerant Groups A1 and B1 are used, the machinery room is not required to meet Class I, Division 2 of the National Electrical Code.

Exception: When ammonia is used, the requirements of Class I, Division 2 of the National Electrical Code shall not apply providing the requirements of 8.14(h) are met.

(h) When ammonia is used, the machinery room is not required to meet Class I, Division 2 of the National Electrical Code providing (1) the mechanical ventilation system in the machinery room is run continuously and failure of the mechanical ventilation system actuates an alarm or (2) the machinery room is equipped with a vapor detector that will automatically start the mechanical ventilation system and actuate an alarm at a detection level not to exceed 1,000 ppm."

Unlike many gases that support combustion [Lower Explosive Limit (LEL)] at concentrations of 10,000 to 20,000 parts per million (ppm), ammonia is not ignitable until the concentration reaches approximately 150,000 ppm. Because ammonia has a low propensity toward ignition, having such a high LEL, a narrow flammable range and a high required ignition energy, the U.S. Department of Transportation and other code writing organizations do not regulate ammonia as a "flammable gas" even though it can support combustion in limited circumstances.

The existing exception for ammonia in Section 500.5(a)(4) has been regarded as necessary to clarify that areas containing ammonia refrigeration equipment should be classified as nonhazardous locations when controls specified in ASHRAE 15 are followed because of ammonia's unique properties. Since the technical aspects of ASHRAE 15's provisions related to classified locations are fairly short, it seems more appropriate to provide these regulations with NFPA 70 as opposed to forcing the code user to reference another standard (the proponent has contacted ASHRAE to acquire permission to include the conceptual information from ASHRAE 15 in the NEC based on this proposal). This will make the NEC easier to apply and more definitive in its application.

PANEL ACTION: Accept in Principle.

Add the following text to 500-3(a) after the Fine Print Note:

"Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations.

FPN: For further information regrading classification and ventilaton of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989 (14-37)"

PANEL STATEMENT: The panel believes its proposed text more clearly meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1971)

14- 38 - (500-5(a)(4), FPN No. 2): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise the second sentence as follows:

It is necessary, therefore, that equipment be ~~approved~~ (identified) not only for the class but also for the specific group of gas or vapor that will be present.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3463)

14- 39 - (500-5(a)(4), FPN No. 2): Accept

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise the second sentence to read as follows:

"It is necessary, therefore, that equipment be ~~approved~~ (identified) not only for class but also for the specific group of the gas or vapor that will be present."

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2132)

14- 40 - (500-5(a)(4), Exception): Accept in Principle
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Replace "nonhazardous" with "unclassified".
SUBSTANTIATION: This is a companion to other proposals which provide a definition of unclassified in Articles 100, 500, and 505, and provides correlation. The term "Classified" refers to the type of material/hazard potential involved, i.e., Class I, Division 1, Class II, Division 2, etc. Terms such as nonhazardous and unclassified are used in both the NEC, the Uniform Building Code (UBC) and other NFPA documents. The term nonhazardous infers that the area has "no" hazards while the term "unclassified" more clearly correlates with the condition of being reviewed but found not to need classification. This action provides needed correlation with other NFPA documents, such as NFPA 497. Additionally the term "nonhazardous" is used 7 times within various parts of the NEC and in at least one place in the NEC the meaning of nonhazardous applies to voltages and not classification. A companion proposal has been made to change the term "nonhazardous" to "unclassified" as appropriate elsewhere in the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1195)

14- 41 - (500-5(b)(3) and FPN No. 4 (New)): Reject
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Committee on Electrical Equipment in Chemical Atmospheres for action.
SUBMITTER: Terry L. Carlson, Nebraska State Electrical Board
RECOMMENDATION: Revise 500-5(b)(3)text as follows:
(3) Group G. Atmospheres containing combustible dusts not included in Group E or F, including flour, grain, plastic, chemicals, and fireworks explosives.
Add new FPN as follows:
FPN No. 4: Fireworks explosives includes but is not limited to dynamite, black powder, salute powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, and igniters. The presence of fireworks explosives may require additional precautions due to the easy ignitability of the manufactured or stored product. See NFPA 1124, Code for the Manufacture, Transportation, and Storage of Fireworks.
SUBSTANTIATION: Fireworks explosives are not presently covered by the NEC. Fireworks manufacturing, processing and storage facilities are very hazardous. A documented case that began in 1995 at Hastings, Nebraska is on record. A complete new wiring system was installed at a huge storage and processing facility. NEMA 1 type wiring was installed. A heat shrink wrap machine was installed for use in making small retail packages of fireworks. Because of the presence of the explosives, a Nebraska State Electrical Inspector red tagged the installation and wrote a Correction Order referencing NEC Article 502 to require the building to be rewired as a hazardous location along with removal of the heat shrink wrap machine. Attorneys for the building owner appealed the correction order, challenging the State Electrical Board. The attorneys reasoned that although NFPA 1124 does reference NEC Article 502 as a requirement, there is no specific wording in NEC Article 500 to 502 regarding fireworks explosives.
After many months, NFPA responded to the board by stating a Formal Interpretation could not be given because the Code panel members could not come to agreement on whether or not the fireworks explosives are covered under the NEC articles. However, the Code panel did agree that NFPA 1124 is the Code that applies to fireworks explosives, that NFPA 1124 2-9 does reference NEC Article 502 as a wiring method for fireworks storage and processing buildings, and that Article 502 for some unknown reason does not reference fireworks explosives.
Like thousands of governmental agencies, the Nebraska Legislature only adopts NFPA 70, the National Electrical Code, as State law to be used as the minimum standard for electrical wiring. Because there are no Code sections in the NEC to regulate fireworks explosives, the Nebraska State Electrical Board had no choice but to countermand the correction order and let the NEMA 1 type wiring remain in the building, along with the heat shrink wrap machine used for packaging the fireworks.
Forty-two months later, on June 3, 1999, there was an explosion and fire in the facility while employees were making retail packages of fireworks. The explosion injured two employees, sending them to the hospital in critical condition with burns. Investigation showed that the open heating element on the heat shrink wrap machine ignited the fireworks explosives dust.
Over the last few years there have been several explosions and fires in fireworks storage and processing facilities all over the United States. The stories have been reported on television and in newspapers. With this proposal, the National Electrical Code will address the problem by providing a standard for fireworks explosives wiring methods. This will help alleviate the chance of more people being killed or injured.
PANEL ACTION: Reject.
PANEL STATEMENT: Responsibility for group classification of dust is the responsibility of the T/C on Electrical Equipment in Chemical Atmospheres. 500-5(b)(3) is actually extracted text and should have been identified as such. This oversight will be editorially corrected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1973)

14- 42 - (500-5(b)(3), FPN No. 2): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the third sentence as follows:
It is necessary, therefore, that equipment be ~~approved~~ (identified) not only for the class, but also for the specific dust that will be present.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3464)

14- 43 - (500-5(b)(3), FPN No. 2): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the third sentence to read as follows:
"It is necessary, therefore, that equipment be ~~approved~~ (identified) not only for the class, but also for the specific group of dust that will be present."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1552)

14- 44 - (500-5(c)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(c) Approval for Class and Properties. Equipment, regardless of the classification of the location in which it is installed, that depends on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the equipment, shall be ~~approved~~ (identified) for a Class I, Division 2 location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1966)

14- 45 - (500-5(c)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the fourth paragraph as follows:
Equipment that has been ~~approved~~ (identified) for a Division1 location shall be permitted in a Division 2 location of the same class and group.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1974)

14- 46 - (500-5(c)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the third paragraph as follows:
Equipment shall be ~~approved~~ (identified) not only for the class of location but also for the explosive, combustible, or ignitable properties of the specific gas, vapor, dust, fiber, or flyings that will be present.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3465)

14- 47 - (500-5(c)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"Equipment that has been ~~approved~~ (identified) for a Division 1 location shall be permitted in a Division 2 location of the same class and group."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3466)

14- 48 - (500-5(c)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the third paragraph to read as follows:
"Equipment shall be ~~approved~~ (identified) not only for the class of location but also for the explosive, combustible, or ignitable properties of the specific gas, vapor, dust, fiber, or flyings that will be present."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1965)

14- 49 - (500-5(d)): Accept in Principle in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the fourth paragraph as follows:
Equipment that is ~~approved~~ (identified) for Class I and Class II shall be marked with the maximum safe operating temperature, as determined by simultaneous exposure to the combinations of Class I and Class II conditions.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle in Part.
Delete the words "that is appproved".
PANEL STATEMENT: Marking is already required. See also Proposal 14-2a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2129)

14- 50 - (500-5(d)): Accept in Principle
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Change the wording of the first paragraph as follows:
(d) Marking. Approved equipment shall be marked to show the class, group, and operating temperature or temperature classification ~~range~~ referenced to a 40°C ambient. The temperature classification, if provided, shall be indicated using the temperature identification (T Codes) shown in Table 500-5(d).
Delete the following existing paragraphs:
"~~The temperature range, if provided, shall be indicated in identification numbers, as shown in Table 500 5(d). Identification numbers marked on equipment nameplates shall be in accordance with Table 500 5(d).~~"
SUBSTANTIATION: It is incorrect to refer to the temperature identification numbers are indicating a temperature range. IEC 79-0 and other NFPA documents such as NFPA 496 and NFPA 70-NEC 505, refer to temperature identification numbers as "T codes" which are a recognized type of temperature classification. The suggested changes agree with this usage.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2610)

14- 51 - (500-5(d)): Accept in Part
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise text to read as follows:
(d) Marking. ~~Approved~~ (Identified) equipment shall be marked to show the class, group, and operating temperature or temperature range referened to a 40°C ambient.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete the word "approved".
PANEL STATEMENT: Marking is already required. See also Proposal 14-2a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3468)

14- 52 - (500-5(d)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(d) Marking. ~~Approved~~ (Identified) equipment shall be marked to show the class, group, and operating temperature or temperature range referenced to a 40°C ambient.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete the word "approved".
PANEL STATEMENT: Marking is already required. See also Proposal 14-2a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3469)

14- 53 - (500-5(d)): Accept in Principle in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the fourth paragraph to read as follows:
"Equipment that is ~~approved~~ (identified) for Class I and Class II shall be marked with the maximum safe operating temperature, as determined by simultaneous exposure to eh combinations of Class I and Class II conditions."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle in Part.
Delete the words "that is appproved".
PANEL STATEMENT: Marking is already required. See also Proposal 14-2a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1964)

14- 54 - (500-5(f)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise paragraph two as follows:
The ignitition temperature for which equipment was ~~approved~~ (identified) prior to this requirement shall be assumed to be as shown in Table 500-5(f).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: This section of the code refers to prior approvals, not new installations. Here, "approved" is the correct word.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3470)

14- 55 - (500-5(f)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"The ignition temperature for which equipment was ~~approved~~ (identified) prior to this requirement shall be assumed to be as shown in Table 500-5(f)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: This section of the code refers to prior approvals, not new installations. Here, "approved" is the correct word.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2338)

14- 56 - (500-7): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Revise Section 500-7 to read as follows:
Class I Locations. Class I locations are those in which Class I (flammable) liquids or Class II (combustible) liquids whose temperatures are above their flash points are housed, stored or used that are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Class I locations shall include those specified in (a) and (b).
SUBSTANTIATION: This section presently does not address Class II liquids that are used, stored or handled in ambient temperatures above their flash point, this could be outside or even inside a structure. An example would be a liquid with a flash point of 105°F. used in and area that has a 110 degree ambient temperature. At this temperature the combustible liquid will take on the properties of a flammable liquid at a lower temperature. This is a concern in the southwestern United States, and other areas or buildings that have an ambient temperature above the flash point of combustible liquids that may be present. For instance, some jet fuels have a flash point right at 100 degrees F. In many locations throughout the southwest it is common to be well above 100 degrees for more than 8 hours.
There is justification for this proposal in NEC 513-1, NEC 514-1 FPN N0. 1, NEC 515-1. FPN, NEC 516-1, and NFPA 30, 1996 Flammable and combustible liquids code 5-9.5.1 and which states "This section shall apply to areas where Class I liquids are stored or handled and to areas where Class II or Class III liquids are stored or handled at temperatures above their flash points (see 1-1.3)." 5-9.5.2 "Electrical wiring and utilization equipment shall be designed and installed in accordance with NFPA 70, National Electrical Code, and this section. Electrical wiring and utilization equipment in classified locations shall be designed and installed in accordance with Chapter 5 of NFPA 70."
The NEC does not currently help the electrical community by clearly addressing combustible liquids. We should not have to rifle through multiple standards to solve a simple problem. This would enable the NEC to address this issue.
All of the above make some reference that a combustible liquid that is above its flash point is a hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: Areas other than those containing Class I or II liquids may need to be classified. NFPA 497 addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3416)

14- 57 - (500-7(b)): Reject
SUBMITTER: Nicholas T. Abbatiello, Spencerport, NY
RECOMMENDATION: Add a subparagraph (4) to read:
"Locations, within enclosed equipment and machines in industrial establishments where the conditions of design, maintenance and supervision ensure that only qualified persons will build and service the installation, not complying with (1) through (3) which otherwise would be designated as Division 1 shall be permitted to be classified to Division 2:
(i) when maintained at or below 25 percent of the Lower Flammable Limit, or
(ii) where the electrical equipment, not rated for Division 1 but only rated for Division 2, is reliably interlocked by Listed and Labeled flammable gas detectors which will deenergize the equipment if 60 percent of the Lower Flammable Limit is exceeded. Consideration shall be given to rate at which the concentration can reach 100 percent versus the time for the deenergized equipment to come to a safe state.
FPN: For additional information, refer to NFPA 69-1997, Explosion Prevention Systems, and ISA S84.01-1996, Application of Safety Instrumented Systems for Process Industries.
SUBSTANTIATION: The current requirements do not address machinery interiors where protection against hazards, such as deflagration, by concentration reduction of the flammable gas or vapor. NFPA 34, Flammable or Combustible Liquids, Dipping and Coating Process, 1995, and Article 516, Spray Application, Dipping, and Coating Processes require interiors to be Division 1. NFPA 69 recognizes the 25 percent or below control and above 60 percent deenergization for protection against deflagration. Why can't there then be allowance for Division 2 equipment since the concentration is not normally flammable? This would provide equivalent safety as the likelihood, rather than the consequence, of an ignition in explosionproof equipment is reduced.
PANEL ACTION: Reject.
PANEL STATEMENT: The text proposed is too vague. The submitter has not addressed all of the issues pertinent to area classification when using gas detection equipment, as detailed in the referenced standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #CP1410)

14- 57a - (500-8(a), FPN (New)): Accept
SUBMITTER: CMP 14
RECOMMENDATION: Add a new FPN under 500-8(a) in Proposal 14-2a (CP1401) to read: "FPN: Switches, circuit breakers, plugs and receptacles, lighting fixtures, and other heat-producing apparatus are considered to be sources of ignition and are investigated for suitability in classified locations. Such types of equipment, as well as cable terminations for entry into explosionproof enclosures, are available as listed for Division 2. Fixed wiring, however, may utilize nonhazardous location wiring

methods that are not evaluated with respect to classified locations. Wiring products such as cable, raceways, boxes, and fittings, therefore, are not marked as being suitable for Division 2. Also see Exception No. 3 to 500-8(b)."
SUBSTANTIATION: Assists in clarifying the use of general purpose equipment in Division 2 locations, without the need for it being identified specifically for Division 2.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
GOODMAN: The use of the term "nonhazardous location" is confusing and not required. As indicated in the Substantiation, the term "general purpose" is acknowledged as the proper term and would provide a clearer description if wording were deemed necessary. Preferably, simply delete the term "nonhazardous location" to have the sentence read:
"Fixed wiring, however, may utilize wiring methods that are not evaluated with respect to classified locations."
LAWRENCE: My records of the meeting do not support the panel action. The text as shown does not correlate with the text at the indicated location of insertion.
WECHSLER: My notes do not support the panel action shown for panel action on this specific proposal. The reference to adding the proposed fine print note to Section 500-8(a) does not appear to fit the existing text, nor does it appear to agree with the revised Article 500 rewrite.
COMMENT ON AFFIRMATIVE:
JAGUNICH: See ballot for David Wechsler.
ZIPSE: I am in agreement with Mr. Goodman. However, it would be more advisable to save the panel proposal and change it during the comment stage than to remove the proposal from ever existing.

(Log #2130)

14- 58 - (500-10 (New)): Accept in Principle
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add new text to read as follows:
500-10. Unclassified Locations. Locations which are neither Class I, Division 1; Class I, Division 2, Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2, or any combination thereof.
SUBSTANTIATION: The term "unclassified" is currently used at least 12 times in the NEC, but is not defined. While the terms "nonhazardous" and "unclassified" are used in both the NEC and other NFPA documents, the preferred term for area/location electrical classification is "unclassified" as it more clearly correlates with the condition of being reviewed but found not to need special electrical equipment for a specific electrically classified location. The term "nonhazardous" infers that the area has "no" hazards. This action provides needed correlation with other NFPA documents, such as NFPA 497 and NFPA 30. Additionally the term "nonhazardous" is used in at least in one other place in the NEC (i.e., Section 640-2) in which the meaning applies to voltages and not classification. A companion proposal has been made to change the term "nonhazardous" to "unclassified" elsewhere in the NEC and to define this term in Article 100 and 505.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

ARTICLE 501 — CLASS I LOCATIONS

(Log #1259)

14- 59 - (501): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In 501-3(b)(6)(3), change "3 ft (914 mm)" to "900 mm (3 ft)".
In 501-4(a)(1) Exception No. 1, change "2 in. (50.8 mm)" to "50 mm (2 in.)" in paragraph 1 of this exception; and change "24 in. (610 mm)" to "600 mm (24 in.)" in this exception in two places, one in each paragraph.
In 501-5(a)(1), change "2 in." to "50 mm (2 in.)" and "18 in. (457 mm)" to "450 mm (18 in.)".
In 501-5(a)(2), change "18 in. (457 mm)" to "450 mm (18 in.)".
In 501-5(a)(3), change "36 in. (914 mm) to "900 mm (36 in.)" and "18 in. (457 mm)" to "450 mm (18 in.)"
In 501-5(a)(4), change "10 ft (3.05 m)" to "3.0 m (10 ft)".
In 501-5(a)(4) Exception change "12 ft (305 mm)" to "300 mm (12 in.)".
In 501-5(b)(2), change "10 ft (3.05 m)" to "3.0 m (10 ft)".
In 501-5(b)(2), Exception No. 1, change "12 in. (305 mm)" to "300 mm (12 in.)".
In 501-5(b)(2), Exception No. 4(a), change "12 in. (305 mm)" to "300 mm (12 in.)".
In 501-5(c)(3), change "5/8 in. (16 mm)" to "16 mm (5/8 in.)".
In 501-5(d)(2), Exception, change "18 in. (457 mm)" to "450 mm (18 in.)".
In 501-5(e)(2), change "[0.007 ft^3/hour (198 cm^3/hour) of air at a pressure of 6 in. of water (1493 pascals)]" to "[200 cm^3/hour (0.007 ft^3/hour) of air at a pressure of 1500 pascals (6 in. of water)]".
In 501-5(e)(3), change "6 in. of water (1493 pascals)" to "1500 pascals (6 in. of water)."
In 501-6(b)(1)(b), change "2-in. (50.8 mm)" to "50 mm (2 in.)" and "1 in. (25.4-mm)" to "25 mm (1 in.)".
In 501-9(a)(3), change "12 in. (305 mm)" to "300 mm (12 in.)" in three places.
In 501-9(b)(3), change "12 in. (305 mm)" to "300 mm (12 in.)" in three places.
In 501-16(b), Exception (a), change "6 ft (1.83 m)" to "1.8 m (6 ft)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Reject.
PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code. Trade sizes of conduit, extract policies, consistency from article to article within the code are all issues that need further evaluation. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.
OMEARA: The proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #CP1411)

14- 59a - (Article 501): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. Further, it was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel, with further consideration given to the comments expressed in the voting, specifically with respect to comments that the accepted Proposal does not accurately reflect what was agreed upon by the Panel. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-61, 14-62, 14-64, 14-66, 14-67, 14-68, 14-69, 14-70, 14-71, 14-72, 14-75, 14-77, 14-92, 14-93, 14-94, 14-95, 14-96, 14-98, 14-100, 14-101, 14-102, 14-103, 14-106, 14-107, 14-108, 14-109, 14-110, 14-111,

14-116, 14-117, 14-118, 14-119, 14-130, 14-131, 14-132, 14-133, 14-134, 14-135, 14-140, 14-141, 14-142, 14-143, 14-144, 14-145, 14-146, 14-147, 14-149, 14-150, 14-151, 14-152, 14-153, 14-154, 14-155, 14-156, 14-157, 14-158, 14-162, 14-164, 14-165, 14-166, 14-168, 14-169, 14-170, 14-171, 14-172, 14-174, 14-175, 14-178, 14-179, 14-184, 14-185, 14-186, 14-187, 14-194, 14-195, 14-196, and 14-197. This action will be considered by the Panel as a Public Comment
SUBMITTER: CMP 14
RECOMMENDATION: Revise Article 501 to read as follows:

501

ARTICLE 501 -- Class I Locations
501-1. General. The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class I in Section 500-~~7~~5.

Equipment listed and marked in accordance with Section 505-10 for use in Class I, Zone 0, 1, or 2 locations shall be permitted in Class I, Division 2 locations for the same gas and with a suitable temperature ~~rating~~classification.
Exception: As modified by this article.

501-2. Transformers and Capacitors
(a) Class I, Division 1. In Class I, Division 1 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed only in approved vaults that comply with Sections 450-41 through 450-48, and, in addition,

a. There shall be no door or other communicating opening between the vault and the Division 1 location, and
b. Ample ventilation shall be provided for the continuous removal of flammable gases or vapors, and
c. Vent openings or ducts shall lead to a safe location outside of buildings, and
d. Vent ducts and openings shall be of sufficient area to relieve explosion pressures within the vault, and all portions of vent ducts within the buildings shall be of reinforced concrete construction.

(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with (a)(1) or be approved for Class I locations.

(b) Class I, Division 2. In Class I, Division 2 locations, transformers and capacitors shall comply with Sections 450-21 through 450-27.

501-3. Meters, Instruments, and Relays
(a) Class I, Division 1. In Class I, Division 1 locations, meters, instruments, and relays, including kilowatt-hour meters, instrument transformers, resistors, rectifiers, and thermionic tubes, shall be provided with enclosures approved for Class I, Division 1 locations. Enclosures approved for Class I, Division 1 locations include explosionproof enclosures and purged and pressurized enclosures.

FPN: See Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(b) Class I, Division 2. In Class I, Division 2 locations, meters, instruments, and relays shall comply with the following.

(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures approved for Class I, Division 1 locations in accordance with Section 501-3(a).

Exception: General-purpose enclosures shall be permitted, if current-interrupting contacts are
a. Immersed in oil, or
b. Enclosed within a chamber that is hermetically sealed against the entrance of gases or vapors, or
c. In nonincendive circuits, or
d. Part of a listed nonincendive component.

(2) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment that are used in or in connection with meters, instruments, and relays shall comply with Section 501-3(a).
Exception: General-purpose–type enclosures shall be permitted if such equipment is without make-and-break or sliding contacts [other than as provided in (b)(1)] and if the maximum operating temperature of any exposed surface will not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved or has been tested and found incapable of igniting the gas or vapor. This exception shall not apply to thermionic tubes.

(3) Without Make-or-Break Contacts. Transformer windings, impedance coils, solenoids, and other windings that do not incorporate sliding or make-or-break contacts shall be provided with enclosures. General-purpose–type enclosures shall be permitted.

(4) General-Purpose Assemblies. Where an assembly is made up of components for which general-purpose enclosures are acceptable as provided in (b)(1), (b)(2), and (b)(3), a single general-purpose enclosure shall be acceptable for the assembly. Where such an assembly includes any of the equipment described in (b)(2), the maximum obtainable surface temperature of any component of the assembly shall be clearly and permanently indicated on the outside of the enclosure. Alternatively, approved equipment shall be permitted to be marked to indicate the temperature ~~range~~class ~~-~~ for which it is suitable, using the temperature class (T Code) ~~identification numbers~~ of Table 500-8 (b) ~~5(d)~~.

(5) Fuses. Where general-purpose enclosures are permitted in (b)(1), (b)(2), (b)(3), and (b)(4), fuses for overcurrent protection of instrument circuits not subject to overloading in normal use shall be permitted to be mounted in general-purpose enclosures if each such fuse is preceded by a switch complying with (b)(1).

(6) Connections To facilitate replacements, process control instruments shall be permitted to be connected through flexible cord, attachment plug, and receptacle, provided the following:

1. A switch complying with (b)(1) is provided so that the attachment plug is not depended on to interrupt current; and
2. The current does not exceed 3 amperes at 120 volts, nominal; and
3. The power-supply cord does not exceed 3 ft (914 mm), is of a type approved for extra-hard usage or for hard usage if protected by location, and is supplied through an attachment plug and receptacle of the locking and grounding type; and
4. Only necessary receptacles are provided; and
5. The receptacle carries a label warning against unplugging under load.

501-4. Wiring Methods. Wiring methods shall comply with (a) or (b).

(a) Class I, Division 1.
(1) In Class I, Division 1 locations, the following wiring methods shall be permitted:

a) Threaded rigid metal conduit or threaded steel intermediate metal conduit. Threaded joints shall be made up with at least five threads fully engaged.

Exception No. 1: Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade. The concrete encasement shall be permitted to be omitted where subject to the provisions of Section 511-4, Exception; 514-8, Exception No. 2; and Section 515-5(a). Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

b) Type MI cable with termination fittings approved for the location. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision

ensure that only qualified persons will service the installation Type MC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic (14-78) sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.
FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

d) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type ITC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

(2) Where necessary to employ flexible connections, as at motor terminals, flexible fittings listed for Class I, Division 1 locations or flexible cord in accordance with the provisions of Section 501-11 shall be permitted.

(3) All boxes, fittings, and joints shall be approved for Class I, Division 1.

(b) Class I, Division 2.
(1) In Class I, Division 2 locations, the following wiring methods shall be permitted:

a) Threaded rigid metal conduit, threaded steel intermediate metal conduit,
b) Enclosed gasketed busways, enclosed gasketed wireways,
c) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings.
d) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;
e) Type MI, MC, MV, or TC cable with (14-79/14-80) termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings.

(2) Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with listed fittings, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with listed bushed fittings shall be used. An additional conductor for grounding shall be included in the flexible cord. (14-87)
FPN: See Section 501-16(b) for grounding requirements where flexible conduit is used.
FPN ~~?~~2
(3) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for nonhazardous (14-88/1401) locations, including Chapter 7 and 8 wiring methods. Nonincendive field wiring systems shall be installed in accordance with the control drawing(s). (14-83)

(4) Boxes, fittings, and joints shall not be required to be explosionproof except as required by Sections 501-3(b)(1), 501-6(b)(1), and 501-14(b)(1).

501-5. Sealing and Drainage
Seals in conduit and cable systems shall comply with (a) through (f). ~~Sealing compound shall be of a type approved for the conditions and use~~ (14-89). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 501-5(e)(2). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 501-5(c)(2).
FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Conduit Seals, Class I, Division 1. In Class I, Division 1 locations, conduit seals shall be located as follows.
1. In each conduit entry into an explosionproof enclosure where either (a) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (b) the entry is 2-in. size or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.

Exception to (a)(1)(a): Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are
a. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
b. Immersed in oil in accordance with Section 501-6(b)(1)(b), or
c. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, approved for the location, and marked "factory sealed" or equivalent. Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal.
Conduit seals shall be installed within 18 in. (457 mm) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.

2. In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 18 in. (457 mm) from the pressurized enclosure.

FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.
FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

3. Where two or more explosionproof enclosures for which conduit seals are required under (a)(1) are connected by nipples or by runs of conduit not more than 36 in. (914 mm) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 18 in. (457 mm) from either enclosure.

4. In each conduit run leaving a Class I, Division 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Division 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for approved explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 1 location.
Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Division 1 location with no fittings less than 12 in. (305 mm) beyond each

boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

(b) Conduit Seals, Class I, Division 2. In Class I, Division 2 locations, conduit seals shall be located as follows.
1. For connections to enclosures that are required to be explosionproof, a conduit seal shall be provided in accordance with (a)(1)(a) and (a)(3). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section 501-4(a).
2. In each conduit run passing from a Class I, Division 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Division 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Division 2 location, and a threaded connection shall be used at the sealing fitting. Except for approved explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Division 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.
Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Division 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.
Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Division 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Division 2 location into an unclassified location if the following conditions are met:

a. No part of the conduit system segment passes through a Class I, Division I location where the conduit contains unions, couplings, boxes, or fittings within 12 in. (305 mm) of the Class I, Division 1 location; and
b. The conduit system segment is located entirely in outdoor locations; and
c. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and
d. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and
e. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Division 2 locations.

(c) Class I, Divisions 1 and 2. Where required, seals in Class I, Division 1 and 2 locations shall comply with the following.
(1) Fittings. Enclosures for connections or equipment shall be provided with an approved integral means for sealing, or sealing fittings approved for Class I locations shall be used. ~~Sealing fittings shall be accessible.~~Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible. (14-104, 14-105)
(2) Compound. The compound shall provide a ~~Sealing compound shall be approved and shall provide a~~ seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF). (14-104)
(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 5/8 in. (16 mm).
Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.
(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.
(5) Assemblies. In an assembly where equipment that may produce arcs, sparks, or high temperatures is located in a compartment separate from the compartment containing splices or taps, and an integral seal is provided where conductors pass from one compartment to the other, the entire assembly shall be approved for Class I locations. Seals in conduit connections to the compartment containing splices or taps shall be provided in Class I, Division 1 locations where required by (a)(1)(b).(14-
(6) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically approved for a higher percentage of fill.

(d) Cable Seals, Class I, Division 1. In Class I, Division 1 locations, cable seals shall be located as follows.
1. Cable shall be sealed at all terminations. The sealing fitting shall comply with (c). Multiconductor Type MC cables with a gas/vaportight continuous corrugated aluminum sheath and an overall jacket of suitable polymeric material shall be sealed with an approved fitting after removing the jacket and any other covering so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors.
Exception: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

2. Cables in conduit with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Division 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.
Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

3. Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (a).

(e) Cable Seals, Class I, Division 2. In Class I, Division 2 locations, cable seals shall be located as follows.
1. Cables entering enclosures that are required to be approved for Class I locations shall be sealed at the point of entrance. The sealing fitting shall comply with (b)(1). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in an approved fitting in the Division 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (d).
Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Division 2 location shall not require a seal at the boundary.
Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

2. Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (e)(1). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [0.007 ft^3/hour (198 cm^3/hour) of air at a pressure of 6 in. of water (1493 pascals)].
FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.
FPN No. 2: The cable core does not include the interstices of the conductor strands.

3. Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (e)(1), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 6 in. of water (1493 pascals) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.
Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Division 2 location without seals.

4. Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Division 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.
FPN: The sheath mentioned in (d) and (e) may be either metal or a nonmetallic material.

(f) Drainage.
(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

(3) Canned Pumps, Process or Service Connections, etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical raceway or cable system capable of transmitting fluids, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the raceway or cable system capable of transmitting fluids beyond the additional devices or means, if the primary seal fails.
The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above.
Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.
FPN: See also the fine print notes to Section 501-5.

501-6. Switches, Circuit Breakers, Motor Controllers, and Fuses
(a) Class I, Division 1. In Class I, Division 1 locations, switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices, shall be provided with enclosures, and the enclosure in each case, together with the enclosed apparatus, shall be approved as a complete assembly for use in Class I locations.

(b) Class I, Division 2. Switches, circuit breakers, motor controllers, and fuses in Class I, Division 2 locations shall comply with the following:

(1) Type Required. Circuit breakers, motor controllers, and switches intended to interrupt current in the normal performance of the function for which they are installed shall be provided with enclosures approved for Class I, Division 1 locations in accordance with Section 501-3(a), unless general-purpose enclosures are provided and
a. The interruption of current occurs within a chamber hermetically sealed against the entrance of gases and vapors, or
b. The current make-and-break contacts are oil-immersed and of the general-purpose type having a 2-in. (50.8-mm) minimum immersion for power contacts and a 1-in. (25.4-mm) minimum immersion for control contacts, or
c. The interruption of current occurs within a factory-sealed explosionproof chamber approved for the location, or
d. The device is a solid state, switching control without contacts, where the surface temperature does not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved.

(2) Isolating Switches. Fused or unfused disconnect and isolating switches for transformers or capacitor banks that are not intended to interrupt current in the normal performance of the function for which they are installed shall be permitted to be installed in general-purpose enclosures.

(3) Fuses. For the protection of motors, appliances, and lamps, other than as provided in (b)(4), standard plug or cartridge fuses shall be permitted, provided they are placed within enclosures identified ~~approved~~ (14-136) for the location; or fuses shall be permitted if they are within general-purpose enclosures, and if they are of a type in which the operating element is immersed in oil or other approved liquid, or the operating element is enclosed within a chamber hermetically sealed against the entrance of gases and vapors, or the fuse is a nonindicating, filled, current-limiting type.

(4) Fuses Internal to Lighting Fixtures. Approved cartridge fuses shall be permitted as supplementary protection within lighting fixtures.

501-7. Control Transformers and Resistors
Transformers, impedance coils, and resistors used as, or in conjunction with, control equipment for motors, generators, and appliances shall comply with (a) and (b).
(a) Class I, Division 1. In Class I, Division 1 locations, transformers, impedance coils, and resistors, together with any switching mechanism associated with them, shall be provided with enclosures approved for Class I, Division 1 locations in accordance with Section 501-3(a).

(b) Class I, Division 2. In Class I, Division 2 locations, control transformers and resistors shall comply with the following.
(1) Switching Mechanisms. Switching mechanisms used in conjunction with transformers, impedance coils, and resistors shall comply with Section 501-6(b).
(2) Coils and Windings. Enclosures for windings of transformers, solenoids, or impedance coils shall be permitted to be of the general-purpose type.
(3) Resistors. Resistors shall be provided with enclosures; and the assembly shall be approved for Class I locations, unless resistance is nonvariable and maximum operating temperature, in degrees Celsius, will not exceed 80 percent of the ignition temperature of the gas or vapor involved, or has been tested and found incapable of igniting the gas or vapor.

501-8. Motors and Generators
(a) Class I, Division 1. In Class I, Division 1 locations, motors, generators, and other rotating electric machinery shall be as follows:
1. **Approved** for Class I, Division 1 locations; or
2. Of the totally enclosed type supplied with positive-pressure ventilation from a source of clean air with discharge to a safe area, so arranged to prevent energizing of the machine until ventilation has been established and the enclosure has been purged with at least 10 volumes of air, and also arranged to automatically de-energize the equipment when the air supply fails; or
3. Of the totally enclosed inert gas-filled type supplied with a suitable reliable source of inert gas for pressuring the enclosure, with devices provided to ensure a positive pressure in the enclosure and arranged to automatically de-energize the equipment when the gas supply fails; or
4. Of a type designed to be submerged in a liquid that is flammable only when vaporized and mixed with air, or in a gas or vapor at a pressure greater than atmospheric and that is flammable only when mixed with air; and the machine is arranged so to prevent energizing it until it has been purged with the liquid or gas to exclude air, and also arranged to automatically de-energize the

equipment when the supply of liquid or gas or vapor fails or the pressure is reduced to atmospheric.
Totally enclosed motors of Types (2) or (3) shall have no external surface with an operating temperature in degrees Celsius in excess of 80 percent of the ignition temperature of the gas or vapor involved. Appropriate devices shall be provided to detect and automatically de-energize the motor or provide an adequate alarm if there is any increase in temperature of the motor beyond designed limits. Auxiliary equipment shall be of a type approved for the location in which it is installed.
FPN: See ASTM Test Procedure, D 2155-69.

(b) Class I, Division 2. In Class I, Division 2 locations, motors, generators, and other rotating electric machinery in which are employed sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature devices), or integral resistance devices, either while starting or while running, shall be approved for Class I, Division 1 locations, unless such sliding contacts, switching mechanisms, and resistance devices are provided with enclosures approved for Class I, Division 2 locations in accordance with Section 501-3(b). The exposed surface of space heaters used to prevent condensation of moisture during shutdown periods shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved when operated at rated voltage, and the maximum surface temperature [based on a 40ºC (104ºF) ambient] shall be permanently marked on a visible nameplate mounted on the motor. Otherwise, space heaters shall be approved for Class I, Division 2 locations.
In Class I, Division 2 locations, the installation of open or nonexplosionproof enclosed motors, such as squirrel-cage induction motors without brushes, switching mechanisms, or similar arc-producing devices that are not identified for use in a Class I, Division 2 location, shall be permitted.
FPN No. 1: It is important to consider the temperature of internal and external surfaces that may be exposed to the flammable atmosphere.
FPN No. 2: It is important to consider the risk of ignition due to currents arcing across discontinuities and overheating of parts in multisection enclosures of large motors and generators. Such motors and generators may need equipotential bonding jumpers across joints in the enclosure and from enclosure to ground. Where the presence of ignitible gases or vapors is suspected, clean-air purging may be needed immediately prior to and during start-up periods.

501-9. Lighting Fixtures
Lighting fixtures shall comply with (a) or (b).
(a) Class I, Division 1. In Class I, Division 1 locations, lighting fixtures shall comply with the following.
(1) Approved Fixtures. Each fixture shall be approved as a complete assembly for the Class I, Division 1 location and shall be clearly marked to indicate the maximum wattage of lamps for which it is approved. Fixtures intended for portable use shall be specifically approved as a complete assembly for that use.
(2) Physical Damage. Each fixture shall be protected against physical damage by a suitable guard or by location.
(3) Pendant Fixtures. Pendant fixtures shall be suspended by and supplied through threaded rigid metal conduit stems or threaded steel intermediate conduit stems, and threaded joints shall be provided with set-screws or other effective means to prevent loosening. For stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or flexible connector approved for the Class I, Division 1 location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be approved for Class I locations.

(b) Class I, Division 2. In Class I, Division 2 locations, lighting fixtures shall comply with the following.
(1) Portable Lighting Equipment. Portable lighting equipment shall comply with (a)(1).
Exception: Where portable lighting equipment are mounted on movable stands and are connected by flexible cords, as covered in Section 501-11, they shall be permitted, where mounted in any position, if they conform to Section 501-9(b)(2).
(2) Fixed Lighting. Lighting fixtures for fixed lighting shall be protected from physical damage by suitable guards or by location. Where there is danger that falling sparks or hot metal from lamps or fixtures might ignite localized concentrations of flammable vapors or gases, suitable enclosures or other effective protective means shall be provided. Where lamps are of a size or type that may, under normal operating conditions, reach surface temperatures exceeding 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved, fixtures shall comply with (a)(1) or shall be of a type that has been tested in order to determine the marked operating temperature or temperature class~~range~~ (T Code).
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an approved fitting or flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
(4) Switches. Switches that are a part of an assembled fixture or of an individual lampholder shall comply with Section 501-6(b)(1).
(5) Starting Equipment. Starting and control equipment for electric-discharge lamps shall comply with Section 501-7(b).
Exception: A thermal protector potted into a thermally protected fluorescent lamp ballast if the lighting fixture is approved for locations of this class and division.

501-10. Utilization Equipment
(a) Class I, Division 1. In Class I, Division 1 locations, all utilization equipment shall be approved for Class I, Division 1 locations.

(b) Class I, Division 2. In Class I, Division 2 locations, all utilization equipment shall comply with the following.
(1) Heaters. Electrically heated utilization equipment shall conform with either item (a) or (b).

a. The heater shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved on any surface that is exposed to the gas or vapor when continuously energized at the maximum rated ambient temperature. If a temperature controller is not provided, these conditions shall apply when the heater is operated at 120 percent of rated voltage.

Exception No. 1: For motor-mounted anticondensation space heaters, see Section 501-8(b).
Exception No. 2: A current-limiting device is applied to the circuit serving the heater that will limit the current in the heater to a value less than that required to raise the heater surface temperature to 80 percent of the ignition temperature.

b. The heater shall be approved for Class I, Division 1 locations.
Exception: Electrical resistance heat tracing approved for Class I, Division 2 locations.

(2) Motors. Motors of motor-driven utilization equipment shall comply with Section 501-8(b).

(3) Switches, Circuit Breakers, and Fuses. Switches, circuit breakers, and fuses shall comply with Section 501-6(b).

501-11. Flexible Cords, Class I, Divisions 1 and 2
A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section 501-4(a) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:
1. Of a type approved for extra-hard usage;
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;
3. Connected to terminals or to supply conductors in an approved manner;
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections; and

5. Be provided with suitable seals where the flexible cord enters boxes, fittings, or enclosures of the explosionproof type.
Exception: As provided in Sections 501-3(b)(6) and 501-4(b).
Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted.
Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.
FPN: See Section 501-13 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation.

501-12. Receptacles and Attachment Plugs, Class I, Divisions 1 and 2
Receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of a flexible cord and shall be approved for the location.
Exception: As provided in Section 501-3(b)(6).

501-13. Conductor Insulation, Class I, Divisions 1 and 2
Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type approved for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means.

501-14. Signaling, Alarm, Remote-Control, and Communications Systems
(a) Class I, Division 1. In Class I, Division 1 locations, all apparatus and equipment of signaling, alarm, remote-control, and communications systems, regardless of voltage, shall be approved for Class I, Division 1 locations, and all wiring shall comply with Sections 501-4(a) and 501-5(a) and (c).

(b) Class I, Division 2. In Class I, Division 2 locations, signaling, alarm, remote-control, and communications systems shall comply with the following.
(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures approved for Class I, Division 1 locations in accordance with Section 501-3(a).
Exception: General-purpose enclosures shall be permitted if current-interrupting contacts are one of the following:
a. Immersed in oil, or
b. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
c. In nonincendive circuits, or
d. Part of a listed nonincendive component
(2) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with Section 501-3(b)(2).
(3) Protectors. Enclosures shall be provided for lightning protective devices and for fuses. Such enclosures shall be permitted to be of the general-purpose type.
(4) Wiring and Sealing. All wiring shall comply with Sections 501-4(b) and 501-5(b) and (c).

501-15. Live Parts, Class I, Divisions 1 and 2
There shall be no exposed live parts.

501-16. Grounding, Class I, Divisions 1 and 2
Wiring and equipment in Class I, Division 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements.
(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.

(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 501-4(b) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.
Exception: In Class I, Division 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

501-17. Surge Protection
(a) Class I, Division 1. Surge arresters, including their installation and connection, shall comply with Article 280. The surge arresters and capacitors shall be installed in enclosures approved for Class I, Division 1 locations. Surge-protective capacitors shall be of a type designed for specific duty.

(b) Class I, Division 2. Surge arresters shall be nonarcing, such as metal-oxide varistor (MOV), sealed type, and surge-protective capacitors shall be of a type designed for specific duty. Installation and connection shall comply with Article 280.
Enclosures shall be permitted to be of the general-purpose type.
Surge protection of types other than described above shall be installed in enclosures approved for Class I, Division 1 locations.

501-18. Multiwire Branch Circuits
In a Class I, Division 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.

SUBSTANTIATION: This complete revision of Article 501 editorially revises the text to make it more easily understood and also incorporates numerous technical and editorial improvements made via other proposals.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
BRIESCH: While the Panel Action to accept the rewrite of Article 501 is supported, the NFPA-circulated Panel Proposal does not include all of the changes agreed to at the meeting. The e-mail sent by Dave Wechsler subsequent to the meeting is more complete in reflecting the Panel Actions from the meeting.
COOK: I agree with Proposal 14-59a and the substantiation, however, it does not incorporate all of the changes made via other proposals. An updated version that was emailed from Dave Wechsler on 1-26-2000 seems to be more complete with respect to including Panel Actions form the meeting in Hilton Head.
ENGLER: Not all of the changes made it into the draft circulated with this ballot, vote is to affirm the text with all of the necessary changes made to it.
JAGUNICH: See ballot for David Wechsler.
LAWRENCE: Due to the large number of public proposals received and acted upon, and also due to time constraints, the panel was not able to compile and correlate all aspects of the rewrites of the affected article. Please see David Wechsler's ballot.
OMEARA: Please see the comments on the ballot for David Wechsler.
WECHSLER: While attempts were made to provide NFPA Staff with corrected revisions of this text before the end of the CMP 14 panel meeting, a detailed review of this balloted draft version has indicated that this does not reflect the accurate committee actions and is not correct.
We attribute the problems with this draft to the following:
a) the use of several earlier drafts that were consistently being revised to keep pace with changes made due to committee actions on public proposals,
b) the limited time available to proof and develop this work,
c) the extremely large number of public proposals,
d) the complex nature of the interaction of affected texts within Articles 500, 501, 502 and 505, and the desire of the panel to maintain consistency, and
e) human errors in transcribing this information.
The following text provides a correct revision of this complete work effort for Article 501. This text should be the panel document of record and not that provided with the committee ballot.

ARTICLE 501 -- Class I Locations

501-1. General. The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class I in Section 500-~~7~~5.

Equipment listed and marked in accordance with Section 505-10 for use in Class I, Zone 0, 1, or 2 locations shall be permitted in Class I, Division 2 locations for the same gas and with a suitable temperature ~~rating~~classification.
Exception: As modified by this article.

501-2. Transformers and Capacitors

(a) Class I, Division 1. In Class I, Division 1 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed only in ~~approved~~ [14-61,14-62]vaults that comply with Sections 450-41 through 450-48, and, in addition,

a. There shall be no door or other communicating opening between the vault and the Division 1 location, and
b. Ample ventilation shall be provided for the continuous removal of flammable gases or vapors, and
c. Vent openings or ducts shall lead to a safe location outside of buildings, and
d. Vent ducts and openings shall be of sufficient area to relieve explosion pressures within the vault, and all portions of vent ducts within the buildings shall be of reinforced concrete construction.

(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with (a)(1) or be approved for Class I locations.

(b) Class I, Division 2. In Class I, Division 2 locations, transformers and capacitors shall comply with Sections 450-21 through 450-27.

501-3. Meters, Instruments, and Relays

(a) Class I, Division 1. In Class I, Division 1 locations, meters, instruments, and relays, including kilowatt-hour meters, instrument transformers, resistors, rectifiers, and thermionic tubes, shall be provided with enclosures approved for Class I, Division 1 locations. Enclosures ~~approved~~ [14-66] for Class I, Division 1 locations include explosionproof enclosures and purged and pressurized enclosures.

FPN: See Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(b) Class I, Division 2. In Class I, Division 2 locations, meters, instruments, and relays shall comply with the following.

(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures approved [14-67,14-68] for Class I, Division 1 locations in accordance with Section 501-3(a).

Exception: General-purpose enclosures shall be permitted, if current-interrupting contacts are
a. Immersed in oil, or
b. Enclosed within a chamber that is hermetically sealed against the entrance of gases or vapors, or
c. In nonincendive circuits, or
d. Part of a listed nonincendive component.

(2) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment that are used in or in connection with meters, instruments, and relays shall comply with Section 501-3(a).

Exception: General-purpose–type enclosures shall be permitted if such equipment is without make-and-break or sliding contacts [other than as provided in (b)(1)] and if the maximum operating temperature of any exposed surface will not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved or has been tested and found incapable of igniting the gas or vapor. This exception shall not apply to thermionic tubes.

(3) Without Make-or-Break Contacts. Transformer windings, impedance coils, solenoids, and other windings that do not incorporate sliding or make-or-break contacts shall be provided with enclosures. General-purpose–type enclosures shall be permitted.

(4) General-Purpose Assemblies. Where an assembly is made up of components for which general-purpose enclosures are acceptable as provided in (b)(1), (b)(2), and (b)(3), a single general-purpose enclosure shall be acceptable for the assembly. Where such an assembly includes any of the equipment described in (b)(2), the maximum obtainable surface temperature of any component of the assembly shall be clearly and permanently indicated on the outside of the enclosure. Alternatively, ~~approved~~ [14-69,14-70] equipment shall be permitted to be marked to indicate the temperature ~~range~~class for which it is suitable, using the temperature class (T Code)~~identification numbers~~ of Table 500-8 (b)~~5(d)~~.

(5) Fuses. Where general-purpose enclosures are permitted in (b)(1), (b)(2), (b)(3), and (b)(4), fuses for overcurrent protection of instrument circuits not subject to overloading in normal use shall be permitted to be mounted in general-purpose enclosures if each such fuse is preceded by a switch complying with (b)(1).

(6) Connections To facilitate replacements, process control instruments shall be permitted to be connected through flexible cord, attachment plug, and receptacle, provided the following:

1. A switch complying with (b)(1) is provided so that the attachment plug is not depended on to interrupt current; and
2. The current does not exceed 3 amperes at 120 volts, nominal; and
3. The power-supply cord does not exceed 3 ft (914 mm), is of a type listed ~~approved~~ [14-71,14-72]-for extra-hard usage or for hard usage if protected by location, and is supplied through an attachment plug and receptacle of the locking and grounding type; and
4. Only necessary receptacles are provided; and
5. The receptacle carries a label warning against unplugging under load.

501-4. Wiring Methods. Wiring methods shall comply with (a) or (b). [14-73, 14-75,14-76,14-79]

(b) Class I, Division 1.

(1) In Class I, Division 1 locations, the following wiring methods shall be permitted:

a) Threaded rigid metal conduit or threaded steel intermediate metal conduit. Threaded joints shall be made up with at least five threads fully engaged.

Exception No. 1: Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade. The concrete encasement shall be permitted to be omitted where subject to the provisions of Section 511-4, Exception; 514-8, Exception No. 2; and Section 515-5(a). Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

b) Type MI cable with termination fittings approved for the location. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings. [14-77]

c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation Type MC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic (14-78) sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.
FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

d) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type ITC-HL cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

(2) Where necessary to employ flexible connections, as at motor terminals, flexible fittings listed for Class I, Division 1 locations or flexible cord in accordance with the provisions of Section 501-11 shall be permitted.

(3) All boxes, fittings, and joints shall be approved for Class I, Division 1.

(b) Class I, Division 2.

(1) In Class I, Division 2 locations, the following wiring methods shall be permitted: [14-83,14-86,14-87]

a) Threaded rigid metal conduit, threaded steel intermediate metal conduit,

b) Enclosed gasketed busways, enclosed gasketed wireways,

c) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings.

d) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;

e) Type MI, MC, MV, or TC cable with [14-79/14-80] termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings.

(2) Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with listed fittings, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with listed bushed fittings shall be used. An additional conductor for grounding shall be included in the flexible cord. [14-87, 14-80]

FPN: See Section 501-16(b) for grounding requirements where flexible conduit is used.

(3) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for nonhazardous [14-81,14-88,1401] locations, including Chapter 7 and 8 wiring methods. Nonincendive field wiring systems shall be installed in accordance with the control drawing(s). (14-83)

(4) Boxes, fittings, and joints shall not be required to be explosionproof except as required by Sections 501-3(b)(1), 501-6(b)(1), and 501-14(b)(1).

501-5. Sealing and Drainage

Seals in conduit and cable systems shall comply with (a) through (f). ~~Sealing compound shall be of a type approved for the conditions and use~~ (14-89,14-91). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 501-5(e)(2). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 501-5(c)(2).

FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Conduit Seals, Class I, Division 1. In Class I, Division 1 locations, conduit seals shall be located as follows.

1. In each conduit entry into an explosionproof enclosure where either (a) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (b) the entry is 2-in. size or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.

Exception to (a)(1)(a): Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are

a. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or

b. Immersed in oil in accordance with Section 501-6(b)(1)(b), or

c. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, identified ~~approved~~ [14-92, 14-93] for the location, and marked "factory sealed" or equivalent.

Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal. Conduit seals shall be installed within 18 in. (457 mm) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.

d. In nonincendive circuits. [14-94]

2. In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 18 in. (457 mm) from the pressurized enclosure.

FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.

FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

3. Where two or more explosionproof enclosures for which conduit seals are required under (a)(1) are connected by nipples or by runs of conduit not more than 36 in. (914 mm) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 18 in. (457 mm) from either enclosure.

4. In each conduit run leaving a Class I, Division 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Division 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for listed ~~approved~~ [14-95,14-96] explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 1 location.

Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Division 1 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

(b) Conduit Seals, Class I, Division 2. In Class I, Division 2 locations, conduit seals shall be located as follows.

1. For connections to enclosures that are required to be explosionproof, a conduit seal shall be provided in accordance with (a)(1)(a) and (a)(3). All portions of the conduit run or

nipple between the seal and such enclosure shall comply with Section 501-4(a).
2. In each conduit run passing from a Class I, Division 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Division 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Division 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed ~~approved~~ [14-100,14-101]**-**explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Division 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Division 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.

Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Division 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Division 2 location into an unclassified location if the following conditions are met:

a. No part of the conduit system segment passes through a Class I, Division I location where the conduit contains unions, couplings, boxes, or fittings within 12 in. (305 mm) of the Class I, Division 1 location; and

b. The conduit system segment is located entirely in outdoor locations; and

c. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and

d. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and

e. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Division 2 locations.

(c) Class I, Divisions 1 and 2. Where required, seals in Class I, Division 1 and 2 locations shall comply with the following.
(1) Fittings. Enclosures for connections or equipment shall be provided with an approved integral means for sealing, or sealing fittings approved for Class I locations shall be used. ~~Sealing fittings shall be accessible.~~Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible. (14-102,14-103,14-104, 14-105)
(2) Compound. The compound shall provide a ~~Sealing compound shall be approved and shall provide a~~ seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF). (14-104, 14-105)
(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 5/8 in. (16 mm).
Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.
(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.
(5) Assemblies. In an assembly where equipment that may produce arcs, sparks, or high temperatures is located in a compartment separate from the compartment containing splices or taps, and an integral seal is provided where conductors pass from one compartment to the other, the entire assembly shall be identified ~~approved~~ for Class I locations. Seals in conduit connections to the compartment containing splices or taps shall be provided in Class I, Division 1 locations where required by (a)(1)(b).[14-106, 14-107]
(6) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically identified ~~approved~~ [14-108,14-109]**-**for a higher percentage of fill.

(d) Cable Seals, Class I, Division 1. In Class I, Division 1 locations, cable seals shall be located as follows.
1. Cable shall be sealed at all terminations. The sealing fitting shall comply with (c). Multiconductor Type MC cables with a gas/vaportight continuous corrugated aluminum sheath and an overall jacket of suitable polymeric material shall be sealed with an listed ~~approved~~ [14-110,14-111]**-**fitting after removing the jacket and any other covering so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors.
Exception: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

2. Cables in conduit with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Division 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.
Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

3. Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (a).

(e) Cable Seals, Class I, Division 2. In Class I, Division 2 locations, cable seals shall be located as follows.
1. Cables entering enclosures that are required to be explosionproof ~~approved for Class I locations~~ [14-116,14-118]shall be sealed at the point of entrance. The sealing fitting shall comply with (b)(1). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in an listed ~~approved~~ [14-117,14-119] fitting in the Division 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (d).
Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Division 2 location shall not require a seal at the boundary.
Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

2. Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (e)(1). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [0.007 ft3/hour (198 cm3/hour) of air at a pressure of 6 in. of water (1493 pascals)].
FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.
FPN No. 2: The cable core does not include the interstices of the conductor strands.

3. Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (e)(1), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 6 in. of water (1493 pascals) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.
Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Division 2 location without seals.

4. Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Division 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.
FPN: The sheath mentioned in (d) and (e) may be either metal or a nonmetallic material.

(f) Drainage.
(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

(3) Canned Pumps, Process or Service Connections, etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical raceway or cable system capable of transmitting fluids, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the raceway or cable system capable of transmitting fluids beyond the additional devices or means, if the primary seal fails.
The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above.
Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.
FPN: See also the fine print notes to Section 501-5.

501-6. Switches, Circuit Breakers, Motor Controllers, and Fuses
(a) Class I, Division 1. In Class I, Division 1 locations, switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices, shall be provided with enclosures, and the enclosure in each case, together with the enclosed apparatus, shall be identified ~~approved~~ [14-130, 14-131] as a complete assembly for use in Class I locations.

(b) Class I, Division 2. Switches, circuit breakers, motor controllers, and fuses in Class I, Division 2 locations shall comply with the following:

(1) Type Required. Circuit breakers, motor controllers, and switches intended to interrupt current in the normal performance of the function for which they are installed shall be provided with enclosures identified ~~approved~~ [14-132,14-133]- for Class I, Division 1 locations in accordance with Section 501-3(a), unless general-purpose enclosures are provided and
a. The interruption of current occurs within a chamber hermetically sealed against the entrance of gases and vapors, or
b. The current make-and-break contacts are oil-immersed and of the general-purpose type having a 2-in. (50.8-mm) minimum immersion for power contacts and a 1-in. (25.4-mm) minimum immersion for control contacts, or
c. The interruption of current occurs within a factory-sealed explosionproof chamber ~~approved for the location~~ [14-134, 14-135], or
d. The device is a solid state, switching control without contacts, where the surface temperature does not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved.

(2) Isolating Switches. Fused or unfused disconnect and isolating switches for transformers or capacitor banks that are not intended to interrupt current in the normal performance of the function for which they are installed shall be permitted to be installed in general-purpose enclosures.

(3) Fuses. For the protection of motors, appliances, and lamps, other than as provided in (b)(4), standard plug or cartridge fuses shall be permitted, provided they are placed within enclosures identified ~~approved~~ (14-136,14-137) for the location; or fuses shall be permitted if they are within general-purpose enclosures, and if they are of a type in which the operating element is immersed in oil or other approved liquid, or the operating element is enclosed within a chamber hermetically sealed against the entrance of gases and vapors, or the fuse is a nonindicating, filled, current-limiting type.

(4) Fuses Internal to Lighting Fixtures. Approved cartridge fuses shall be permitted as supplementary protection within lighting fixtures.

501-7. Control Transformers and Resistors
Transformers, impedance coils, and resistors used as, or in conjunction with, control equipment for motors, generators, and appliances shall comply with (a) and (b).
(a) Class I, Division 1. In Class I, Division 1 locations, transformers, impedance coils, and resistors, together with any switching mechanism associated with them, shall be provided with enclosures identified ~~approved~~ [14-140,14-141]- for Class I, Division 1 locations in accordance with Section 501-3(a).

(b) Class I, Division 2. In Class I, Division 2 locations, control transformers and resistors shall comply with the following.
(1) Switching Mechanisms. Switching mechanisms used in conjunction with transformers, impedance coils, and resistors shall comply with Section 501-6(b).
(2) Coils and Windings. Enclosures for windings of transformers, solenoids, or impedance coils shall be permitted to be of the general-purpose type.
(3) Resistors. Resistors shall be provided with enclosures; and the assembly shall be identified ~~approved~~ [14-142, 14-143]- for Class I locations, unless resistance is nonvariable and maximum operating temperature, in degrees Celsius, will not exceed 80 percent of the ignition temperature of the gas or vapor involved, or has been tested and found incapable of igniting the gas or vapor.

501-8. Motors and Generators
(a) Class I, Division 1. In Class I, Division 1 locations, motors, generators, and other rotating electric machinery shall be as follows:
1. Identified ~~Approved~~ [14-146,14-147]- for Class I, Division 1 locations; or
2. Of the totally enclosed type supplied with positive-pressure ventilation from a source of clean air with discharge to a safe area, so arranged to prevent energizing of the machine until ventilation has been established and the enclosure has been purged with at least 10 volumes of air, and also arranged to automatically de-energize the equipment when the air supply fails; or
3. Of the totally enclosed inert gas-filled type supplied with a suitable reliable source of inert gas for pressuring the enclosure, with devices provided to ensure a positive pressure in the enclosure and arranged to automatically de-energize the equipment when the gas supply fails; or
4. Of a type designed to be submerged in a liquid that is flammable only when vaporized and mixed with air, or in a gas or vapor at a pressure greater than atmospheric and that is flammable only when mixed with air; and the machine is arranged so to prevent

energizing it until it has been purged with the liquid or gas to exclude air, and also arranged to automatically de-energize the equipment when the supply of liquid or gas or vapor fails or the pressure is reduced to atmospheric.
Totally enclosed motors of Types (2) or (3) shall have no external surface with an operating temperature in degrees Celsius in excess of 80 percent of the ignition temperature of the gas or vapor involved. Appropriate devices shall be provided to detect and automatically de-energize the motor or provide an adequate alarm if there is any increase in temperature of the motor beyond designed limits. Auxiliary equipment shall be of a type identified ~~approved~~ [14-144,14-145]**-**for the location in which it is installed.
FPN: See ASTM Test Procedure, D 2155-69.

(b) Class I, Division 2. In Class I, Division 2 locations, motors, generators, and other rotating electric machinery in which are employed sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature devices), or integral resistance devices, either while starting or while running, shall be identified ~~approved~~ [14-149, 14-151]**-**for Class I, Division 1 locations, unless such sliding contacts, switching mechanisms, and resistance devices are provided with enclosures approved for Class I, Division 2 locations in accordance with Section 501-3(b). The exposed surface of space heaters used to prevent condensation of moisture during shutdown periods shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved when operated at rated voltage, and the maximum surface temperature [based on a 40ºC (104ºF) ambient] shall be permanently marked on a visible nameplate mounted on the motor. Otherwise, space heaters shall be identified ~~approved~~ [14-152] for Class I, Division 2 locations.
In Class I, Division 2 locations, the installation of open or nonexplosionproof enclosed motors, such as squirrel-cage induction motors without brushes, switching mechanisms, or similar arc-producing devices that are not identified for use in a Class I, Division 2 location, shall be permitted.
FPN No. 1: It is important to consider the temperature of internal and external surfaces that may be exposed to the flammable atmosphere.
FPN No. 2: It is important to consider the risk of ignition due to currents arcing across discontinuities and overheating of parts in multisection enclosures of large motors and generators. Such motors and generators may need equipotential bonding jumpers across joints in the enclosure and from enclosure to ground. Where the presence of ignitible gases or vapors is suspected, clean-air purging may be needed immediately prior to and during start-up periods.

501-9. Lighting Fixtures
Lighting fixtures shall comply with (a) or (b).
(a) Class I, Division 1. In Class I, Division 1 locations, lighting fixtures shall comply with the following.
(1) Approved Fixtures. Each fixture shall be identified ~~approved~~ as a complete assembly for the Class I, Division 1 location and shall be clearly marked to indicate the maximum wattage of lamps for which it is identified ~~approved~~. Fixtures intended for portable use shall be specifically identified ~~approved~~ as a complete assembly for that use. [14-153,14-154]
(2) Physical Damage. Each fixture shall be protected against physical damage by a suitable guard or by location.
(3) Pendant Fixtures. Pendant fixtures shall be suspended by and supplied through threaded rigid metal conduit stems or threaded steel intermediate conduit stems, and threaded joints shall be provided with set-screws or other effective means to prevent loosening. For stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or flexible connector identified ~~approved~~ [14-155,14-156]**-**for the Class I, Division 1 location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be identified ~~approved~~ [14-157, 14-158]**-**for Class I locations.

(b) Class I, Division 2. In Class I, Division 2 locations, lighting fixtures shall comply with the following.
(1) Portable Lighting Equipment. Portable lighting equipment shall comply with (a)(1).
Exception: Where portable lighting equipment are mounted on movable stands and are connected by flexible cords, as covered in Section 501-11, they shall be permitted, where mounted in any position, if they conform to Section 501-9(b)(2).
(2) Fixed Lighting. Lighting fixtures for fixed lighting shall be protected from physical damage by suitable guards or by location. Where there is danger that falling sparks or hot metal from lamps or fixtures might ignite localized concentrations of flammable vapors or gases, suitable enclosures or other effective protective means shall be provided. Where lamps are of a size or type that may, under normal operating conditions, reach surface temperatures exceeding 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved, fixtures shall comply with (a)(1) or shall be of a type that has been tested in order to determine the marked operating temperature or temperature class~~range~~ (T Code).
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an identified ~~approved~~ [14-162, 14-164]**-**fitting or flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
(4) Switches. Switches that are a part of an assembled fixture or of an individual lampholder shall comply with Section 501-6(b)(1).
(5) Starting Equipment. Starting and control equipment for electric-discharge lamps shall comply with Section 501-7(b).
Exception: A thermal protector potted into a thermally protected fluorescent lamp ballast if the lighting fixture is identified ~~approved~~ [14-165, 14-166]**-**for locations of this class and division.

501-10. Utilization Equipment
(a) Class I, Division 1. In Class I, Division 1 locations, all utilization equipment shall be approved for Class I, Division 1 locations.

(b) Class I, Division 2. In Class I, Division 2 locations, all utilization equipment shall comply with the following.
(1) Heaters. Electrically heated utilization equipment shall conform with either item (a) or (b).

a. The heater shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved on any surface that is exposed to the gas or vapor when continuously energized at the maximum rated ambient temperature. If a temperature controller is not provided, these conditions shall apply when the heater is operated at 120 percent of rated voltage.

Exception No. 1: For motor-mounted anticondensation space heaters, see Section 501-8(b).

Exception No. 2: A current-limiting device is applied to the circuit serving the heater that will limit the current in the heater to a value less than that required to raise the heater surface temperature to 80 percent of the ignition temperature.

b. The heater shall be identified ~~approved~~ {14-169, 14-170]**-**for Class I, Division 1 locations.
Exception: Electrical resistance heat tracing identified ~~approved~~ [14-171, 14-172]**-**for Class I, Division 2 locations.

(2) Motors. Motors of motor-driven utilization equipment shall comply with Section 501-8(b).

(3) Switches, Circuit Breakers, and Fuses. Switches, circuit breakers, and fuses shall comply with Section 501-6(b).

501-11. Flexible Cords, Class I, Divisions 1 and 2
A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section 501-4(a) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:

1. Of a type listed ~~approved~~ [14-174,14-175]**-**for extra-hard usage;
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;
3. Connected to terminals or to supply conductors in an approved manner;
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections; and
5. Be provided with suitable seals where the flexible cord enters boxes, fittings, or enclosures of the explosionproof type.

Exception: As provided in Sections 501-3(b)(6) and 501-4(b).
Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted.
Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.
FPN: See Section 501-13 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation.

501-12. Receptacles and Attachment Plugs, Class I, Divisions 1 and 2
Receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of a flexible cord and shall be identified ~~approved~~ [14-178,14-179]**-**for the location.
Exception: As provided in Section 501-3(b)(6).

501-13. Conductor Insulation, Class I, Divisions 1 and 2
Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type approved for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means.

501-14. Signaling, Alarm, Remote-Control, and Communications Systems
(a) Class I, Division 1. In Class I, Division 1 locations, all apparatus and equipment of signaling, alarm, remote-control, and communications systems, regardless of voltage, shall be identified ~~approved~~ [14-184,14-185]**-**for Class I, Division 1 locations, and all wiring shall comply with Sections 501-4(a) and 501-5(a) and (c).

(b) Class I, Division 2. In Class I, Division 2 locations, signaling, alarm, remote-control, and communications systems shall comply with the following.
(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures identified ~~approved~~ [14-186,14-187]**-**for Class I, Division 1 locations in accordance with Section 501-3(a).
Exception: General-purpose enclosures shall be permitted if current-interrupting contacts are one of the following:
a. Immersed in oil, or
b. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
c. In nonincendive circuits, or
d. Part of a listed nonincendive component
(2) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with Section 501-3(b)(2).
(3) Protectors. Enclosures shall be provided for lightning protective devices and for fuses. Such enclosures shall be permitted to be of the general-purpose type.
(4) Wiring and Sealing. All wiring shall comply with Sections 501-4(b) and 501-5(b) and (c).

501-15. Live Parts, Class I, Divisions 1 and 2
There shall be no exposed live parts.

501-16. Grounding, Class I, Divisions 1 and 2
Wiring and equipment in Class I, Division 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements.
(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.

(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 501-4(b) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.
Exception: In Class I, Division 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

501-17. Surge Protection
(a) Class I, Division 1. Surge arresters, including their installation and connection, shall comply with Article 280. The surge arresters and capacitors shall be installed in enclosures identified ~~approved~~ [14-194, 14-195] for Class I, Division 1 locations. Surge-protective capacitors shall be of a type designed for specific duty.

(b) Class I, Division 2. Surge arresters shall be nonarcing, such as metal-oxide varistor (MOV), sealed type, and surge-protective capacitors shall be of a type designed for specific duty. Installation and connection shall comply with Article 280.
Enclosures shall be permitted to be of the general-purpose type.
Surge protection of types other than described above shall be installed in enclosures identified ~~approved~~ [14-196,14-197]**-**for Class I, Division 1 locations.

501-18. Multiwire Branch Circuits
In a Class I, Division 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.

(Log #1398)

14- 60 - (501-1): Reject
SUBMITTER: Jon Miller, Richard Poling, Detector Electronics Corp./Rep. Detector Electronics Corp./ E I du Pont
RECOMMENDATION: Revise 501-1 to read as follows:

501-1. General

The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class I in Section 500-7.

Equipment listed and marked in accordance with Section 505-10 for use in Class I, Zone 0, 1, or 2 locations shall be permitted in Class I, Division 2 locations for the same gas and with a suitable temperature rating.

Exception: As modified by this article.

Permanently mounted combustible gas detection equipment may be used as a means for reducing the need for special electrical equipment when:

- combustible gas detection equipment is listed and marked both as performance tested and as suitable for use in hazardous (classified) locations,
- combustible gas detection equipment is installed in accordance with industrial practices,
- used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and
- appropriate alarms with ventilation or interlocks are provided.

FPN 1: For suggested minimum performance specifications and guidance in the selection of gas detection equipment, see ISA S12.13.01, Performance Requirements, Combustible Gas Detectors.

FPN 2: For suggested installation, operation and maintenance guidance, see ISA RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.

FPN 3: For guidance in the installation of gas detection equipment, see ANSI/API RP 500, Recommended Practice for

Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2.

SUBSTANTIATION: Equipment necessary to be placed in hazardous (classified) locations which cannot meet specific hazardous location protection techniques currently requires purged/pressurized protection techniques. This is not always possible or desirable under all installation considerations. For many years gas detection equipment has been used as a method of protection in petroleum facilities in accordance with ANSI/API RP 500, Recommended practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2 and within hazardous location facilities in Canada in accordance with the Canadian Electrical Code (CEC) with no reported incidents. Gas detection equipment is capable of providing indication of the presence of combustible gases prior to reaching lower explosive limits and is capable of providing alarms with ventilation or interlocks. To ensure proper gas detection equipment functionality under such critical conditions, an existing ISA standard S12.13.01, Performance Requirements, Combustible Gas Detectors, will provide guidance on gas detection equipment performance requirements and an existing ISA recommended practice RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments, will provide user guidance on the proper use of gas detection equipment. In conclusion, this additional method of protection should be considered for equipment which cannot meet the proper hazardous (classified) location requirements, but is necessary to be installed in such locations.

PANEL ACTION: Reject.

PANEL STATEMENT: While the Panel agrees with the principle of selectively applying gas detection in Class I areas, the evaluation process that is required to support this complex operating condition extends beyond merely a simple installation requirement. The NEC is primarily an electrical installation document.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #2613)

14- 61 - (501-2(a)(1)): Accept in Part

SUBMITTER: Donald R. Cook, Southern Section, IAEI

RECOMMENDATION: Revise text to read as follows:

(1) Containing Liquid that Will Burn. Transformers and capacitors containing liquid that will burn shall be installed only in ~~approved~~ (identified) vaults that comply with Sections 450-41 through 450-48, and, in addition,

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Part.

Delete the word "approved" but do not substitute "identified."

PANEL STATEMENT: Transformer vaults are not normally identified.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3471)

14- 62 - (501-2(a)(1)): Accept in Part

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

"(1) Containing Liquid that Will Burn. Transformers and capacitors containing liquid that will burn shall be installed only in ~~approved~~ (identified) vaults that comply with Sections 450-41 through 450-48, and, in addition,"

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Part.

Delete the word "approved" but do not substitute "identified."

PANEL STATEMENT: Transformer vaults are not normally identified.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1553)

14- 63 - (501-3(a)): Reject

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise to read as follows:

(a) Class I, Division 1. In Class I, Division 1 locations, meters, instruments, and relays, including kilowatt-hour-meters, instrument transformers, resistors, rectifiers, and thermionic tubes, shall be provided with enclosures ~~approved~~ (identified) for Class I, Division 1 locations.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Reject.

PANEL STATEMENT: Changing the word "approved" will change the context of the paragraph.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 2

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

COOK: I do not agree with the Panel Action which is inconsistent with others that involve enclosures in Class I areas, see Proposals 14-130, 131, 132, 133, 136, 137, 140, 141, 142, 143, etc. This equipment could not be "approved" (acceptable to an authority having jurisdiction) without some kind of identification.

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1554)

14- 64 - (501-3(a)): Accept in Part

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise paragraph two to read as follows:

Enclosures ~~approved~~ (identified) for Class I, Division 1 locations include explosion-proof enclosures and purged and pressurized enclosures.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Part.

Delete the word "approved", but do not insert the word "identified".

PANEL STATEMENT: Panel 14 believes that "approved" does not amplify a statement of fact.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3472)

14- 65 - (501-3(a)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class I, Division 1. In Class I, Division 1 locations, meters, instruments, and relays, including kilowatt-hour meters, instrument transformers, resistors, rectifiers, and thermionic tubes, shall be provided with enclosures ~~approved~~ (identified) for Class I, Division 1 locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: Changing the word "approved" will change the context of the paragraph.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-63.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3473)

14- 66 - (501-3(a)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second paragraph to read as follows:
"Enclosures ~~approved~~ (identified) for Class I, Division 1 locations include explosionproof enclosures and purged and pressurized enclosures."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete the word "approved", but do not insert the word "identified".
PANEL STATEMENT: The Panel believes that the word "approved" does not amplify a statement of fact.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1555)

14- 67 - (501-3(b)(1)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) Contacts. Switches, circuit breakers, and make- and -break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures ~~approved~~ (identified) for Class I, Division 1 locations in accordance with Section 501-3(a).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Listed enclosures are regularly available. Also, field approval is difficult.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: According to my notes, when the committee reviewed this specific section, we agreed that in Section 501-3(a) the word "approved" could be deleted because it was extraneous and we edited the text accordingly. However, Section 501-3(b)(1) refers back to Section 501-3(a) and we agreed that we needed "approved."
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3474)

14- 68 - (501-3(b)(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures ~~approved~~ (identified) for Class I, Division 1 locations in accordance with Section 501-3(a).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change the word "approved" to "listed".
PANEL STATEMENT: Listed enclosures are regularly available. Also, field approval is difficult.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: According to my notes, when the committee reviewed this specific section, we agreed that in Section 501-3(a) the word "approved" could be deleted because it was extraneous and we edited the text accordingly. However, Section 501-3(b)(1) refers back to Section 501-3(a) and we agreed that we needed "approved."
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1556)

14- 69 - (501-3(b)(4)): Accept in Principle in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise third sentence to read as follows:
Alternatively, ~~approved~~ (identified) equipment shall be permitted to be marked to indicate the temperature range for which it is suitable, using the identification numbers of the Table 500-5(d).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle in Part.
Revise 501-3(b)(4) to read: "Alternatively, equipment shall be permitted to be marked to indicate the temperature class for which it is suitable, using Table 500-5(d)."
PANEL STATEMENT: Editorial changes have been made to conform to the NEC Style Manual and to conform to changes made in Proposal 14-59a (CP1411).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3475)

14- 70 - (501-3(b)(4)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the third sentence to read as follows:
"Alternatively, ~~approved~~ (identified) equipment shall be permitted to be marked to indicate the temperature range for which it is suitable, using the identification numbers of Table 500-5(d)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: This proposal is identical to Proposal 14-69.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1557)

14- 71 - (501-3(b)(6)(3)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) The power-supply cord does not exceed 3 ft (914 mm), is of a type ~~approved~~ (identified) for extra-hard usage or for hard usage if protected by location, and is supplied through an attachment plug and receptacle of the locking and grounding type; and....
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: The panel substantiation does not truly justify the action to change the wording. The submitter has not shown that a problem exits, and the fact that a listed product may be more readily available, does not mean that one was "approved" would not provide equal protection or service. Flexible cords should not be considered the same as fittings, and reducers. Under the proposed rewording, flexible cords should more appropriately be "identified."
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3476)

14- 72 - (501-3(b)(6)(3)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"(3) The power-supply cord does not exceed 3 ft (914 mm), is of a type ~~approved~~ (identified) for extra-hard usage or for hard usage if protected by location, and is supplied through an attachment plug and receptacle of the locking and grounding type: and".
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2125)

14- 73 - (501-4): Accept in Principle in Part
Note: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal. The Panel's stated action is to revise 501-4 as shown in Proposal 14-318a which is a complete rewrite of Article 505, not Article 501. This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information, with respect to Code-Making Panel 16's Panel Action on Proposal 16-319. Code-Making Panel 14 shall retain jurisdiction regarding types of wiring methods permitted in hazardous locations.
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise and add the underlined text into existing paragraph as follows:
See NEC Proposal 501-4 Wiring Methods, "Proposal" for the revised rewrite of this entire section.
501-4. Wiring Methods. Wiring methods shall comply with (a) and (b).
(a) Class I, Division 1. In Class I, Division 1 locations, apply the following:
(1) Threaded rigid metal conduit, or threaded steel intermediate metal conduit may be used.
Exception No. 1: Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade. The concrete encasement shall be permitted to be omitted where subject to the provisions of Section 511-4, Exception 514-8, Exception No. 2; and Section 515-5(a).
Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.
(2) Type MI cable with termination fittings approved for the location may be used. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.
Exception No. 1~~2~~: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated aluminum sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.
FPN: See Sections 334-3 and 334-4 for restrictions on use of Type

MC cable.

Exception No. 2~~3~~: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type ITC cable, ~~listed for use in Class I, Division 1 locations,~~ with a gas/vaportight continuous corrugated aluminum sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application shall be permitted.

(3) All boxes, fittings, and joints shall be threaded for connection to conduit or cable terminations and shall be explosionproof. Threaded joints shall be made up with at least five threads fully engaged.

(4) Flexible Connections. Where necessary to employ flexible connections, as at motor terminals, flexible fittings listed for Class I locations shall be used.

Exception: Flexible cord installed in accordance with the provisions of Section 501-11 shall be permitted.

(b) Class I, Division 2. In Class I, Division 2 locations, apply the following:

(1) Threaded rigid metal conduit, threaded steel intermediate metal conduit,

(2) Enclosed gasketed busways, enclosed gasketed wireways,

(3) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings,

(4) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use,

(5) Types MI, MC, MV, or TC cable with approved termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings,

(6) Types CATVP, CATVR, CATV, or CATVX in cable tray, and in opening wiring,

(7) Where provision must be made for limited flexibility, as at motor terminals, flexible metal fittings, flexible metal conduit with approved fittings, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with approved fittings, or flexible cord approved for extra-hard usage and provided with approved bushed fittings shall be used. An additional conductor for grounding shall be included in the flexible cord,

FPN: See Section 501-16(b) for grounding requirements where flexible conduit is used.

(8) Boxes, fittings, and joints shall not be required to be explosionproof except as required by Sections 501-3(b)(1), 501-6(b)(1), and 501-14(b)(1).

SUBSTANTIATION: See NEC Proposal 501-4 Wiring Methods "Problem".

• This proposal first reorganizes the existing text within to clarify the requirements, and to correct years of additions that simply aggravated the problem further. For example, the phrase, "Type MI, MC, MV, or TC cable with approved termination fittings shall be the wiring method employed" hardly fits into a paragraph that permits may different installation techniques to be used.

• This proposal also eliminates the unnecessary and undefined term "Fixed Wiring" that appeared in 501-4(a)(1) and "Flexible Connections" that appeared in 501-4(a)(2), with a simply listing of permitted methods.

• The order of the exceptions under 501-4(a)(1) has been changed to reflect the reordered listing and to agree with the paragraph that the exception applies.

• Type CATVP, CATVR, CATV, or CATVX coaxial cables, as described in Article 820-51, have been added as these cables are needed in modern industrial facilities for digital and video signal transmission. Further these cables have the additional having fire-resistant characteristics similar to the requirements for other types of cables such as TC and ITC, which are currently permitted for Class I, Division 2 locations. In addition they are suitable for installation in cable trays as permitted by Article 318.

PANEL ACTION: Accept in Principle in Part.

Revise 501-4 as shown in Proposal 14-318a, but do not accept the addition of Types CATVP, CATVR, CATV, or CATVX in cable tray.

PANEL STATEMENT: The submitter has not provided adequate technical justification to support the proposal to accept CATV cable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

LAWRENCE: Panel action should have been "Accept in Part in Principle" with the removal of Type CATVX and the addition of support/protection requirements to correlate with the actions of Panel 16 on Proposal 16-318 to accept Types CATVP, CATVR, and CATV in Section 820-53(e).

COMMENT ON AFFIRMATIVE:

WECHSLER: Panel 16 took action to permit the use of all but CATVX in hazardous locations. [See CMP 16, Proposal 16-319] Based upon this action, CMP 14 should have accepted in part, too, the use of coaxial cable to complement the action of CMP 16: "Revise the submitter's proposal by adding a new 820-53(e) as follows:

"(e) Hazardous (Classified) Locations. Where the use of Type CATVP, CATVR, and CATV cable is permitted in Section 501-4(b), 502-4(b), and 504-20, the cable shall be installed in cable trays; in raceways; supported by messenger wire, or otherwise adequately supported and mechanically protected by angles, struts, channels, or by other mechanical means."

(Log #2282)

14- 74 - (501-4 Exception No. 4): Reject

SUBMITTER: Jack Bartlett, Gilbarco Inc.

RECOMMENDATION: Text change for 501-4 as follows:

Exception No. 4: In Gas Pumps and Dispensers with restricted public access to the enclosures (i.e., locked cabinets), where the conditions of maintenance and supervision ensure that only qualified persons will install and service the installation, flexible cord of a type suitable to comply with 501-11 and 501-13 will be permitted.

SUBSTANTIATION: Flexible cord has been permitted for use in this application outside the USA for many years with no detrimental effect to safety.

The continuance of NFPA 70 to demand conduit has a negative effect on USA based design and manufacturing companies to compete in the world market and restricts imaginative design solutions in this market area.

PANEL ACTION: Reject.

PANEL STATEMENT: Flexible cord is not an acceptable wiring method for permanently installed equipment where there is no demonstarted need.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1558)

14- 75 - (501-4(a)(1)): Accept in Principle

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise to read as follows:

(1) Fixed Wiring. In Class I, Division 1 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings ~~approved~~ (identified) for the location shall be the wiring method employed.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Principle.

Change "approved" to "listed".

PANEL STATEMENT: Listed fittings are readily available.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1811)

14- 76 - (501-4(a)(1)): Reject
SUBMITTER: William G. Lawrence, Jr., S. Yarmouth, MA
RECOMMENDATION: (Existing Text) ....Threaded joints shall be made up with at least five threads fully engaged.....
(Revised Text) ...Threaded joints shall be made up with at least three and one half threads fully engaged....
SUBSTANTIATION: Although the nominal thread engagement of male conduit / female equipment NPT parts threaded per ANSI/ASME B1.20.1 (Pipe Threads, General Purpose Inch) is 5.5 threads, with both the male and female parts at a minimum tolerance (L1-1), the resulting thread engagement is only 3.5 threads. To allow for the five thread engagement currently specified, the female parts have historically been tapped deeper with a minimum limit of L1+0.5. This creates a nominal engagement of 7 threads with a minimum of 5.
The International Standard for Type of Protection "d" (IEC 60079-1) is changing the minimum thread engagement for taper threaded joints from 5 to 3.5 to allow the use of standard NPT gauging practice. Based on flame propagation tests conducted by the British on this construction and the current allowance of a straight-thread conduit coupling with a taper-thread conduit, the relaxation from 5 to 3.5 does not represent a compromise in safety.
In addition, the introduction of various types of cable glands and other fittings with a hex "shoulder" for tightening aggravates the problem. With the male NPT thread on the fitting conforming to the standard ASME gauging and the female equipment entry tapped deeper to ensure five threads of engagement, it is highly likely that the shoulder will contact the surface of the equipment before the NPT threads are "tight" resulting in a "loose" joint likely to propagate an explosion. The Europeans recognized this potential problem several years ago and the "European ATEX Notified Bodies Group ExNB" issue Clarification Sheet ExNB/98/06/010/CS requiring that, for Eurpean Certification, female threaded entries conform to ANSI/ASME B1.20.1 and also meet the five thread engagement. This results in female entries tapped to L1+0.5 / L1+1 instead of the deeper L1+0.5 / L1+3.5. This tight tolerance with a half thread "window" in lieu of a 3 thread "window" makes manufacturing difficult with much scrap produce
The change in NPT thread engagement does not compromise safety and would allow US manufacturers to produce one product for use both here in the US and in the rest of the world.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not demonstrated that relaxation of this requirement will not detract from the integrity of the installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
LAWRENCE: The panel statement ignores the statement by the submitter that "straight thread" couplings have been permitted to be used with "tapered thread" conduit since the 1930's. This already permitted joint results in a thread engagement relaxation far greater than that proposed for "taper-thread" to "taper-thread" joints.

(Log #3477)

14- 77 - (501-4(a)(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Fixed Wiring. In Class I, Division 1 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings ~~approved~~ (identified) for the location shall be the wiring method employed.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2998)

14- 78 - (501-4(a)(1) Exception No. 2): Accept
Note: The Technical Correlating Committee understands that the Proposal reference in the Panel Statement is to Proposal 14-59a.
SUBMITTER: Michael P. Mennone, Rockbestos-Surprenant Cable Corp.
RECOMMENDATION: Revise Section 501-4(a)(1) Exception No. 2 to read as follows:
Exception No. 2: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated ~~aluminum~~ metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.
SUBSTANTIATION: Type MC with a gas/vaportight continuous corrugated sheath is manufactured and listed with various (aluminum, stainless steel, copper) sheath materials. In response to the acceptance of this exception (which was to be added to the 1996 NEC), UL Standard No. 2225 entitled "Metal-Clad Cables and Cable-Sealing Fittings for Use in Hazardous (Classified) Locations" was developed to qualify Type MC cables for this specific use. Cables meeting these additional requirements would then be listed as Type MC-HL. Copper and stainless steel sheathed Type MC cables have the same ability as aluminum to meet the intent of this section and also possess the ability to meet all of the additional requirements stated in UL Standard No. 2225. It is our contention that these additional types of sheathed cables were overlooked in the original proposal. This capability does exist and should be recognized by the code.
PANEL ACTION: Accept.
PANEL STATEMENT: The accepted change is reflected in Proposal 14-318a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1559)

14- 79 - (501-4(b)): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(b) Class I, Division 2. In Class I, Division 2 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, enclosed gasketed busways, enclosed gasketed wireways, or Type PLTC cable in accordance with the provisions of Article 725, or Type ITC cable in cable trays, in raceways, supported by messenger wire, or directly buried where the cable is listed for this use; Type MI, MC, MV, or TC cable with ~~approved~~ (identified) termination fittings shall be the wiring method employed.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete the word "approved".
PANEL STATEMENT: Requirements for ordinary location electrical equipment need not be repeated in Chapter 5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1560)

14- 80 - (501-4(b)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise fourth sentence to read as follows:
Where provision must be made for limited flexibility, as at motor terminals, flexible metal fittings, flexible metal conduit with ~~approved~~ (identified) fittings, liquidtight flexible metal conduit with ~~approved~~ (identified) fittings, liquidtight flexible nonmetallic conduit with ~~approved~~ (identified) fittings, or flexible cord ~~approved~~ (identified) for extra-hard usage and provided with ~~approved~~ (identified) bushed fittings shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-87 is identical and addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2127)

14- 81 - (501-4(b)): Accept in Principle in Part
Note: The Technical Correlating Committee understands that the Proposal reference in the Panel Statement is to Proposal 14-59a.
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete the current exception "~~Exception: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in ordinary locations~~" and replace it with the following positive text:
"Nonincendive field wiring shall be permitted using any of the wiring methods suitable for unclassified locations, including Chapter 7 and Chapter 8 methods, and special instrument cables. At termination boxes and instruments, coaxial and multi-conductor cables may be run as open wiring for up to 6 ft to allow flexibility for limited movement, vibrations, or replacement."
SUBSTANTIATION: In accordance with the NEC Style Manual, since nonincendive field wiring is a defined term, it is not appropriate to consider this an exception. It is a recognized practice and the revised text, provides this fact with revised wording that permits any wiring method to be used for this special type of field wiring.
PANEL ACTION: Accept in Principle in Part.
Add the following to 501-4(b):
"(4) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for nonhazardous locations, including Chapter 7 and 8 wiring methods."
PANEL STATEMENT: This change is reflected in Proposal 14-318a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2295)

14- 82 - (501-4(b)): Reject
SUBMITTER: Gregory J. Steinman, Thomas & Betts Corp.
RECOMMENDATION: Revise the fourth sentence to read as follows:
"Where provision must be made for limited flexibility, or where flexibility is needed for installation, as at motor terminals, flexible metal fittings, flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with approved fittings, or flexible cord approved for extra hard usage and provided with approved bushed fittings shall be used."
SUBSTANTIATION: Mast arm type pole mounted luminaires need a flexible wiring method to pull through the mast arm. If these wiring methods are suitable to be flexible in Class I Division 2 locations, they should be suitable enclosed within a pole. This is an application where flexibility is not needed for the use of the product, only in the installation.
PANEL ACTION: Reject.
PANEL STATEMENT: "Needed" is a reduction in the requirements based on "must" in the referenced sentence. If required for installation, this method is allowed already.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2530)

14- 83 - (501-4(b)): Accept in Principle in Part
Note: The Technical Correlating Committee understands that the Proposal reference in the Panel Statement is to Proposal 14-59a.
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: (b) Class I, Division 2. In Class I, Division 2 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, enclosed gasketed busways, enclosed gasketed wireways, or Type PLTC cable in accordance with the provisions of Article 725, or Type ITC cable in cable trays, in raceways, supported by messenger wire, or directly buried where the cable is listed for this use; Type MI, MC, MV, or TC cable with approved termination fittings shall be the wiring method employed. Type ITC, PLTC, MI, MC, MV, or TC cable shall be permitted to be installed in cable tray systems and shall be installed in a manner to avoid tensile stress at the termination fittings. Boxes, fittings, and joints shall not be required to be explosionproof except as required by Sections 501-3(b)(1), 501-6(b)(1), and 501-14(b)(1). Where provision must be made for limited flexibility, as at motor terminals, flexible metal fittings, flexible metal conduit with approved fittings, liquidtight flexible metal
FPN: See Section 501-16(b) for grounding requirements where flexible conduit is used.
Exception: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in unclassified locations.
Nonincendive field wiring apparatus, associated nonincendive field wiring apparatus, and other equipment shall be installed in accordance with the control drawing(s).
FPN: The control drawing identification is marked on the apparatus.
Exception: A simple apparatus that does not interconnect nonincendive field wiring circuits.
SUBSTANTIATION: 501-4 is modified to require a Control Drawing which details the permitted connections.
PANEL ACTION: Accept in Principle in Part.
Add the following new sentence to 501-4(b): "Nonincendive field wiring systems shall be installed in accordance with the control drawing(s)."
This change is reflected in Proposal 14-318a.
PANEL STATEMENT: The concept of the control drawings has been accepted and editorially revised. The Fine Print Note is not accepted because it includes a requirement and an exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2850)

14- 84 - (501-4(b)): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Separation of Nonincendive Field Wiring Conductors
(a) From Nonincendive Field Wiring Conductors.
(1) Open Wiring. Conductors and cables of nonincendive field wiring circuits not in raceways or cable trays shall be separated at least 1.97 in. (50 mm) and secured from conductors and cables of any other circuits.
(2) In Raceways, Cable Trays, and Cables. Conductors of nonincendive field wiring circuits shall not be placed in any raceway, cable tray, or cable with conductors of any other circuit.
Exception No. 1: Where conductors of nonincendive field wiring circuits are separated from conductors of incendive field wiring circuits by a distance of at least 1.97 in. (50 mm) and secured, or by a grounded metal partition or an approved insulating partition.
FPN: No. 20 gauge sheet metal partitions 0.0359 in. (912 µm) or thicker are generally considered acceptable.
Exception No. 2: Where either (1) all of the nonincendive field wiring circuit conductors or (2) all of the incendive field wiring circuit conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.
FPN: Cables meeting the requirements of Articles 330 and 334 are typical of those considered acceptable.
(3) Within Enclosures.
a. Conductors of nonincendive field wiring circuits shall be separated at least 1.97 in. (50 mm) from conductors of any incendive field wiring circuits, or as specified in Section 501-4(b)(a)(2).
b. All conductors shall be secured so that any conductor that might come loose from a terminal cannot come in contact with another terminal.
FPN No. 1: The use of separate wiring compartments for the nonincendive field wiring and incendive field wiring terminals is the preferred method of complying with this requirement.
FPN No. 2: Physical barriers such as grounded metal partitions or approved insulating partitions or approved restricted access wiring ducts separated from other such ducts by at least ≤ in. (19 mm) can be used to help ensure the required separation of the wiring.
(b) From Different Nonincendive Field Wiring Circuit Conductors. Different nonincendive field wiring circuits shall be in separate cables or shall be separated from each other by one of the following means.
1. The conductors of each circuit are within a grounded metal shield.
2. The conductors of each circuit have insulation with a minimum thickness of 0.01 in. (254 µm).
Exception: Unless otherwise approved.
SUBSTANTIATION: Apart from the exception in 501-4(b) the current version of the Code does not give any guidance on wiring for nonincendive field wiring circuits. An examination of nonincendive field wiring takes into consideration the faults of opening, shorting, and grounding of the field wiring. When applied to multiple conductor applications such as programmable logic controllers [PLCs] this type of approach can lead to output parameters for the devices which render them unusable. The current version of the Code requires the examination to include situations which, cannot be determined by the manufacturer of the equipment or an NRTL. The installer could determine these parameters but how many would actually consider these in the case where multiple nonincendive circuits are run in a single cable. The situation is similar to that for intrinsically safe wiring, and the proposed text is based on that in Article 504-30.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel believes that there is no technical justification given for separatiion of conductors above what is required in nonhazardous locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2934)

14- 85 - (501-4(b)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: In the first paragraph, after the words "steel intermediate conduit", add "rigid nonmetallic conduit with an equipment grounding conduction".
SUBSTANTIATION: Addition of rigid nonmetallic conduit to Class I, Division 2 wiring methods.
This proposal provides the option of using a conduit system that is corrosion resistant and safe for Class I, Division 2 locations. Chemical plants, refineries, off shore drilling facilities, and other similar processes are highly corrosive and also have classified areas. Nonmetallic conduit provides a critical option in these locations. The NEC requirements for rigid nonmetallic conduit are found in Article 347. Rigid nonmetallic conduit is also listed in the UL Information Directory, which describes the types of rigid nonmetallic conduit, and also in UL Standard 1684.
Rigid nonmetallic conduit is permitted in Class III, Division I locations as a buried raceway in Class I locations in Commercial Garages, Article 511; in Bulk Storage Plants, Articles 515; and in Class I, Division I locations when enclosed in concrete.
This proposal also requires an equipment grounding conduction in these locations. Rigid nonmetallic conduit is not permitted where subject to physical damage unless identified for such use.
PANEL ACTION: Reject.
PANEL STATEMENT: There is insufficient technical information presented to accept this proposal. There are concerns about mechanical strength and the proposal is not specific enough about the product that is desired to be used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3478)

14- 86 - (501-4(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(b) Class I, Division 2. In Class I, Division 2 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, enclosed gasketed busways, enclosed gasketed wireways, or Type PLTC cable in accordance with the provisions of Articles 725, or Type ITC cable in cable trays, in raceways, supported by messenger wire, or directly buried where the cable is listed for this use: Type MI. MC, MV, or TC cable with ~~approved~~ (identified) termination fittings shall be the wiring method employed.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Delete the word "approved".
PANEL STATEMENT: Requirements for ordinary location electrical equipment need not be repeated in Chapter 5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3479)

14- 87 - (501-4(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the fourth sentence to read as follows:
"Where provision must be made for limited flexibility, as at motor terminals, flexible metal fittings, flexible metal conduit with ~~approved~~ (identified) fittings, liquidtight flexible metal conduit with ~~approved~~ (identified) fittings, liquidtight flexible nonmetallic conduit with ~~approved~~ (identified) fittings, or flexible cord ~~approved~~ (identified) for extra-hard usage and provided with ~~approved~~ (identified) bushed fittings shall be used."

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change the word "approved" to "listed" in all cases.
PANEL STATEMENT: Listed equipment is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #4236)

14- 88 - (501-4(b), Exception): Accept in Principle
Note: The Technical Correlating Committee understands that the Proposal reference in the Panel Statement is to Proposal 14-59a.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise by deleting the word "ordinary" and replacing it with the word "unclassified."
SUBSTANTIATION: This is the technically correct term. This was proposal 14-113 in the prior cycle, one of four proposals that the panel accepted in the ROP, forgot about, and inadvertently wiped out through unrelated editorial activity in the comment period.
PANEL ACTION: Accept in Principle.
See Proposal 14-318a.
PANEL STATEMENT: Proposal 14-318a addresses this issue. The word "nonhazardous" has been established by definition in Proposal 14-2a and meets the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: The panel action should be "Accept". See my comments on Proposal 14-2a.
GOODMAN: This proposal should be "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification. The correct term is "unclassified". Also see detailed comment under Proposal 14-2a. Note that the reference used in the Panel Action and Panel Statement of Proposal 14-318a applies to the Article 505 rewrite and does not apply to this proposal or action.

(Log #1561)

14- 89 - (501-5): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second sentence to read as follows:
Sealing compound shall be of a type ~~approved~~ (identified) for the conditions and use.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Delete the second sentence in 501-5.
PANEL STATEMENT: The Panel believes its action on Proposal 14-104 meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3032)

14- 90 - (501-5): Accept in Principle
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Revise the second line to read as follows:
Sealing compound shall be of a type tested and approved for the conditions and use on specific brand of fittings as integral installation.
SUBSTANTIATION: Sealing compound is tested on specific brand fittings and is approved only for that brand of fittings. A mix match of seal fittings and sealing compound of various brands is a common problem of installation practice. This revision is required for avoiding faulty installations.
PANEL ACTION: Accept in Principle.
See Proposal 14-89.
PANEL STATEMENT: Proposal 14-89 addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3480)

14- 91 - (501-5): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"Sealing compound shall be of a type ~~approved~~ (identified) for the conditions and use."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-89 addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3481)

14- 92 - (501-5(a)(1), Exception (c)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise Exception (c) to read as follows:
(c) Enclosed within a factory-sealed explosionproof chamber located within the enclosure, ~~approved~~ (identified) for the location, and marked "factory sealed" or equivalent.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1969)

14- 93 - (501-5(a)(1), Exception (c)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
(c) Enclosed within a factory-sealed explosion-proof chamber located within the enclosure, ~~approved~~ (identified) for the location, and marked "factory sealed" or equivalent.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #4237)

14- 94 - (501-5(a)(1), Exception (d)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Add a part (d) as a fourth option under the Exception, as follows:
d. In nonincendive circuits.
SUBSTANTIATION: The operational language of the parent language under exception specifically mentions ignition sources in "normal" operation. A nonincendive circuit is presumed to not be ignition capable under normal operating conditions. Therefore, this proposal doesn't increase the risk of ignition, and it increases the flexibility of the wiring system design. Although this substantiation is my own, the proposal was Proposal 14-121 in the prior cycle. It is one of four proposals that the panel accepted in the ROP, forgot about, and inadvertently wiped out through unrelated editorial activity in the comment period.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1562)

14- 95 - (501-5(a)(4)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise third sentence to read as follows:
Except for ~~approved~~ (identified) explosionproof reducers at the conduit seal; there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 1 location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed reducers are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3482)

14- 96 - (501-5(a)(4)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text of sentence three to read as follows:
"Except for ~~approved~~ (identified) explosionproof reducers at the conduit seal, there shall be no union, coupling, box or fitting between the conduit seal and the point at which the conduit leaves the Division 1 location."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed reducers are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3307)

14- 97 - (501-5(a)(4) Exception No. 2): Reject
SUBMITTER: Shawn K. Williams, B.H.M.G. Consulting Engineers
RECOMMENDATION: Add a new exception to read as follows:
Exception No. 2: Where a submerged pump is installed in a sewage wet well that has been classified as a Class I Division 1 location and has flexible cords for connection to a supply or control circuit as allowed in 501-11, a junction box with terminals listed for Class I locations may be installed between the boundary of the classified location and the seal fitting required by 501-5(a)(4) to facilitate easy removal of the pump cable.
SUBSTANTIATION: The code as it is written now requires that the pump cable be installed in a seal fitting. If the pump needs to be removed for maintenance the seal fitting must be destroyed, possibly damaging the cable, in order to remove the pump cable. An explosionproof junction box will allow for easy removal of the cable and provide a safe installation in case gases build up and arcing occurs in the junction box.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not permitted to have a box between the boundary and a seal fitting. This situation may be already covered by 501-11. The submitter's intent is not clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #4238)

14- 98 - (501-5(a)(4) Exception No. 2): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Identify the existing exception as Exception No. 1 and add a second exception as follows:
Exception No. 2: For underground conduit installed in accordance with Section 300-5 where the boundary is beneath the ground, the sealing fitting shall be permitted to be installed after the conduit leaves the ground, but there shall be no union, coupling, box, or fitting, other than approved explosionproof reducers at the sealing fitting, in the conduit between the sealing fitting and the point at which the conduit leaves the ground.

SUBSTANTIATION: Section 501-5(c)(1) requires seals to be accessible. Since hazardous locations frequently involve flammable gases and vapors heavier than air, generally area classifications require graded locations below a classified location to retain the same area classification. Some Code rule expressly impose this requirement, such as Section 515-6, which mandates a Division 1 classification for below grade conduits. The only way to literally combine these two rules is to go through the burden of installing a handhole within a conduit length of the transition point. This proposal is a reasonable compromise to address this problem. Its principle is reflected in Sec. 514-8, which has allowed this procedure since the 1987 NEC through the verbal sleight of hand of artificially extending the boundary of the classified location. I am submitting a companion proposal to remove that language from Section 514-8, since it won't be necessary if this general procedure is agreed to. Although this is my own substantiation, the proposal is the final panel action in the ROP on Proposal 14-126 in the previous cycle. It is one of four proposals that the panel accepted in the ROP, forgot about, and in-advertently wiped out through unrelated editorial activity in the comment period.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2133)

14- 99 - (501-5(b) Exception No. 1): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise text to read as follows:
"Metal conduit containing no unions, ~~couplings,~~ boxes or fittings that passes completely through a Class I, Division 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the ~~unbroken~~ conduit are in unclassified locations. Couplings shall be permitted in the conduit run in the Division 2 location."
SUBSTANTIATION: A metal conduit, containing only couplings, completely passing through a Division 2 location and terminating with both ends in an unclassified location should not require sealing. The risk of vapors in ignitable quantities in the atmosphere, migrating into the conduit, which is at the same atmospheric pressure both inside and outside the conduit, through a threaded metal coupling in a Division 2 location is extremely low if not nonexistent.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided sufficient technical justification for reducing the requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
GOODMAN: The current Exception allows a conduit completely passing through a Division 2 location with both ends in an unclassified location to not require seals. The submitter's request to add only couplings into that conduit should be permitted. As indicated in the substantiation, there is, in essence, no risk of the entrance or migration of vapors from the Division 2 location to the unclassified location since there is no differential pressure to "push" into the conduit system any vapors which may be present.

(Log #1563)

14- 100 - (501-5(b)(2)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise fourth sentence to read as follows:
Except for ~~approved~~ (identified) explosionproof reducers at the conduit seal; there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Division 2 location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed reducers are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3483)

14- 101 - (501-5(b)(2)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text of fourth sentence to read as follows:
"Except for ~~approved~~ (identified) explosionproof reducers at the conduit seal, there shall be no union, coupling box, or fitting between the conduit seal and the point at which the conduit leaves the Division 2 location."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed reducers are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1564)

14- 102 - (501-5(c)(1)): Accept in Principle in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) Fittings. Enclosures for connections or equipment shall be provided with an ~~approved~~ (identified) intergral means for sealing or sealing fittings ~~approved~~ (identified) for Class I locations shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle in Part.
Delete the first "approved" and replace the second "approved" with "listed".
PANEL STATEMENT: The first "approved" is redundant. With respect to the second, listed seals are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3484)

14- 103 - (501-5(c)(1)): Accept in Principle in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Fittings. Enclosures for connections or equipment shall be provided with an ~~approved~~ (identified) integral means for sealing, or sealing fittings ~~approved~~ (identified) for Class I locations shall be used. Sealing fittings shall be accessible.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: Proposal 14-102 is identical and addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1565)

14- 104 - (501-5(c)(2)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(2) Compound. Sealing compound shall be ~~approved~~ (identified) and shall provide against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall have not have a melting point of less that 93°C (200°F).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Revise the last sentence of 501-5(c)(1) to read: "Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible."
Revise 501-5(c)(2) to read: "The compound shall provide a seal against passage of gas or vapor through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93 deg C (200 deg F)."
PANEL STATEMENT: The proposed changes provide additional clarification for the requirements for sealing compound.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3485)

14- 105 - (501-5(c)(2)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(2) Compound. Sealing compound shall be ~~approved~~ (identified) and shall provide a seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93°C (200°F).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-104 is identical and addresses the same issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1566)

14- 106 - (501-5(c)(5)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(5) Assemblies. In an assembly where equipment that may produce arc, sparks, or high temperatures is located in a compartment separate from the compartment containing splices or taps, and an integral seal is provided where conductors pass from one compartment to the other, the entire assembly shall be ~~approved~~ (identified) for Class I locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3486)

14- 107 - (501-5(c)(5)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(5) Assemblies. In an assembly where equipment that may produce arcs, sparks, or high temperatures is located in a compartment separate from the compartment containing splices or taps, and an integral seal is provided where conductors pass from one compartment to the other, the entire assembly shall be ~~approved~~ (identified) for Class I locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1567)

14- 108 - (501-5(c)(6)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(6) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically ~~approved~~ (identified) for a higher percentage of fill.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3487)

14- 109 - (501-5(c)(6)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(6) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically ~~approved~~ (identified) for a higher percentage of fill.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1968)

14- 110 - (501-5(d)(1)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the third sentence as follows:
Multiconductor Type MC cables with a gas/vaportight continuous corrugated aluminum sheath and an overall jacket of suitable polymeric material shall be sealed with an ~~approved~~ (identified) fitting after removing the jacket and any other covering so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3489)

14- 111 - (501-5(d)(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the third sentence to read as follows:
"Multiconductor Type MC cables with a gas/vaportight continuous corrugated aluminum sheath and an overall jacket of suitable polymeric material shall be sealed with an ~~approved~~ (identified) fitting after removing the jacket and any other covering so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1967)

14- 112 - (501-5(d)(1), Exception): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an ~~approved~~ (identified) means to minimize the entrance of gases and vapors and prevent propagation of flame into the cable core.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3488)

14- 113 - (501-5(d)(1), Exception): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception. Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an ~~approved~~ (identified) means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1975)

14- 114 - (501-5(d)(2), Exception): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an ~~approved~~ (identified) means to minimize the entrance of gases and vapors and prevent propagation of flame into the cable core, or by other ~~approved~~ (identified) methods.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3490)

14- 115 - (501-5(d)(2), Exception): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception. Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an ~~approved~~ (identified) means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other ~~approved~~ (identified) methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1568)

14- 116 - (501-5(e)(1)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) Cables entering enclosures that are required to be ~~approved~~ (identified) for Class I locations shall be sealed at the point of entrance.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Replace "approved for Class I locations" with the word "explosionproof".
PANEL STATEMENT: This is consistent with 501(b)(1).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1569)

14- 117 - (501-5(e)(1)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise paragraph one, sentence three to read as follows:
Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in an ~~approved~~ (identified) fitting in the Division 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3491)

14- 118 - (501-5(e)(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Cables entering enclosures that are required to be ~~approved~~ (identified) for Class I locations shall be sealed at the point of entrance.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: This is identical to Proposal 14-116.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3492)

14- 119 - (501-5(e)(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: In paragraph one, revise the third sentence to read as follows:
"Mulitconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in an ~~approved~~ (identified) fitting in the Division 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases or vapors."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1976)

14- 120 - (501-5(e)(1) Exception No. 2): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielded material or separation of the twisted pairs provided the termination is by an ~~approved~~ (identified) means to minimize the entrance of gases and vapors and prevent propagation of flame into the cable core.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3493)

14- 121 - (501-5(e)(1) Exception No. 2): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise Exception No. 2 to read as follows:
Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation or the twisted pairs provided the termination is by an ~~approved~~ (identified) means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1570)

14- 122 - (501-5(f)(1)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, ~~approved~~ (identified) means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1985)

14- 123 - (501-5(f)(1), (2), and (3)): Reject
SUBMITTER: John H. Rannells, JHR Consulting
RECOMMENDATION: Revise text to read as follows:
501-5. Sealing and Drainage.
(f) Drainage.
(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may enter and be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.
FPN No. 1: Electrical Submersible Pump (ESP) produced oil well operate at high pressures and may also experience seal leakage and the attendant problems.
FPN No. 2: Other codes or standards may require special handling of the above "trapped liquid or condensed vapor".
FPN No. 3: In addition to "liquid or other condensed vapor" poisonous gases such as hydrogen sulfide (H2S) may also be present and "may enter, and be trapped within, enclosures" and parts of the raceway systems.
(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of the liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.
(3) Canned Pumps, Process or Service Connections, etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical conduit, raceway or cable system capable of transmitting fluids, an additional listed seal system, seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the conduit, raceway or cable system capable of transmitting fluids beyond the additional systems, devices or means, if the primary seal fails.
The additional approved seal system, seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above. Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.
FPN: See also the fine print notes to Section 501-5.
SUBSTANTIATION: Problem: The problem is that materials not listed for high pressure are installed in systems where they may encounter high-pressure fluids. NEC Article 501-5(f), (1), (2), and (3) works perfectly when the process system is not under high pressure. But, because it requires material not listed for pressure [Rigid Metal Conduit (RMC), Electrical Metallic Tubing (EMT), Drains or Vents, and Poured Conduit Seals], it is possible that "flammable or combustible fluids" may enter "arcing electrical devices" in processes operating at high pressure such as Electrical Submersible Pump (ESP) "produced" oil wells ("5000 psi).
- RMC may be derived from ASTM A-53, but is not listed for pressure, and is therefore not suitable for pressure service.
- EMT, with a wall thickness less than RMC of the same external diameter, is not listed for pressure and is therefore not suitable for pressure service.
- Poured Conduit Seals are not listed for pressures beyond those in 501-5, (e), (2) and are therefore not suitable for use in situations where they are required to prevent the passage of gases at pressures greatly in excess of 6 in. of water (1493 pascals).
- Conduit Drains, Vents, and Fittings are not listed for pressure and are therefore not suitable for pressure service.
Solution: The use of a listed system (Primary Seal, Drain/Vent, and Secondary Seal) for high process pressure ("5000 psi) applications will eliminate release of flammable or combustible fluids that may occur when conduit, fittings, drains or vents, and seals, not listed for high pressures, are used...and fail. High pressure capable, NRTL listed systems, are available and in use in the United States today.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation addresses a pressure rating problem which does not exist in the code. Section 501-5(f)(3) requires that seals and barriers meet the pressure requirements to which they might be subjected. There is no substantiation given for the fine print notes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3335)

14- 124 - (501-5(f)(1)): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Revise the title as follows:
(1) Control Equipment and Raceway System.
SUBSTANTIATION: Editorial revision. Drainage of raceway is a major item in wiring system and it should be highlited.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not believe there is a need to revise the title.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3494)

14- 125 - (501-5(f)(1)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, ~~approved~~ (identified) means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1571)

14- 126 - (501-5(f)(3)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) Canned Pumps, Process or Service Connections, etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical raceway or cable system capable or transmitting fluids, an additional ~~approved~~ (identified) seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the raceway or cable system capable of transmitting fluids beyond the additional devices or means, if the primary falls.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1572)

14- 127 - (501-5(f)(3)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise paragraph two to read as follows:
The additional ~~approved~~ (identified) seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other ~~approved~~ (identified) means are provided to accomplish the purpose above.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3495)

14- 128 - (501-5(f)(3)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(3) Canned Pumps, Process or Service Connections, etc. for canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical raceway or cable system capable of transmitting fluids, an additional ~~approved~~ (identified) seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the raceway or cable system capable of transmitting fluids beyond the additional devices or means, if the primary seal fails.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3496)

14- 129 - (501-5(f)(3)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"The additional ~~approved~~ (identified) seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other ~~approved~~ (identified) means are provided to accomplish the purpose above."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1573)

14- 130 - (501-6(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Class I, Division 1. In Class I, Division 1 locations, switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices, shall be provided with enclosures, and the enclosure in each case, together with the enclosed apparatus, shall be ~~approved~~ (identified) as a complete assembly for use in Class I locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3497)

14- 131 - (501-6(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class I, Division 1. In Class I, Division 1 locations, switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices, shall be provided with enclosures, and the enclosure in each case, together with the enclosed apparatus, shall be (1) Type Required. Circuit breakers, motor controllers, and switches intended to interrupt current in the normal performance of the function for which they are installed shall be provide with enclosures ~~approved~~ (identified) for Class I, Division 1 locations in accordance with Section 501-3(a), unless general-purpose enclosures are provided and as a complete assembly for use in Class I locations.

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1574)

14- 132 - (501-6(b)(1)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
"(1) Type Required. Circuit breakers, motor controllers, and switches intended to interrupt current in the normal performance of the function for which they are installed shall be provided with enclosures ~~approved~~ (identified) for Class 1, Division 1 locations in accordance with Section 501-3(a), unless general-purpose enclosures are provided and...".
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3498)

14- 133 - (501-6(b)(1)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Type Required. Circuit breakers, motor controllers, and switches intended to interrupt current in the normal performance of the function for which they are installed shall be provide with enclosures (1) Type Required. Circuit breakers, motor controllers, and switches intended to interrupt current in the normal performance of the function for which they are installed shall be provide with enclosures ~~approved~~ (identified) for Class I, Division 1 locations in accordance with Section 501-3(a), unless general-purpose enclosures are provided and for Class I, Division 1 locations in accordance with Section 501-3(a), unless general-purpose enclosures are provided and
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1575)

14- 134 - (501-6(b)(1)c): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(c) The interruption of current occurs within a factory-sealed explosionproof chamber ~~approved~~ (identified) for the location, or....
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Delete "approved for the location".
PANEL STATEMENT: Explosionproof equipment is suitable for the location by nature of its definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3499)

14- 135 - (501-6(b)(1)(c)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(c) The interruption of current occurs within a factory-sealed explosionproof chamber ~~approved~~ (identified) for the location, or.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-134 is identical and addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1576)

14- 136 - (501-6(b)(3)): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) Fuses. For the protection of motors, appliances, and lamps, other than as provided in (b)(4), standard plug or cartridge fuses shall be permitted, provided they are placed within enclosures ~~approved~~ (identified) for the location, or fuses shall be permitted

if they are within general-purpose enclosures, and if they are of a type in which the operating element is immersed in oil or other ~~approved~~ (identified)liquid, or the operating element is enclosed within a chamber hermetically sealed against the entrance of gases, vapors, or the fuse is a nonindicating, filled, current-limiting type.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Change only first "approved" with "identified".
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a. Also, a "liquid" cannot be listed or identified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
COOK: I will agree that the liquid used to immerse the element of a fuse will not be listed, however I would assume that the fuse manufacturer would identify some specific liquid to be used for that purpose. I would also assume that all liquids would not be acceptable and that an authority having jurisdiction should not be the person determining which liquid is acceptable. I would like to have input from the fuse manufacturers on this issue before determining if "approved" is the correct term.
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3500)

14- 137 - (501-6(b)(3)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read:
(3) Fuses. For the protection of motors, appliances, and lamps, other than as provided in (b)(4), standard plug or cartridge fuses shall be permitted, provided they are placed within enclosures ~~approved~~ (identified) for the location; or
fuses shall be permitted if they are within general-purpose enclosures, and if they are of a type in which the operating element is immersed in oil or other ~~approved~~ (identified) liquid, or the operating element is enclosed within a chamber hermitically sealed against the entrance of gases and vapors, or the fuse is a nonindicating, filled, current-limiting type.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
See Proposal 14-136
PANEL STATEMENT: Proposal 14-136 is identical and addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
COOK: See my Comment on Affirmative on Proposal 14-136.

(Log #1577)

14- 138 - (501-6(b)(4)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(4) Fuses Internal to Lighting Fixtures. ~~Approved~~ (identified) cartridge fuses shall be permitted as supplementary protection within lighting fixtures.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word to use here.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with the Panel Action and Statement. Fuses that are used for supplementary protection are not an item that an authority having jurisdiction could "approve" (acceptable to the authority having jurisdiction) without some listing or identification. I realize that the listing or identification would not be for hazardous locations, the proposal does not propose fuses identified for hazardous locations, however test lab directories include many listings for ordinary location fuses that are acceptable. I can not imagine any authority having jurisdiction or owner at a hazardous location facility that would want a fuse that did not meet the ordinary location requirements. Listed fuses are readily available.
JAGUNICH: The deletion of the word "approved" should be accepted but no word should be substituted for it. CMP14 has repeatedly stated that means or methods must be approved, but has removed the word "approved" for all other purposes within the articles for which the panel is responsible. Code enforcement officials rarely have at their disposal the tools for approving supplementary protection within lighting fixtures.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3501)

14- 139 - (501-6(b)(4)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(4) Fuses Internal to Lighting Fixtures. ~~Approved~~ (Identified) cartridge fuses shall be permitted as supplementary protection within lighting fixtures.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word to use here.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative on Proposal 14-138.
JAGUNICH: See my Explanation of Negative on Proposal 14-138 (Log #1577).
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1578)

14- 140 - (501-7(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Class I, Division 1. In Class I, Division 1 locations, transformers, impedance coils, and resistors, together with any switching mechanism associated with them, shall be provided with enclosures ~~approved~~ (identified) for Class I, Division 1 locations in accordance with Section 501-3(a).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires

that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13. _____

(Log #3502)

14- 141 - (501-7(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class I, Division 1. In Class I, Division 1 locations, transformers, impedance coils, and resistors, together with any switching mechanism associated with them, shall be provided with enclosures ~~approved~~ (identified) for Class I, Division 1 locations in accordance with Section 501-3(a).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

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(Log #1579)

14- 142 - (501-7(b)(3)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) Resistors. Resistors shall be provided with enclosures; and the assembly shall be ~~approved~~ (identified)for Class I locations, unless resistance is nonvariable and maximum operating temperature, in degrees Celsius, will not exceed 80 percent of the ignition temperature of the gas or vapor involved, or has been tested and found incapable of igniting the gas or vapor.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

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(Log #3503)

14- 143 - (501-7(b)(3)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(3) Resistors. Resistors shall be provided with enclosures; and the assembly shall be ~~approved~~ (identified) for Class I locations, unless resistance is nonvariable and maximum operating temperature, in degrees Celsius, will not exceed 80 percent of the ignition temperature of the gas or vapor involved, or has been tested and found incapable of igniting the gas or vapor.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

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(Log #1963)

14- 144 - (501-8(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the second paragraph, third sentence as follows:
Auxilliary equipment shall be of a type ~~approved~~ (identified) for the location in which it is installed.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

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(Log #3505)

14- 145 - (501-8(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: In the second paragraph, revise the third sentence to read as follows:
"Auxiliary equipment shall be of a type ~~approved~~ (identified) for the location in which it is installed."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1580)

14- 146 - (501-8(a)(1)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) ~~Approved~~ (identified) for Class I, Division 1 locations; or....
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3504)

14- 147 - (501-8(a)(1)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) ~~Approved~~ (Identified) for Class I, Division 1 locations; or.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3306)

14- 148 - (501-8(a)(4)): Reject
SUBMITTER: Shawn K. Williams, B.H.M.G. Consulting Engineers
RECOMMENDATION: Revise as follows:
Of a type designed to be submerged in a liquid ~~that is flammable only when vaporized and mixed with air,~~ or in a gas or vapor at a pressure greater than atmospheric.
SUBSTANTIATION: This portion of the code is not logical. Why allow a pump to be nonexplosion proof if submerged in a flammable liquid but require a pump that is submerged in a nonflammable liquid such as water to be explosionproof. The same deenergizing requirements listed later in the paragraph will work for both applications.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not support the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1581)

14- 149 - (501-8(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(b) Class I, Division 2. In Class I, Division 2 locations, motors, generators, and other rotating electric machinery in which are employed sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading and overtemperature devices), or integral resistance devices, either while starting or while running, shall be ~~approved~~ (identified) for Class I, Division 1 locations, unless such sliding contacts, switching mechanisms, and resistance devices are provided with enclosures ~~approved~~ (identified) for Class I, Division 2 locations in accordance with Section 501-3(b).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1582)

14- 150 - (501-8(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first paragraph, third sentence to read as follows:
Otherwise, space heaters shall be ~~approved~~ (identified) for Class I, Division 2 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3506)

14- 151 - (501-8(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(b) Class I, Division 2. In Class I, Division 2 locations, motors, generators, and other rotating electric machinery in which are employed sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature devices), or integral resistance devices, either while starting or while running, shall be ~~approved~~ (identified) for Class I, Division 1 locations, unless such sliding contacts, switching mechanisms, and resistance devices are provided with enclosures ~~approved~~ (identified) for Class I, Division 2 locations in accordance with Section 501-3(b).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3507)

14- 152 - (501-8(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: In the first paragraph, revise the third sentence to read as follows:
"Otherwise, space heaters shall be ~~approved~~ (identified) for Class I, Division 2 locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1583)

14- 153 - (501-9(a)(1)): Accept
Note: It was the action of the Technical Correlating Committee that the Panel give consideration to also revising the title of 501-9(a)(1) to correlate with the Panel's actions on Proposals 14-237 and 14-238. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) Approved Fixtures. Each fixture shall be ~~approved~~ (identified) as a complete assembly for the Class I, Division 1 location and shall be clearly marked to indicate the maximum wattage of lamps for which it is ~~approved~~ (identified). Fixtures intended for portable use shall be specifically ~~approved~~ (identified) as a complete assembly for that use.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3508)

14- 154 - (501-9(a)(1)): Accept
Note: It was the action of the Technical Correlating Committee that the Panel give consideration to also revising the title of 501-9(a)(1) to correlate with the Panel's actions on Proposals 14-237 and 14-238. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Approved Fixtures. Each fixture shall be ~~approved~~ (identified) as a complete assembly for the Class I, Division 1 location and shall be clearly marked to indicate the maximum wattage of lamps for which it is ~~approved~~ (identified). Fixtures intended for portable use shall be specifically ~~approved~~ (identified) as a complete assembly for that use.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1584)

14- 155 - (501-9(a)(3)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second sentence to read as follows:
For stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or flexible connector ~~approved~~ (identified) for the Class I, Division 1 location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3509)

14- 156 - (501-9(a)(3)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"For stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or flexible connector ~~approved~~ (identified) for the Class I, Division 1 location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1585)

14- 157 - (501-9(a)(4)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be ~~approved~~ (identified) for Class I locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3510)

14- 158 - (501-9(a)(4)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be ~~approved~~ (identified) for Class I locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3804)

14- 159 - (501-9(b)(2)): Reject
SUBMITTER: Hector R. de Vega, Fluor Daniel, Inc.
RECOMMENDATION: Revise text to read as follows:
(2) Fixed Lighting. Lighting fixtures for fixed lighting shall be protected from physical damage by suitable guards or by location. Where there is danger that falling sparks or hot metal from lamps or fixtures might ignite localized concentrations of flammable vapors or gases, suitable enclosures or other effective means shall be provided. Where lamps are of a size or type that may, under normal operating conditions, reach surface temperatures exceeding 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved, fixtures shall comply with (a)(1) above or shall be of a type that has been tested in order to determine the marked operating temperature or temperature range not to exceed 100 percent of the ignition temperature in degrees Celsius of the gas or vapor involved.
SUBSTANTIATION: The original text allowed a fixture to be used in a Class I, Division 2 area without regard to the maximum surface temperature of the fixture, provided it was "tested and marked". This proposal would limit the use of "tested and marked" fixtures to those that do not exceed 100 percent of the ignition temperature of the surrounding atmosphere.
PANEL ACTION: Reject.
PANEL STATEMENT: The concern of the submitter is already covered by 500-5(e) of the existing code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #4414)

14- 160 - (501-9(b)(2)): Reject
SUBMITTER: Stephen V. Norako, Cooper Crouse-Hinds Div.
RECOMMENDATION: Revise text to read as follows:
"~~Where lamps are of a size or type that may, under normal operating conditions, reach surface temperatures exceeding 80 percent of the ignition temperatures in degrees Celsius of the gas or vapor involved,~~ fixtures shall with (a)(1) or shall be of a type that has been tested in order to determine the marked operating temperature or temperature range."
SUBSTANTIATION: Lamp temperatures today are seldom if ever published by the lamp manufacturers. When temperatures are available, they are established in open air at favorable ambient (25°C). These temperature values in no way compare to the temperatures reached inside enclosed thick walled glass light fixtures at the high ambiance, 40°C or higher, typical of industrial establishments. Therefore this 80 percent rule has no basis and should be deleted.
PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation does not demonstrate the possibility that lamp temperatures will reach or exceed autoignition temperatures.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with the Panel Action and agree with the submitter's proposal and substantiation. It is also an unenforceable requirement.

(Log #1586)

14- 161 - (501-9(b)(3)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, or by other ~~approved~~ (identified) means.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1587)

14- 162 - (501-9(b)(3)): Accept
Note: The Technical Correlating Committee understands that the Proposal revises the second sentence of the section.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an ~~approved~~ (identified) fitting or flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3511)

14- 163 - (501-9(b)(3)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(3) Pendant Fixtures. Pendant Fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, or by other ~~approved~~ (identified) means.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3512)

14- 164 - (501-9(b)(3)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an ~~approved~~ (identified) fitting or flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1962)

14- 165 - (501-9(b)(5), Exception): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception: A thermal protector potted into a thermally protected fluorescent lamp ballast if the lighting fixture is ~~approved~~ (identified) for locations of this class and division.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

Log #3513)

14- 166 - (501-9(b)(5), Exception): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception: A thermal protector potted into a thermally protected fluorescent lamp ballast if the lighting fixture is ~~approved~~ (identified) for locations of this class and division.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1588)

14- 167 - (501-10(a)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Class I, Division 2. In Class I, Division 2 locations, all utilization equipment shall be ~~approved~~ (identified) for Class I, Division 1 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: The wording of the recommended text was incorrectly copied from 501-10(a). The intent is covered by Proposal 14-168.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3514)

14- 168 - (501-10(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class I, Division 1. In Class I, Division 1 locations, all utilization equipment shall be ~~approved~~ (identified) for Class I, Division 1 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1589)

14- 169 - (501-10(b)(1)b): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(b) The heater shall be ~~approved~~ (identified) for Class I, Division 1 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3515)

14- 170 - (501-10(b)(1)b): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(b) The heater shall be ~~approved~~ (identified) for Class I, Division 1 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1961)

14- 171 - (501-10(b)(1)b, Exception): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception: Electrical resistance heat tracing ~~approved~~ (identified) for Class I, Division 2 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based

on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3516)

14- 172 - (501-10(b)(1)b, Exception): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception: Electrical resistance heat tracing ~~approved~~ (identified) for Class I, Division 2 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3987)

14- 173 - (501-11): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-318a. The Technical Correlating Committee understands that there is no change to 501-11. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
~~501-11.~~ 505-17. Flexible Cords, Class I, ~~Divisions~~ Zones 1 and 2. A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section ~~501-4(a)~~ 505-15(b) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:
1. Of a type approved for extra-hard usage;
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;
3. Connected to terminals or to supply conductors in an approved manner;
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension no the terminal connections; and
5. Be provided with suitable seals where the flexible cord enters boxes, fittings, or enclosures that are required to be explosionproof or flameproof.
Exception: As provided in ~~Sections 501-3(b)(6) and 501-4(b),~~ 505-15(c).
Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted.
Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.
FPN: See Section ~~501-13~~ 505-18 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation.
SUBSTANTIATION: This proposal is the work of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose of the proposal is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.
PANEL ACTION: Accept in Principle.
Add the following as new 505-17:
"505-17. Flexible Cords, Class I, Zones 1 and 2. A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section 505-15(b) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:
1. Of a type listed for extra-hard usage;
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;
3. Connected to terminals or to supply conductors in an approved manner;
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension no the terminal connections; and
5. Be provided with listed seals where the flexible cord enters boxes, fittings, or enclosures that are required to be explosionproof or flameproof .
Exception: As provided in Sections 505-15(c)(2).
Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted.
Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.
FPN: See Section 505-18 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation."
PANEL STATEMENT: The panel has changed the words "approved" and "suitable" to "listed" in accordance with present requirements in Article 505. Cross-references have also been corrected where necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1590)

14- 174 - (501-11(1)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) Of a type ~~approved~~ (identified) for extra-hard usage.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.

Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #4483)

14- 175 - (501-11(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"(1) Of a type ~~approved~~ (identified) for extra-hard usage;"
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1591)

14- 176 - (501-11(3)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) Connected to terminals or to supply conductors in ~~approved~~ (identified) manner.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #4484)

14- 177 - (501-11(3)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(3) Connected to terminals or to supply conductors in an ~~approved~~ (identified) manner:
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1592)

14- 178 - (501-12): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
501-12. Receptacles and Attachment Plugs, Class I, Divisions 1 and 2. Receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of a flexible cord and shall be ~~approved~~ (identified) for the location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #4485)

14- 179 - (501-12): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
501-12. Receptacles and Attachment Plugs, Class I, Divisions 1 and 2. Receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of a flexible cord and shall be ~~approved~~ (identified) for the location.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1593)

14- 180 - (501-13): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
501-13. Conductor Insulation, Class I, Divisions 1 and 2. Where condensed vapors or liquids may collect on, or come in contact

with, the insulation on conductors, such insulation shall be of a type ~~approved~~ (identified) for use under such conditions; or the insulation shall be protected by a sheath of lead or by other ~~approved~~ (identified) means.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: To accept this proposal would cause a conflict with the action taken on Proposal 14-181.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with the Panel Action. I have no idea how an authority having jurisdiction could "approve" conductor insulation for use in chemical atmospheres. We do not expect the authority having jurisdiction to determine suitability of insulation, for use in wet locations without the insulation being identified with a "W", but expect the same authority having jurisdiction to determine if the insulation is suitable to be used in chemical atmospheres. After reviewing the test criteria for gasoline and oil resistance ratings, I am certain that I am not qualified to make those approvals in the field without some way to identify that the insulation is suitable.

(Log #3989)

14- 181 - (501-13): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-318a. The Technical Correlating Committee understands that there is no change to 501-13. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
~~501-13.~~ 505-18. Conductor Insulation, Class I, ~~Divisions~~ Zones 1 and 2. Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type approved for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means.
SUBSTANTIATION: This proposal is the work of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose of the proposal is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.
PANEL ACTION: Accept in Principle.
Add a new 505-18 to read: "Conductors and Conductor Insulation.
(1) For Type of Protection 'e', field wiring conductors shall be copper.
(2) Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type approved for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means."
PANEL STATEMENT: This text is placed in the correct location as originally intended and redundant references have been deleted. The similar requirement in 501-13 will remain.
The requirement in (1) is taken from Section 4.1 of ISA S12.16.01-1998 (IEC 79-7 Mod) titled Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection – Increased Safety "e". See Proposal 14-365 for additional information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
COOK: I agree with the Panel Action with a comment to see Proposal 14-180 for use of the term "approved".
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #4486)

14- 182 - (501-13): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
501-13. Conductor Insulation, Class I, Divisions 1 and 2. Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type ~~approved~~ (identified) for use under such conditions; or the insulation shall be protected by a sheath of lead or by other ~~approved~~ (identified) means.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: To accept this proposal would cause a conflict with the action taken on Proposal 14-181.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative on Proposal 14-180.

(Log #920)

14- 183 - (501-13(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Power Supply. Power supply to contact conductors shall be ungrounded and electrically isolated from all other systems and... (remainder unchanged).
SUBSTANTIATION: Editorial. Article 100 definition of isolated does not seem appropriate. Proposal clearly states what appears to be the intent. There is no specific requirement for an ungrounded power supply in this section; one has to refer to Section 250-22 for specificity as to what is intended.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no 501-13(a) to revise.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1594)

14- 184 - (501-14(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Class I, Division 1. In Class I, Division 1 locations, all apparatus and equipment of signaling, alarm, remote-control, and communications systems, regardless of voltage, shall be ~~approved~~ (identified) for Class I, Division Ilocations, and all wiring shall comply with Sections 501-4(a) and 501-5(a) and (c).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3517)

14- 185 - (501-14(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class I, Division 1. In Class I, Division 1 locations, all apparatus and equipment of signaling, alarm, remote-control, and communications systems, regardless of voltage, shall be ~~approved~~ (identified) for Class I, Division 1 locations, and all wiring shall comply with Sections 501-4(a) and 501-5(a) and (c).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1595)

14- 186 - (501-14(b)(1)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures ~~approved~~ (identified)for Class I, Division 1 locations in accordance with Section 501-3(a).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3518)

14- 187 - (501-14(b)(1)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Contacts. Switches, circuit breakers, and make-and-break contacts of pushbuttons, relays, alarm bells, and horns shall have enclosures ~~approved~~ (identified) for Class I, Division 1 locations in accordance with Section 501-3(a).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3985)

14- 188 - (501-15): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-318a. The Technical Correlating Committee understands that there is no change to 501-15. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
~~501-15.~~ 505-19. Live Parts, Class I, ~~Divisions~~ Zones 1 and 2. There shall be no exposed live parts.
SUBSTANTIATION: This proposal is the work of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose of the proposal is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.
PANEL ACTION: Accept in Principle.
Revise to read as follows: "505-19 Live Parts. There shall be no exposed live parts."
PANEL STATEMENT: This makes Article 505 consistent with Article 501.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #589)

14- 189 - (501-16, 502-16): Reject
SUBMITTER: Ted Abner, Pinckney, MI
RECOMMENDATION: I propose the below listed sections make reference back to other like sections where possible due to the fact the only difference between them is their classifications.
Section 501-16
Grounding, Class I, Division 1 and 2. Wiring and equipment in Class I and II Division 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements:
(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended upon for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I or II locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Section 502-16.
Grounding, Class II, Division 1 and 2. Shall comply with Section 501-16. ~~Wiring and equipment in Class II Division 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements:~~
~~(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended upon for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such mans of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class II locations and the point of grounding for service equipment or point of grounding of a separately derived system.~~
The above listed article is only one of many changes that could be made throughout the code.

SUBSTANTIATION: This proposal would eliminate duplication of paragraphs.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel's intent is to keep Class I and Class II requirements separate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1596)

14- 190 - (501-16(a)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other ~~approved~~ (identified)means of bonding shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2385)

14- 191 - (501-16(a)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
(a) Bonding. Standard locknuts or bushings ~~The locknut-bushing, and double-locknut types of contacts~~ shall not be depended on for bonding purposes~~, but bonding jumpers with proper fittings or other approved means of bonding shall be used~~; bonding shall comply with Sections 250-100 and 250-94. (Balance of paragraph and exception unchanged)
~~FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.~~
SUBSTANTIATION: Present wording conflicts with Section 250-94, which is referenced by Section 250-100. Taken literally, it does not require bonding for standard locknuts that are employed to secure threadless connectors to enclosures, nor around concentric or eccentric knockouts that may not be suitable for bonding, as required under Section 250-94. May also be interpreted to prohibit the use of bonding locknuts and bushings, which are acceptable under Section 250-94. (The balance of this paragraph and the exception are also unnecessary if submitter's proposal for Section 250-100 is accepted).
PANEL ACTION: Reject.
PANEL STATEMENT: These requirements are more stringent than those in Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with the Panel Action and Statement. I agree with the submitter's proposal and most of the substantiation. I am not certain about the last sentence, in parentheses, since I have not seen the submitter's proposal for Section 250-100.

(Log #2386)

14- 192 - (501-16(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
(a) Bonding. Standard locknuts or bushings ~~The locknut-bushing, and double-locknut types of contacts~~ shall not be depended on for bonding purposes~~, but bonding jumpers with proper fittings or other approved means of bonding shall be used~~; bonding shall comply with Sections 250-100 and 250-94. (Balance of paragraph and exception unchanged)
~~FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.~~
SUBSTANTIATION: Present wording conflicts with Section 250-94, which is referenced by Section 250-100. Taken literally, it does not require bonding for standard locknuts that are employed to secure threadless connectors to enclosures, nor around concentric or eccentric knockouts that may not be suitable for bonding, as required under Section 250-94. May also be interpreted to prohibit the use of bonding locknuts and bushings, which are acceptable under Section 250-94.
PANEL ACTION: Reject.
PANEL STATEMENT: These requirements are more stringent than those in Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-191.

(Log #3519)

14- 193 - (501-16(a)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other ~~approved~~ (identified) means of bonding shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1597)

14- 194 - (501-17(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Class I, Division 1. Surge arresters, including their installation and connection, shall comply with Article 280. The surge arresters and capacitors shall be installed in enclosures ~~approved~~ (identified)for Class I, Division 1 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3520)

14- 195 - (501-17(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class I, Division 1. Surge arresters, including their installation and connection, shall comply with Article 280. The surge arresters and capacitors shall be installed in enclosures ~~approved~~ (identified) for Class I, Division 1 locations. Surge-protective capacitors shall be of a type designed for specific duty.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1598)

14- 196 - (501-17(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second paragraph to read as follows:
Enclosures shall be permitted to be of the general-purpose type. Surge protection of types other than described above shall be installed in enclosures ~~approved~~ (identified) for Class I, Division 1 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3521)

14- 197 - (501-17(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second paragraph to read as follows:
"Enclosures shall be permitted to be of the general-purpose type. Surge protection of types other than described above shall be installed in enclosures ~~approved~~ (identified) for Class I, Division 1 locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3988)

14- 198 - (501-18): Accept in Principle
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-318a. The Technical Correlating Committee understands that there is no change to 501-18. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
~~501-18.~~ 505-21. Multiwire Branch Circuits. In a Class I, ~~Division~~ Zone 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.
SUBSTANTIATION: This proposal is the work of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose of the proposal is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.
PANEL ACTION: Accept in Principle.
Add the proposed text to 505-22.
PANEL STATEMENT: The Panel agrees with the text, but the correct location is 505-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1541)

14- 199 - (501-18, Exception): Reject
SUBMITTER: Thomas J. Conlan, Conlan's "The Electrician Inc."
RECOMMENDATION: Revise to read as follows:
501-18. Multiwire Branch Circuits. In H11 location a multiwire branch circuit shall not be permitted.
~~Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.~~
SUBSTANTIATION: Remove the exception.
The disconnect does not address automatic or manual operation. Fusible disconnects can blow one fuse and not the other also a bad neutral can cause a higher voltage than 120 nominal on 120/240 volt multiwire branch circuit which can lead to a fire.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not support the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

ARTICLE 502 — CLASS II LOCATIONS

(Log #1260)

14- 200 - (502): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: In 502-2(b)(2)(c), change "6 in. (152 mm)" to "150 mm (6 in.)".

In 502-5(2), change "10 ft (3.05 m)" to "3.0 m (10 ft)".

In 502-5(3), change "5 ft (1.52 m)" to "1.5 m (5 ft)."

In 502-11(a)(3), change "12 in. (305 mm) to "300 mm (12 in.)" in three places.

In 502-11(b)(4), change "12 in. (305 mm)" to "300 mm (12 in.)" in three places.

In 502-16(b), Exception (a), change "6 ft (1.83 m)" to "1.8 m (6 ft)."

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Reject.

PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 3

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.

OMEARA: This proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.

ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #CP1412)

14- 200a - (502): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. Further, it was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel, with further consideration given to the comments expressed in the voting, specifically with respect to comments that the accepted Proposal does not accurately reflect what was agreed upon by the Panel. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-201, 14-202, 14-204, 14-205, 14-206, 14-207, 14-207a, 14-208, 14-209, 14-210, 14-210a, 14-211, 14-212, 14-213, 14-216, 14-219, 14-223,14-224, 14-227, 14-228, 14-231, 14-232, 14-233, 14-234, 14-235, 14-236, 14-239, 14-240, 14-243, 14-244, 14-245, 14-246, 14-249, 14-250, 14-251, 14-252, 14-255, 14-256, 14-257, 14-258, 14-259, 14-262, 14-263, 14-264, 14-265, 14-266, 14-267, 14-268, 14-269, 14-270, and 14-271. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 14

RECOMMENDATION: Revise Article 502 to read as follows:

502

ARTICLE 502 -- Class II Locations

502-1. General

The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class II locations in Section 500-8.

Exception: As modified by this article.

Dust-ignitionproof, as used in this article, shall mean enclosed in a manner that will exclude dusts and, where installed and protected in accordance with this Code, will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

> FPN: For further information on dust-ignitionproof enclosures, see Type 9 enclosure in Enclosures for Electrical Equipment, ANSI/NEMA 250-1991, and Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Equipment installed in Class II locations shall be able to function at full rating without developing surface temperatures high enough to cause excessive dehydration or gradual carbonization of any organic dust deposits that may occur.

> FPN: Dust that is carbonized or excessively dry is highly susceptible to spontaneous ignition.

Equipment and wiring of the type defined in Article 100 as explosionproof shall not be required and shall not be acceptable in Class II locations unless approved for such locations.

Where Class II, Group E dusts are present in hazardous quantities, there are only Division 1 locations.

502-2. Transformers and Capacitors

(a) Class II, Division 1. In Class II, Division 1 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed only in approved vaults complying with Sections 450-41 through 450-48, and, in addition, the following shall apply.

a. Doors or other openings communicating with the Division 1 location shall have self-closing fire doors on both sides of the wall, and the doors shall be carefully fitted and provided with suitable seals (such as weather stripping) to minimize the entrance of dust into the vault.

b. Vent openings and ducts shall communicate only with the outside air.

c. Suitable pressure-relief openings communicating with the outside air shall be provided.

(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with Sections 450-41 through 450-48 or be approved as a complete assembly, including terminal connections for Class II locations.

(3) Metal Dusts. No transformer or capacitor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present.

(b) Class II, Division 2. In Class II, Division 2 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed in vaults that comply with Sections 450-41 through 450-48.

(2) Containing Askarel. Transformers containing askarel and rated in excess of 25 kVA shall be as follows:

a. Provided with pressure-relief vents

b. Provided with a means for absorbing any gases generated by arcing inside the case, or the pressure-relief vents shall be connected to a chimney or flue that will carry such gases outside the building

c. Have an airspace of not less than 6 in. (152 mm) between the transformer cases and any adjacent combustible material

(3) Dry-Type Transformers. Dry-type transformers shall be installed in vaults or shall have their windings and terminal connections enclosed in tight metal housings without ventilating or other openings and shall operate at not over 600 volts, nominal.

502-4. Wiring Methods

Wiring methods shall comply with (a) and (b).

(a) Class II, Division 1. In Class II, Division 1 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings approved for the location shall be the wiring method employed. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

Exception: In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight

continuous corrugated aluminum sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.

(1) Fittings and Boxes. Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations, shall have close-fitting covers, and shall have no openings (such as holes for attachment screws) through which dust might enter or through which sparks or burning material might escape. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in locations where dusts are of a combustible, electrically conductive nature, shall be approved for Class II locations.

(2) Flexible Connections. Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with approved fittings, or flexible cord approved for extra-hard usage and provided with bushed fittings shall be used. Where flexible cords are used, they shall comply with Section 502-12. Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type approved for the condition or shall be protected by means of a suitable sheath.
FPN: See Section 502-16(b) for grounding requirements where flexible conduit is used.

(b) Class II, Division 2. In Class II, Division 2 locations, rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, Type MC or MI cable with approved termination fittings, Type PLTC in cable trays, Type ITC in cable trays, or Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.
Exception No. 1: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in nonhazardous ~~ordinary~~ locations including Chapter 7 and 8 wiring methods.(14-220)
Exception No. 2: Type MC cable listed for use in Class II, Division 1 locations shall be permitted to be installed without the above required spacings.

(1) Boxes and Fittings. All boxes and fittings shall be dusttight. (14-222)

~~(1) Wireways, Fittings, and Boxes. Wireways, fittings, and boxes in which taps, joints, or terminal connections are made shall be designed to minimize the entrance of dust and (1) shall be provided with telescoping or close-fitting covers or other effective means to prevent the escape of sparks or burning material and (2) shall have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which adjacent combustible material might be ignited.~~

(2) Flexible Connections. Where flexible connections are necessary, (a)(2) shall apply.

502-5. Sealing, Class II, Divisions 1 and 2
Where a raceway provides communication between an enclosure that is required to be dust-ignitionproof and one that is not, suitable means shall be provided to prevent the entrance of dust into the dust-ignitionproof enclosure through the raceway. One of the following means shall be permitted:
1. A permanent and effective seal,
2. A horizontal raceway not less than 10 ft (3.05 m) long, or
3. A vertical raceway not less than 5 ft (1.52 m) long and extending downward from the dust-ignitionproof enclosure
Where a raceway provides communication between an enclosure that is required to be dust-ignitionproof and an enclosure in an unclassified location, seals shall not be required.
Sealing fittings shall be accessible.
Seals shall not be required to be explosionproof.
FPN: Electrical sealing putty is a method of sealing.

502-6. Switches, Circuit Breakers, Motor Controllers, and Fuses
(a) Class II, Division 1. In Class II, Division 1 locations, switches, circuit breakers, motor controllers, and fuses shall comply with the following:
(1) Type Required. Switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices that are intended to interrupt current during normal operation or that are installed where combustible dusts of an electrically conductive nature may be present, shall be provided with approved dust-ignitionproof enclosures.
(2) Isolating Switches. Disconnecting and isolating switches containing no fuses and not intended to interrupt current and not installed where dusts may be of an electrically conductive nature shall be provided with tight metal enclosures that shall be designed to minimize the entrance of dust and that shall (1) be equipped with telescoping or close-fitting covers or with other effective means to prevent the escape of sparks or burning material and (2) have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which exterior accumulations of dust or adjacent combustible material might be ignited.

(3) Metal Dusts. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fuses, switches, motor controllers, and circuit breakers shall have enclosures identified ~~specifically approved~~(14-225,226)~~-~~for such locations.

(b) Class II, Division 2. In Class II, Division 2 locations, enclosures for fuses, switches, circuit breakers, and motor controllers, including pushbuttons, relays, and similar devices, shall be dusttight.

502-7. Control Transformers and Resistors
(a) Class II, Division 1. In Class II, Division 1 locations, control transformers, solenoids, impedance coils, resistors, and any overcurrent devices or switching mechanisms associated with them shall have dust-ignitionproof enclosures approved for Class II locations. No control transformer, impedance coil, or resistor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present unless provided with an enclosure approved for the specific location.

(b) Class II, Division 2. In Class II, Division 2 locations, transformers and resistors shall comply with the following.
(1) Switching Mechanisms. Switching mechanisms (including overcurrent devices) associated with control transformers, solenoids, impedance coils, and resistors shall be provided with dusttight enclosures.
(2) Coils and Windings. Where not located in the same enclosure with switching mechanisms, control transformers, solenoids, and impedance coils shall be provided with tight metal housings without ventilating openings.
(3) Resistors. Resistors and resistance devices shall have dust-ignitionproof enclosures~~-~~ identified ~~approved.~~ for Class II locations.(14-229)
Exception: Where the maximum normal operating temperature of the resistor will not exceed 120ºC (248ºF), nonadjustable resistors or resistors that are part of an automatically timed starting sequence shall be permitted to have enclosures complying with (b)(2).

502-8. Motors and Generators
(a) Class II, Division 1. In Class II, Division 1 locations, motors, generators, and other rotating electrical machinery shall be
1. Approved for Class II, Division 1 locations, or
2. Totally enclosed pipe-ventilated, meeting temperature limitations in Section 502-1.

(b) Class II, Division 2. In Class II, Division 2 locations, motors, generators, and other rotating electrical equipment shall be totally enclosed nonventilated, totally enclosed pipe-ventilated, totally enclosed water–air cooled, totally enclosed fan-cooled or dust-ignitionproof for which maximum full-load external temperature shall be in accordance with Section 500-5(f) for normal operation when operating in free air (not dust blanketed) and shall have no external openings.
Exception: If the authority having jurisdiction believes accumulations of nonconductive, nonabrasive dust will be moderate and if machines can be easily reached for routine cleaning and maintenance, the following shall be permitted to be installed:
a. Standard open-type machines without sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature devices), or integral resistance devices

b. Standard open-type machines with such contacts, switching mechanisms, or resistance devices enclosed within dusttight housings without ventilating or other openings
c. Self-cleaning textile motors of the squirrel-cage type

502-9. Ventilating Piping
Ventilating pipes for motors, generators, or other rotating electric machinery, or for enclosures for electric equipment, shall be of metal not less than 0.021 in. (533 µm) in thickness, or of equally substantial noncombustible material, and shall comply with the following:
1. Lead directly to a source of clean air outside of buildings,
2. Be screened at the outer ends to prevent the entrance of small animals or birds, and
3. Be protected against physical damage and against rusting or other corrosive influences
Ventilating pipes shall also comply with (a) and (b).

(a) Class II, Division 1. In Class II, Division 1 locations, ventilating pipes, including their connections to motors or to the dust-ignitionproof enclosures for other equipment, shall be dusttight throughout their length. For metal pipes, seams and joints shall comply with one of the following:
1. Be riveted and soldered,
2. Be bolted and soldered,
3. Be welded, or
4. Be rendered dusttight by some other equally effective means

(b) Class II, Division 2. In Class II, Division 2 locations, ventilating pipes and their connections shall be sufficiently tight to prevent the entrance of appreciable quantities of dust into the ventilated equipment or enclosure and to prevent the escape of sparks, flame, or burning material that might ignite dust accumulations or combustible material in the vicinity. For metal pipes, lock seams and riveted or welded joints shall be permitted; and tight-fitting slip joints shall be permitted where some flexibility is necessary, as at connections to motors.

502-10. Utilization Equipment
(a) Class II, Division 1. In Class II, Division 1 locations, all utilization equipment shall be approved for Class II locations. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, such equipment shall be approved for the specific location.

(b) Class II, Division 2. In Class II, Division 2 locations, all utilization equipment shall comply with the following.
(1) Heaters. Electrically heated utilization equipment shall be approved for Class II locations.
Exception: Metal-enclosed radiant heating panel equipment shall be dusttight and marked in accordance with Section 500-5(d).
(2) Motors. Motors of motor-driven utilization equipment shall comply with Section 502-8(b).
(3) Switches, Circuit Breakers, and Fuses. Enclosures for switches, circuit breakers, and fuses shall be dusttight.
(4) Transformers, Solenoids, Impedance Coils, and Resistors. Transformers, solenoids, impedance coils, and resistors shall comply with Section 502-7(b).

502-11. Lighting Fixtures
Lighting fixtures shall comply with (a) and (b).
(a) Class II, Division 1. In Class II, Division 1 locations, lighting fixtures for fixed and portable lighting shall comply with the following.
(1) ~~Approved~~ Fixtures. Each fixture shall be identified ~~approved~~ for Class II locations and shall be clearly marked to indicate the maximum wattage of the lamp for which it is designed ~~approved~~. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fixtures for fixed or portable lighting and all auxiliary equipment shall be identified ~~approved~~ for the specific location. (14-237)
(2) Physical Damage. Each fixture shall be protected against physical damage by a suitable guard or by location.
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with approved fittings, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or a flexible connector approved for the location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting. Threaded joints shall be provided with set-screws or other effective means to prevent loosening. Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord approved for hard usage shall be used, and suitable seals shall be provided where the cord enters the fixture and the outlet box or fitting. Flexible cord shall not serve as the supporting means for a fixture.

(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be approved for Class II locations.

(b) Class II, Division 2. In Class II, Division 2 locations, lighting fixtures shall comply with the following.
(1) Portable Lighting Equipment. Portable lighting equipment shall be identified ~~approved~~ for Class II locations. They shall be clearly marked to indicate the maximum wattage of lamps for which they are designed ~~approved~~. (14-247).
(2) Fixed Lighting. Lighting fixtures for fixed lighting, where not of a type approved for Class II locations, shall provide enclosures for lamps and lampholders that shall be designed to minimize the deposit of dust on lamps and to prevent the escape of sparks, burning material, or hot metal. Each fixture shall be clearly marked to indicate the maximum wattage of the lamp that shall be permitted without exceeding an exposed surface temperature in accordance with Section 500-5(f) under normal conditions of use.
(3) Physical Damage. Lighting fixtures for fixed lighting shall be protected from physical damage by suitable guards or by location.
(4) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with approved fittings, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an approved fitting or a flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting. Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord approved for hard usage shall be used. Flexible cord shall not serve as the supporting means for a fixture.
(5) Electric-Discharge Lamps. Starting and control equipment for electric-discharge lamps shall comply with the requirements of Section 502-7(b).

502-12. Flexible Cords — Class II, Divisions 1 and 2
Flexible cords used in Class II locations shall comply with the following:
1. Be of a type approved for extra-hard usage,
FPN: Flexible cord listed for hard usage as permitted by Sections 502-11 (a) (3) and (b) (4). (14-257)
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23,
3. Be connected to terminals or to supply conductors in an approved manner,
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections, and
5. Be provided with suitable seals to prevent the entrance of dust where the flexible cord enters boxes or fittings that are required to be dust-ignitionproof

502-13. Receptacles and Attachment Plugs
(a) Class II, Division 1. In Class II, Division 1 locations, receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of the flexible cord and shall be approved for Class II locations.

(b) Class II, Division 2. In Class II, Division 2 locations, receptacles and attachment plugs shall be of the type that provide for connection to the grounding conductor of the flexible cord and shall be designed so that connection to the supply circuit cannot be made or broken while live parts are exposed.

502-14. Signaling, Alarm, Remote-Control, and Communications Systems; and Meters, Instruments, and Relays
FPN: See Article 800 for rules governing the installation of communications circuits.

(a) Class II, Division 1. In Class II, Division 1 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with the following:
(1) Wiring Methods. The wiring method shall comply with Section 502-4(a).

(2) Contacts. Switches, circuit breakers, relays, contactors, fuses and current-breaking contacts for bells, horns, howlers, sirens, and other devices in which sparks or arcs may be produced shall be provided with enclosures approved for a Class II location.
Exception: Where current-breaking contacts are immersed in oil or where the interruption of current occurs within a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.
(3) Resistors and Similar Equipment. Resistors, transformers, choke coils, rectifiers, thermionic tubes, and other heat-generating equipment shall be provided with enclosures approved for Class II locations.
Exception: Where resistors or similar equipment are immersed in oil or enclosed in a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.
(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with Section 502-8(a).
(5) Combustible, Electrically Conductive Dusts. Where dusts are of a combustible, electrically conductive nature, all wiring and equipment shall be approved for Class II locations.
(6) Metal Dusts. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, all apparatus and equipment shall be approved for the specific conditions.

(b) Class II, Division 2. In Class II, Division 2 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with the following.
(1) Contacts. Enclosures shall comply with (a)(2), or contacts shall have tight metal enclosures designed to minimize the entrance of dust and shall have telescoping or tight-fitting covers and no openings through which, after installation, sparks or burning material might escape.
Exception: In nonincendive circuits, enclosures shall be permitted to be of the general-purpose type.
(2) Transformers and Similar Equipment. The windings and terminal connections of transformers, choke coils, and similar equipment shall be provided with tight metal enclosures without ventilating openings.
(3) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with (a)(3).
Exception: Enclosures for thermionic tubes, nonadjustable resistors, or rectifiers for which maximum operating temperature will not exceed 120ºC (248ºF) shall be permitted to be of the general-purpose type.
(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with Section 502-8(b).
(5) Wiring Methods. The wiring method shall comply with Section 502-4(b).

502-15. Live Parts, Class II, Divisions 1 and 2
Live parts shall not be exposed.

502-16. Grounding, Class II, Divisions 1 and 2
Wiring and equipment in Class II, Divisions 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements.
(a) Bonding. The locknut-bushing and double-locknut types of contact shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class II locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), if the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.
(b) Types of Equipment Grounding Conductors. Where flexible conduit is used as permitted in Section 502-4, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.
Exception: In Class II, Division 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

502-17. Surge Protection — Class II, Divisions 1 and 2
Surge arresters, including their installation and connection, shall comply with Article 280. In addition, surge arresters, if installed in a Class II, Division 1 location, shall be in suitable enclosures. Surge-protective capacitors shall be of a type designed for specific duty.

502-18. Multiwire Branch Circuits
In a Class II, Division 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.
SUBSTANTIATION: This complete revision of Article 502 editorially revises the text to make it more easily understood and also incorporates numerous technical and editorial improvements made via other proposals.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
BRIESCH: While the Panel Action to accept the rewrite of Article 502 is supported, the NFPA-circulated Panel Proposal does not include all of the changes agreed to at the meeting. The e-mail sent by Dave Wechsler subsequent to the meeting is more complete in reflecting the Panel Actions from the meeting.
COOK: I agree with Proposal 14-200a and the substantiation, however, it does not incorporate all of the changes made via other proposals. An updated version that was emailed from Dave Wechsler on 1-26-2000 seems to be more complete with respect to including Panel Actions from the meeting in Hilton Head.
ENGLER: Not all of the changes made it into the draft circulated with this ballot, vote is to affirm the text with all of the necessary changes made to it.
JAGUNICH: The panel proposal sent with the ballot material does not appear to be consistent with CMP14's intent, as expressed during the panel meeting. This rewrite should reexamined and modified as necessary.
LAWRENCE: Due to the large number of public proposals received and acted upon and also due to time constraints, the panel was not able to compile and correlate all aspects of the rewrites of the affected article. Please see David Wechsler's ballot.
OMEARA: Please see the comments on the ballot for David Wechsler.
WECHSLER: While attempts were made to provide NFPA Staff with corrected revisions of this text before the end of the CMP 14 panel meeting, a detailed review of this balloted draft version has indicated that this does not reflect the accurate committee actions and is not correct.
We attribute the problems with this draft to the following:
a) the use of several earlier drafts that were consistently being revised to keep pace with changes made due to committee actions on public proposals,
b) the limited time available to proof and develop this work,
c) the extremely large number of public proposals,
d) the complex nature of the interaction of affected texts within Articles 500, 501, 502 and 505, and the desire of the committee to maintain consistency, and
e) human errors in transcribing this information.
The following text provides a correct revision of this complete work effort for Article 502. This text should be the panel document of record and not that provided with the panel ballot.

ARTICLE 502 -- Class II Locations
502-1. General
The general rules of this Code shall apply to the electric wiring and equipment in locations classified as Class II locations in Section 500-5(c)~~500 8~~.
Exception: As modified by this article.

Dust-ignitionproof, as used in this article, shall mean enclosed in a manner that will exclude dusts and, where installed and protected in accordance with this Code, will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

FPN: For further information on dust-ignitionproof enclosures, see Type 9 enclosure in Enclosures for Electrical Equipment, ANSI/NEMA 250-1991, and Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations, ANSI/UL 1203-1994.

Equipment installed in Class II locations shall be able to function at full rating without developing surface temperatures high enough to cause excessive dehydration or gradual carbonization of any organic dust deposits that may occur.

FPN: Dust that is carbonized or excessively dry is highly susceptible to spontaneous ignition.

Equipment and wiring of the type defined in Article 100 as explosionproof shall not be required and shall not be acceptable in Class II locations unless identified ~~approved~~ [14-201, 14-202]- for such locations.

Where Class II, Group E dusts are present in hazardous quantities, there are only Division 1 locations.

502-2. Transformers and Capacitors

(a) Class II, Division 1. In Class II, Division 1 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed only in ~~approved~~ [14-204,14-205]- vaults complying with Sections 450-41 through 450-48, and, in addition, the following shall apply.

a. Doors or other openings communicating with the Division 1 location shall have self-closing fire doors on both sides of the wall, and the doors shall be carefully fitted and provided with suitable seals (such as weather stripping) to minimize the entrance of dust into the vault.

b. Vent openings and ducts shall communicate only with the outside air.

c. Suitable pressure-relief openings communicating with the outside air shall be provided.

(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with Sections 450-41 through 450-48 or be identified ~~approved~~ [14-206,14-207]- as a complete assembly, including terminal connections for Class II locations.

(3) Metal Dusts. No transformer or capacitor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present.

(b) Class II, Division 2. In Class II, Division 2 locations, transformers and capacitors shall comply with the following.

(1) Containing Liquid that Will Burn. Transformers and capacitors containing a liquid that will burn shall be installed in vaults that comply with Sections 450-41 through 450-48.

(2) Containing Askarel. Transformers containing askarel and rated in excess of 25 kVA shall be as follows:

a. Provided with pressure-relief vents

b. Provided with a means for absorbing any gases generated by arcing inside the case, or the pressure-relief vents shall be connected to a chimney or flue that will carry such gases outside the building

c. Have an airspace of not less than 6 in. (152 mm) between the transformer cases and any adjacent combustible material

(3) Dry-Type Transformers. Dry-type transformers shall be installed in vaults or shall have their windings and terminal connections enclosed in tight metal housings without ventilating or other openings and shall operate at not over 600 volts, nominal.

502-4. Wiring Methods

Wiring methods shall comply with (a) or ~~and~~ (b). (CP-1409 to correlate with 501-4)

(a) Class II, Division 1. In Class II, Division 1 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings listed ~~approved~~ [14-208,14-209]- for the location shall be the wiring method employed. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

Exception: In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated metallic ~~aluminum~~ [14-210]- sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.

(1) Fittings and Boxes. Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations and shall be dust-tight. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in Group E, shall be identified for Class II locations.~~, shall have close fitting covers, and shall have no openings (such as holes for attachment screws) through which dust might enter or through which sparks or burning material might escape. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in locations where dusts are of a combustible, electrically conductive nature, shall be approved for Class II locations.~~ (14-211,14-212,CP-1408)

(2) Flexible Connections. Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with listed ~~approved~~ fittings, or flexible cord listed ~~approved~~ for extra-hard usage and provided with bushed fittings shall be used. Where flexible cords are used, they shall comply with Section 502-12. Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type listed ~~approved~~ for the condition or shall be protected by means of a suitable sheath. [14-213]

FPN: See Section 502-16(b) for grounding requirements where flexible conduit is used.

(b) Class II, Division 2. In Class II, Division 2 locations, rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, Type MC or MI cable with listed ~~approved~~ [14-216,14-219]- termination fittings, Type PLTC in cable trays, Type ITC in cable trays, or Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.

Exception No. 1: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in nonhazardous ~~ordinary~~ locations including Chapter 7 and 8 wiring methods.(14-220)

Exception No. 2: Type MC cable listed for use in Class II, Division 1 locations shall be permitted to be installed without the above required spacings.

(1) Boxes and Fittings. All boxes and fittings shall be dusttight. (14-221,14-222)

~~(1) Wireways, Fittings, and Boxes. Wireways, fittings, and boxes in which taps, joints, or terminal connections are made shall be designed to minimize the entrance of dust and (1) shall be provided with telescoping or close fitting covers or other effective means to prevent the escape of sparks or burning material and (2) shall have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which adjacent combustible material might be ignited.~~

(2) Flexible Connections. Where flexible connections are necessary, (a)(2) shall apply.

Rewrite of above section 502-4 to correlate with 501-4 and as modified by Proposals

502-4. Wiring Methods

Wiring methods shall comply with (a) or (b). (CP-1409 to correlate with 501-4)

(a) Class II, Division 1 .

(1) In Class II, Division 1 locations, the following wiring methods shall be permitted:

(a) Threaded rigid metal conduit, or threaded steel intermediate metal conduit may be used.

(b) Type MI cable with termination fittings listed [14-208,14-209] for the location. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

(c) In industrial establishments with limited public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated metallic [14-210] sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.

(d) Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations and shall be dust-tight. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in Group E, shall be identified for Class II locations. (14-211,14-212,CP-1408)

(e) Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with bushed fittings shall be used. Where flexible cords are used, they shall comply with Section 502-12. Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type listed for the condition or shall be protected by means of a suitable sheath. [14-213]

FPN: See Section 502-16(b) for grounding requirements where flexible conduit is used.

(b) Class II, Division 2.

(1) In Class II, Division 2 locations, the following wiring methods shall be permitted:

a. Rigid metal conduit, intermediate metal conduit, electrical metallic tubing,
b. Dusttight wireways,
c. Type MC or MI cable with listed [14-216,14-219]termination fittings,
d. Type PLTC in cable trays,
e. Type ITC in cable trays,
f. Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.

Exception: Type MC cable listed for use in Class II, Division 1 locations shall be permitted to be installed without the above required spacings.

(2) Where provision must be made for flexibility apply 502-4 (a)(1)(e.)

(3) Nonincendive field wiring shall be permitted using any of the wiring methods permitted for nonhazardous [14-81,14-88,1401, 14-220] locations, including Chapter 7 and 8 wiring methods. Nonincendive field wiring systems shall be installed in accordance with the control drawing(s). (14-83)

(4) All boxes and fittings shall be dusttight. (14-221,14-222)

502-5. Sealing, Class II, Divisions 1 and 2

Where a raceway provides communication between an enclosure that is required to be dust-ignitionproof and one that is not, suitable means shall be provided to prevent the entrance of dust into the dust-ignitionproof enclosure through the raceway. One of the following means shall be permitted:
1. A permanent and effective seal,
2. A horizontal raceway not less than 10 ft (3.05 m) long, or
3. A vertical raceway not less than 5 ft (1.52 m) long and extending downward from the dust-ignitionproof enclosure

Where a raceway provides communication between an enclosure that is required to be dust-ignitionproof and an enclosure in an unclassified location, seals shall not be required.
Sealing fittings shall be accessible.
Seals shall not be required to be explosionproof.
FPN: Electrical sealing putty is a method of sealing.

502-6. Switches, Circuit Breakers, Motor Controllers, and Fuses

(a) Class II, Division 1. In Class II, Division 1 locations, switches, circuit breakers, motor controllers, and fuses shall comply with the following:
(1) Type Required. Switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices that are intended to interrupt current during normal operation or that are installed where combustible dusts of an electrically conductive nature may be present, shall be provided with identified ~~approved~~ [14-223,14-224] dust-ignitionproof enclosures.
(2) Isolating Switches. Disconnecting and isolating switches containing no fuses and not intended to interrupt current and not installed where dusts may be of an electrically conductive nature shall be provided with tight metal enclosures that shall be designed to minimize the entrance of dust and that shall (1) be equipped with telescoping or close-fitting covers or with other effective means to prevent the escape of sparks or burning material and (2) have no openings (such as holes for attachment screws) through which, after installation, sparks or burning material might escape or through which exterior accumulations of dust or adjacent combustible material might be ignited.

(3) Metal Dusts. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fuses, switches, motor controllers, and circuit breakers shall have enclosures identified ~~specifically approved~~(14-225,14-226)- for such locations.

(b) Class II, Division 2. In Class II, Division 2 locations, enclosures for fuses, switches, circuit breakers, and motor controllers, including pushbuttons, relays, and similar devices, shall be dusttight.

502-7. Control Transformers and Resistors

(a) Class II, Division 1. In Class II, Division 1 locations, control transformers, solenoids, impedance coils, resistors, and any overcurrent devices or switching mechanisms associated with them shall have dust-ignitionproof enclosures approved for Class II locations. No control transformer, impedance coil, or resistor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present unless provided with an enclosure identified ~~approved~~ [14-227, 14-228]- for the specific location.

(b) Class II, Division 2. In Class II, Division 2 locations, transformers and resistors shall comply with the following.
(1) Switching Mechanisms. Switching mechanisms (including overcurrent devices) associated with control transformers, solenoids, impedance coils, and resistors shall be provided with dusttight enclosures.
(2) Coils and Windings. Where not located in the same enclosure with switching mechanisms, control transformers, solenoids, and impedance coils shall be provided with tight metal housings without ventilating openings.
(3) Resistors. Resistors and resistance devices shall have dust-ignitionproof enclosures~~.~~ identified ~~approved.~~ for Class II locations.(14-229,14-230)
Exception: Where the maximum normal operating temperature of the resistor will not exceed 120ºC (248ºF), nonadjustable resistors or resistors that are part of an automatically timed starting sequence shall be permitted to have enclosures complying with (b)(2).

502-8. Motors and Generators

(a) Class II, Division 1. In Class II, Division 1 locations, motors, generators, and other rotating electrical machinery shall be
1. Identified ~~Approved~~[14-231, 14-232]- for Class II, Division 1 locations, or
2. Totally enclosed pipe-ventilated, meeting temperature limitations in Section 502-1.

(b) Class II, Division 2. In Class II, Division 2 locations, motors, generators, and other rotating electrical equipment shall be totally

enclosed nonventilated, totally enclosed pipe-ventilated, totally enclosed water–air cooled, totally enclosed fan-cooled or dust-ignitionproof for which maximum full-load external temperature shall be in accordance with Section 500-8(c)(2) ~~500-5(f)~~ for normal operation when operating in free air (not dust blanketed) and shall have no external openings.
Exception: If the authority having jurisdiction believes accumulations of nonconductive, nonabrasive dust will be moderate and if machines can be easily reached for routine cleaning and maintenance, the following shall be permitted to be installed:
a. Standard open-type machines without sliding contacts, centrifugal or other types of switching mechanism (including motor overcurrent, overloading, and overtemperature devices), or integral resistance devices
b. Standard open-type machines with such contacts, switching mechanisms, or resistance devices enclosed within dusttight housings without ventilating or other openings
c. Self-cleaning textile motors of the squirrel-cage type

502-9. Ventilating Piping
Ventilating pipes for motors, generators, or other rotating electric machinery, or for enclosures for electric equipment, shall be of metal not less than 0.021 in. (533 µm) in thickness, or of equally substantial noncombustible material, and shall comply with the following:
1. Lead directly to a source of clean air outside of buildings,
2. Be screened at the outer ends to prevent the entrance of small animals or birds, and
3. Be protected against physical damage and against rusting or other corrosive influences
Ventilating pipes shall also comply with (a) and (b).

(a) Class II, Division 1. In Class II, Division 1 locations, ventilating pipes, including their connections to motors or to the dust-ignitionproof enclosures for other equipment, shall be dusttight throughout their length. For metal pipes, seams and joints shall comply with one of the following:
1. Be riveted and soldered,
2. Be bolted and soldered,
3. Be welded, or
4. Be rendered dusttight by some other equally effective means

(b) Class II, Division 2. In Class II, Division 2 locations, ventilating pipes and their connections shall be sufficiently tight to prevent the entrance of appreciable quantities of dust into the ventilated equipment or enclosure and to prevent the escape of sparks, flame, or burning material that might ignite dust accumulations or combustible material in the vicinity. For metal pipes, lock seams and riveted or welded joints shall be permitted; and tight-fitting slip joints shall be permitted where some flexibility is necessary, as at connections to motors.

502-10. Utilization Equipment
(a) Class II, Division 1. In Class II, Division 1 locations, all utilization equipment shall be identified ~~approved~~ [14-233,14-234] for Class II locations. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, such equipment shall be approved for the specific location.

(b) Class II, Division 2. In Class II, Division 2 locations, all utilization equipment shall comply with the following.
(1) Heaters. Electrically heated utilization equipment shall be identified ~~approved~~ [14-235,14-236]- for Class II locations.
Exception: Metal-enclosed radiant heating panel equipment shall be dusttight and marked in accordance with Section 500-8 (b)~~500-5(d)~~.
(2) Motors. Motors of motor-driven utilization equipment shall comply with Section 502-8(b).
(3) Switches, Circuit Breakers, and Fuses. Enclosures for switches, circuit breakers, and fuses shall be dusttight.
(4) Transformers, Solenoids, Impedance Coils, and Resistors. Transformers, solenoids, impedance coils, and resistors shall comply with Section 502-7(b).

502-11. Lighting Fixtures
Lighting fixtures shall comply with (a) and (b).
(a) Class II, Division 1. In Class II, Division 1 locations, lighting fixtures for fixed and portable lighting shall comply with the following.
(1) ~~Approved~~ Fixtures. Each fixture shall be identified ~~approved~~ for Class II locations and shall be clearly marked to indicate the maximum wattage of the lamp for which it is designed ~~approved~~. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fixtures for fixed or portable lighting and all auxiliary equipment shall be identified ~~approved~~ for the specific location. (14-237,14-238)
(2) Physical Damage. Each fixture shall be protected against physical damage by a suitable guard or by location.
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with approved fittings, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or a flexible connector listed ~~approved~~ [14-240,14-243]- for the location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting. Threaded joints shall be provided with set-screws or other effective means to prevent loosening. Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord listed ~~approved~~ [14-239,14-244]- for hard usage shall be used, and suitable seals shall be provided where the cord enters the fixture and the outlet box or fitting. Flexible cord shall not serve as the supporting means for a fixture.

(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be identified ~~approved~~ [14-245,14-246]- for Class II locations.

(b) Class II, Division 2. In Class II, Division 2 locations, lighting fixtures shall comply with the following.
(1) Portable Lighting Equipment. Portable lighting equipment shall be identified ~~approved~~ for Class II locations. They shall be clearly marked to indicate the maximum wattage of lamps for which they are designed~~approved~~ [14-247,14-248].
(2) Fixed Lighting. Lighting fixtures for fixed lighting, where not of a type identified ~~approved~~ [14-249,14-250]- for Class II locations, shall provide enclosures for lamps and lampholders that shall be designed to minimize the deposit of dust on lamps and to prevent the escape of sparks, burning material, or hot metal. Each fixture shall be clearly marked to indicate the maximum wattage of the lamp that shall be permitted without exceeding an exposed surface temperature in accordance with Section 500-8 (c)(2)~~500-5(f)~~ under normal conditions of use.
(3) Physical Damage. Lighting fixtures for fixed lighting shall be protected from physical damage by suitable guards or by location.
(4) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with approved fittings, or by other approved means. For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an approved fitting or a flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting. Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord listed ~~approved~~ [14-251,14-256]- for hard usage shall be used. Flexible cord shall not serve as the supporting means for a fixture.
(5) Electric-Discharge Lamps. Starting and control equipment for electric-discharge lamps shall comply with the requirements of Section 502-7(b).

502-12. Flexible Cords — Class II, Divisions 1 and 2
Flexible cords used in Class II locations shall comply with the following:
1. Be of a type listed ~~approved~~ [14-258,14-259]- for extra-hard usage,
FPN: Flexible cord listed for hard usage as permitted by Sections 502-11 (a) (3) and (b) (4). (14-257)
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23,
3. Be connected to terminals or to supply conductors in an approved manner,
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension on the terminal connections, and
5. Be provided with suitable seals to prevent the entrance of dust where the flexible cord enters boxes or fittings that are required to be dust-ignitionproof

502-13. Receptacles and Attachment Plugs
(a) Class II, Division 1. In Class II, Division 1 locations, receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of the flexible cord and shall be identified ~~approved~~ [14-262,14-263]- for Class II locations.

(b) Class II, Division 2. In Class II, Division 2 locations, receptacles and attachment plugs shall be of the type that provide for connection to the grounding conductor of the flexible cord and shall be designed so that connection to the supply circuit cannot be made or broken while live parts are exposed.

502-14. Signaling, Alarm, Remote-Control, and Communications Systems; and Meters, Instruments, and Relays
FPN: See Article 800 for rules governing the installation of communications circuits.

(a) Class II, Division 1. In Class II, Division 1 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with the following:
(1) Wiring Methods. The wiring method shall comply with Section 502-4(a).
(2) Contacts. Switches, circuit breakers, relays, contactors, fuses and current-breaking contacts for bells, horns, howlers, sirens, and other devices in which sparks or arcs may be produced shall be provided with enclosures identified ~~approved~~ [14-264,14-265]- for a Class II location.
Exception: Where current-breaking contacts are immersed in oil or where the interruption of current occurs within a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.
(3) Resistors and Similar Equipment. Resistors, transformers, choke coils, rectifiers, thermionic tubes, and other heat-generating equipment shall be provided with enclosures identified ~~approved~~ [14-266,14-267]- for Class II locations.
Exception: Where resistors or similar equipment are immersed in oil or enclosed in a chamber sealed against the entrance of dust, enclosures shall be permitted to be of the general-purpose type.
(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with Section 502-8(a).
(5) Combustible, Electrically Conductive Dusts. Where dusts are of a combustible, electrically conductive nature, all wiring and equipment shall be identified ~~approved~~ [14-268,14-269]- for Class II locations.
(6) Metal Dusts. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, all apparatus and equipment shall be identified ~~approved~~ [14-270,14-271]for the specific conditions.

(b) Class II, Division 2. In Class II, Division 2 locations, signaling, alarm, remote-control, and communications systems; and meters, instruments, and relays shall comply with the following.
(1) Contacts. Enclosures shall comply with (a)(2), or contacts shall have tight metal enclosures designed to minimize the entrance of dust and shall have telescoping or tight-fitting covers and no openings through which, after installation, sparks or burning material might escape.
Exception: In nonincendive circuits, enclosures shall be permitted to be of the general-purpose type.
(2) Transformers and Similar Equipment. The windings and terminal connections of transformers, choke coils, and similar equipment shall be provided with tight metal enclosures without ventilating openings.
(3) Resistors and Similar Equipment. Resistors, resistance devices, thermionic tubes, rectifiers, and similar equipment shall comply with (a)(3).
Exception: Enclosures for thermionic tubes, nonadjustable resistors, or rectifiers for which maximum operating temperature will not exceed 120ºC (248ºF) shall be permitted to be of the general-purpose type.
(4) Rotating Machinery. Motors, generators, and other rotating electric machinery shall comply with Section 502-8(b).
(5) Wiring Methods. The wiring method shall comply with Section 502-4(b).

502-15. Live Parts, Class II, Divisions 1 and 2
Live parts shall not be exposed.

502-16. Grounding, Class II, Divisions 1 and 2
Wiring and equipment in Class II, Divisions 1 and 2 locations shall be grounded as specified in Article 250 and with the following additional requirements.
(a) Bonding. The locknut-bushing and double-locknut types of contact shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class II locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode conductor are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), if the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.
(b) Types of Equipment Grounding Conductors. Where flexible conduit is used as permitted in Section 502-4, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.
Exception: In Class II, Division 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

502-17. Surge Protection — Class II, Divisions 1 and 2
Surge arresters, including their installation and connection, shall comply with Article 280. In addition, surge arresters, if installed in a Class II, Division 1 location, shall be in suitable enclosures. Surge-protective capacitors shall be of a type designed for specific duty.

502-18. Multiwire Branch Circuits
In a Class II, Division 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.

(Log #1960)

14- 201 - (502-1): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the fourth paragraph to read as follows:
Equipment and wiring of the type defined in Article 100 as explosionproof shall not be required and shall not be acceptable in Class II locations unless ~~approved~~ (identified) for such locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3522)

14- 202 - (502-1): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the fourth paragraph to read as follows:
"Equipment and wiring of the type defined in Article 100 as explosionproof shall not be required and shall not be acceptable in Class II locations unless ~~approved~~ (identified) for such locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1793)

14- 203 - (502-1-Dust-ignitionproof): Accept in Principle
Note: The Technical Correlating Committee directs that the Panel clarify the Panel Action and Statement on this Proposal. Companion Proposal 1-127 was rejected by Code-Making Panel 1. Code-Making Panel 14 has included a definition for Dust-ignitionproof in both Articles 500 (Proposal 14-2a) and 502 (Proposal 14-200a) and has not deleted the text as recommended by the submitter. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Relocate the definition of Dust-ignitionproof and the related FPN to Article 100, and delete the text that applies the definition only to Article 502.
SUBSTANTIATION: The term "Dust-ignitionproof" is used in both Articles 500 and 502. For the purposes of Article 500 the term is undefined because the definition in Article 502 applies only to Article 502. In addition, according to Section 500-4(b) FPN, "Dust-ignitionproof equipment is defined in Article 100."
A similar proposal was made for the 1999 NEC and it was rejected by Panel 14. It is difficult to understand why the panel insisted on allowing and the TC allowed this plain error to continue. As presently located this definition contradicts the scope statement of Article 100, violates the manual of style, allows an undefined terms to be used in Article 500, and makes the statement of the fine print note in Section 500-4(b) false and misleading.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-2a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1793a)

1- 313 - (502-1-Dust-ignitionproof): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Relocate the definition of Dust-ignitionproof and the related FPN to Article 100, and delete the text that applies the definition only to Article 502.
SUBSTANTIATION: The term "Dust-ignitionproof" is used in both Articles 500 and 502. For the purposes of Article 500 the term is undefined because the definition in Article 502 applies only to Article 502. In addition, according to Section 500-4(b) FPN, "Dust-ignitionproof equipment is defined in Article 100."
A similar proposal was made for the 1999 NEC and it was rejected by Panel 14. It is difficult to understand why the panel insisted on allowing and the TC allowed this plain error to continue. As presently located this definition contradicts the scope statement of Article 100, violates the manual of style, allows an undefined terms to be used in Article 500, and makes the statement of the fine print note in Section 500-4(b) false and misleading.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes the definition is more appropriate in Article 502. Refer to CMP-14 for comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 1 Macias

(Log #2652)

14- 204 - (502-2(a)(1)): Accept in Part
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise text to read as follows:
(1) Containing Liquid that Will Burn. Transformers and capacitors containing liquid that will burn shall be installed only in ~~approved~~ (identified) vaults that comply with Sections 450-41 through 450-48, and, in addition, the following shall apply.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete the word "approved".
PANEL STATEMENT: Transformer vaults are not normally identified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3523)

14- 205 - (502-2(a)(1)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Containing Liquid that Will Burn. Transformers and capacitors containing liquid that will burn shall be installed only in ~~approved~~ (identified) vaults complying with Sections 450-41 through 450-48, and, in addition, the following shall apply.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-204 is identical and addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1599)

14- 206 - (502-2(a)(2)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with Sections 450-41 through 450-48 or be ~~approved~~ (identified) as a complete assembly, including terminal connections for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires

that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3524)

14- 207 - (502-2(a)(2)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(2) Not Containing Liquid that Will Burn. Transformers and capacitors that do not contain a liquid that will burn shall be installed in vaults complying with Sections 450-41 through 450-48 or be ~~approved~~ (identified) as a complete assembly, including terminal connections for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #CP1409)

14- 207a - (502-4): Accept
SUBMITTER: CMP 14
RECOMMENDATION: Amend first sentence by replacing "and" with "or". Make this same change in first sentence of 503-3.
SUBSTANTIATION: "And" makes Division 1 wiring requirements mandatory for Division 2.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
ENGLER: Not all of the changes made it into the draft circulated with this ballot, vote is to affirm the text with all of the necessary changes made to it.
JAGUNICH: See ballot for David Wechsler.
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-200a.

(Log #1600)

14- 208 - (502-4(a)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Class II, Division 1. In Class II, Division 1 locations, threaded rigid metal conduit, or Type MI cable with termination fittings ~~approved~~ (identified) for the location shall be the wiring method employed.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3525)

14- 209 - (502-4(a)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class II, Division 1. In Class II, Division 1 locations, threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings ~~approved~~ (identified) for the location shall be the wiring method employed.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2997)

14- 210 - (502-4(a), Exception): Accept
SUBMITTER: Michael P. Mennone, Rockbestos-Surprenant Cable Corp.
RECOMMENDATION: Revise 502-4(a) exception to read as follows:
Exception: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class II, Division 1 locations, with a gas/vaportight continuous corrugated ~~aluminum~~ metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.
SUBSTANTIATION: Type MC with a gas/vaportight continuous corrugated sheath is manufactured and listed with various (aluminum, stainless steel, copper) sheath materials. In response to the acceptance of this exception (which was to be added to the 1996 NEC), UL Standard No. 2225 entitled "Metal-Clad Cables and Cable-Sealing Fittings for Use in Hazardous (Classified) Locations" was developed to qualify Type MC cables for this specific use. Cables meeting these additional requirements would then be listed as Type MC-HL. Copper and stainless steel sheathed Type MC cables have the same ability as aluminum to meet the intent of this section and also possess the ability to meet all of the additional requirements stated in UL Standard No. 2225. It is our contention that these additional types of sheathed cables were overlooked in

the original proposal. This capability does exist and should be recognized by the code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #CP1408)

14- 210a - (502-4(a)(1)): Accept
SUBMITTER: CMP 14
RECOMMENDATION: Revise 502-4(a)(1) to read: "(1) Fittings and Boxes. Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations and shall be dust-tight. Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in Group E locations, shall be identified for Class II locations."
SUBSTANTIATION: To correlate with 502-4(b)(1).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
JAGUNICH: See ballot for David Wechsler.

(Log #1601)

14- 211 - (502-4(a)(1)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second sentence to read as follows:
Fittings and boxes in which taps, joints, or terminal connections are made, or that are used in locations where dusts are of a combustible, electrically conductive nature, shall be ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3526)

14- 212 - (502-4(a)(1)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"Fittings and boxes in which taps, joists, or terminal connections are made, or that are used in locations where dusts are of a combustible, electrically conductive nature, shall be ~~approved~~ (identified) for Class II locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1602)

14- 213 - (502-4(a)(2)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(2) Flexible Connections. Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with ~~approved~~ (identified) fittings, liquidtight flexible nonmetallic conduit with ~~approved~~ (identified) fittings, or flexible cord ~~approved~~ (identified)for extra-hard usage and provided with bushed fittings shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed" in all three places.
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1603)

14- 214 - (502-4(a)(2)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise third sentence to read as follows:
Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type ~~approved~~ (identified) for the conditions or shall be protected by means of a suitable sheath.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the most appropriate word.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-180.

(Log #3527)

14- 215 - (502-4(a)(2)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the third sentence to read as follows:
"Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors shall be of a type

~~approved~~ (identified) for the condition or shall be protected by means of a suitable sheath."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the most appropriate word.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-180.

(Log #1604)

14- 216 - (502-4(b)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(b) Class II, Division 2. In Class II, Division 2 locations, rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, Type MC or MI cable with ~~approved~~ (identified) termination fittings, Type PLTC in cable trays, Type ITC in cable trays, or Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2134)

14- 217 - (502-4(b)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 16 for information, with respect to Code-Making Panel 16's Panel Action on Proposal 16-319. Code-Making Panel 14 shall retain jurisdiction regarding types of wiring methods permitted in hazardous locations.
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add the underlined text into the existing paragraph as follows:
(b) Class II, Division 2. In Class II, Division 2 locations, rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, Type MC or MI cable with approved termination fittings, Type PLTC in cable trays, Type ITC in cable trays, Types CATVP, CATVR, CATV, or CATVX in cable tray, or Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.
SUBSTANTIATION: Type CATVP, CATVR, CATV, or CATVX coaxial cables, as described in Section 820-51, have the additional having fire-resistant characteristics similar to the requirements for other types of cables such as TC and ITC, which are currently permitted for Class II Division 2 locations. In addition they are suitable for installation in cable trays as permitted by Article 318. Coaxial cables are needed in modern industrial facilities for digital and video signal transmission.
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 14-73.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
LAWRENCE: Panel action should have been "Accept in Part in Principle" with the removal of Type CATVX and the addition of support/protection requirements to correlate with the actions of Panel 16 on Proposal 16-318 to accept Types CATVP, CATVR, and CATV in Section 820-53(e).
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-73.

(Log #2851)

14- 218 - (502-4(b)): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Separation of Nonincendive Field Wiring Conductors
(a) From Nonincendive Field Wiring Conductors.
(1) Open Wiring. Conductors and cables of nonincendive field wiring circuits not in raceways or cable trays shall be separated at least 1.97 in. (50 mm) and secured from conductors and cables of any other circuits.
(2) In Raceways, Cable Trays, and Cables. Conductors of nonincendive field wiring circuits shall not be placed in any raceway, cable tray, or cable with conductors of any other circuit.
Exception No. 1: Where conductors of nonincendive field wiring circuits are separated from conductors of incendive field wiring circuits by a distance of at least 1.97 in. (50 mm) and secured, or by a grounded metal partition or an approved insulating partition.
FPN: No. 20 gauge sheet metal partitions 0.0359 in. (912 µm) or thicker are generally considered acceptable.
Exception No. 2: Where either (1) all of the nonincendive field wiring circuit conductors or (2) all of the incendive field wiring circuit conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.
FPN: Cables meeting the requirements of Articles 330 and 334 are typical of those considered acceptable.
(3) Within Enclosures.
a. Conductors of nonincendive field wiring circuits shall be separated at least 1.97 in. (50 mm) from conductors of any incendive field wiring circuits, or as specified in Section 501-4(b)(a)(2).
b. All conductors shall be secured so that any conductor that might come loose from a terminal cannot come in contact with another terminal.
FPN No. 1: The use of separate wiring compartments for the nonincendive field wiring and incendive field wiring terminals is the preferred method of complying with this requirement.
FPN No. 2: Physical barriers such as grounded metal partitions or approved insulating partitions or approved restricted access wiring ducts separated from other such ducts by at least ≤ in. (19 mm) can be used to help ensure the required separation of the wiring.
(b) From Different Nonincendive Field Wiring Circuit Conductors. Different nonincendive field wiring circuits shall be in separate cables or shall be separated from each other by one of the following means.
1. The conductors of each circuit are within a grounded metal shield.
2. The conductors of each circuit have insulation with a minimum thickness of 0.01 in. (254 µm).
Exception: Unless otherwise approved.
SUBSTANTIATION: Apart from the exception in 501-4(b) the current version of the Code does not give any guidance on wiring for nonincendive field wiring circuits. An examination of nonincendive field wiring takes into consideration the faults of opening, shorting, and grounding of the field wiring. When applied to multiple conductor applications such as programmable logic controllers [PLCs] this type of approach can lead to output parameters for the devices which render them unusable. The current version of the Code requires the examination to include situations which, cannot be determined by the manufacturer of the

equipment or an NRTL. The installer could determine these parameters but how many would actually consider these in the case where multiple nonincendive circuits are run in a single cable. The situation is similar to that for intrinsically safe wiring, and the proposed text is based on that in Article 504-30.
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 14-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3528)

14- 219 - (502-4(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(b) Class II, Division 2. In Class II, Division 2 locations, rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, Type MC or MI cable with ~~approved~~ (identified) termination fittings, Type PLTC in cable trays, Type ITC in cable trays, or Type MC, MI, or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables, shall be the wiring method employed.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #4239)

14- 220 - (502-4(b), Exception): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise by deleting the word "ordinary" and replacing it with the word "unclassified."
SUBSTANTIATION: This is the technically correct term. This was proposal 14-208 in the prior cycle, one of four proposals that the panel accepted in the ROP, forgot about, and inadvertently wiped out through unrelated editorial activity in the comment period.
PANEL ACTION: Accept in Principle.
The definition of "ordinary" has been modified to "nonhazardous". See Proposal 14-2a.
In Exception No. 1 to 502-4(b), after the word "locations", add the words "including Chapter 7 and 8 wiring methods."
PANEL STATEMENT: Proposal 14-2a addresses this issue. The added words correlate with Article 501 requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: The panel action should be "Accept". See my comments on Proposal 14-2a.
GOODMAN: The proposal should be "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification with respect to the term "Unclassified" as a replacement for "Nonhazardous". The correct term is "unclassified". Also see detailed comment under Proposal 14-2a.

(Log #2389)

14- 221 - (502-4(b)(1)): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 14-222. This action will be considered by the Panel as a Public Comment.
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise the heading and first sentence as shown below:
(1) ~~Wireways,~~ Fittings, and Boxes. ~~Wireways, f~~Fittings, and boxes in which taps. (balance unchanged)
SUBSTANTIATION: 502-4(b) requires dusttight wireways in Class II, Division 2. Present wording of (1) conflicts with that requirement by permitting wireways "designed to minimize the entrance of dust," which are not necessarily dusttight under the Article 100 definition of that term.
PANEL ACTION: Accept.
PANEL STATEMENT: See Proposal 14-222.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2390)

14- 222 - (502-4(b)(1)): Accept in Principle
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
(1) Wireways, Fittings, and Boxes. Wireways, fittings, and boxes ~~in which taps, joints, or terminal connections are made~~ shall be designed to minimize the entrance of dust. (balance unchanged)
SUBSTANTIATION: A Class II location can be extremely dusty without being Division 1, resulting in dust buildup within enclosures that do not adequately minimize the entrance of dust. The present language does not address fittings and boxes without taps, joints, or terminal connections, and therefor permits standard stamped metal boxes and covers with multiple KO punchings and numerous small holes. This is inconsistent with Section 502-4(b), which requires dusttight wireways in Class II, Division 2, and Section 503-3(a) and (b), which require dusttight boxes and fittings in Class III locations, without regard to taps, joints, or terminal fittings.
PANEL ACTION: Accept in Principle.
Revise 502-4(b)(1) to read: "(1) Boxes and Fittings. All boxes and fittings shall be dust-tight."
PANEL STATEMENT: This more effectively meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1605)

14- 223 - (502-6(a)(1)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(1) Type Required. Switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices that are intended to interrupt current during normal operation or that are installed where combustible dusts of an electrically conductive nature may be present, shall be provided with ~~approved~~ (identified) dust-ignitionproof enclosures.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3529)

14- 224 - (502-6(a)(1)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Type Required. Switches, circuit breakers, motor controllers, and fuses, including pushbuttons, relays, and similar devices that are intended to interrupt current during normal operation or that are installed where combustible dusts of an electrically conductive nature may be present, shall be provided with ~~approved~~ (identified) dust-ignitionproof enclosures.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1606)

14- 225 - (502-6(a)(3)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) Metal Dusts. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fuses, switches, motor controllers, and circuit breakers shall have enclosures specifically ~~approved~~ (identified) for such locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Replace "approved" with "identified" and delete the word "specifically".
PANEL STATEMENT: This word implies a higher level of identification which is not intended by Panel 14. Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3530)

14- 226 - (502-6(a)(3)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(3) Metal Dusts. In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fuses, switches, motor controllers, and circuit breakers shall have enclosures specifically ~~approved~~ (identified) for such locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Replace "approved" with "identified" and delete the word "specifically".
PANEL STATEMENT: This word implies a higher level of identification which is not intended by Panel 14. Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1607)

14- 227 - (502-7(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second sentence to read as follows:
No control transformer, impedance coil, or resistor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present unless provided with an enclosure ~~approved~~ (identified) for the specific location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3531)

14- 228 - (502-7(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"No control transformer, impedance coil, or resistor shall be installed in a location where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present unless provided with an enclosure ~~approved~~ (identified) for the specific location."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific

purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1608)

14- 229 - (502-7(b)(3)): Accept
Note: The Technical Correlating Committee understands that the Exception is to remain as currently written.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) Resistors. Resistors and resistance devices shall have dust-ignitonproof enclosures ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3532)

14- 230 - (502-7(b)(3)): Accept
Note: The Technical Correlating Committee understands that the Exception is to remain as currently written.
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(b) Resistors. Resistors and resistance devices shall have dust-ignitionproof enclosures ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Proposal 14-229 is identical and addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1609)

14- 231 - (502-8(a)(1)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
~~Approved~~ (identified) for Class II, Division 1 locations, or.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "Identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3533)

14- 232 - (502-8(a)(1)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) ~~Approved~~ (Identified) for Class II, Division 1 locations, or.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1610)

14- 233 - (502-10(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Class II, Division 1. In Class II, Division 1 locations, all utilization equipment shall be ~~approved~~ (identified) for Class II locations. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, such equipment shall be ~~approved~~ (identified) for the specific location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3534)

14- 234 - (502-10(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class II, Division 1. In Class II, Division 1 locations, all utilization equipment shall be ~~approved~~ (identified) for Class II locations. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, such equipment shall be ~~approved~~ (identified) for the specific location.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1959)

14- 235 - (502-10(b)(1)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
(1) Heaters. Electrically heated utilization equipment shall be ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3535)

14- 236 - (502-10(b)(1)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Heaters. Electrically heated utilization equipment shall be ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1958)

14- 237 - (502-11(a)(1)): Accept in Principle in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
(1) ~~Approved~~ (Identified) Fixtures. Each fixture shall be ~~approved~~ (identified) for Class II locations and shall be clearly marked to indicate the maximum wattage of the lamp for which it is ~~approved~~ (identified). In locations where dusts from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fixtures for fixed or portable lighting and all auxiliary equipment shall be ~~approved~~ (identified) for the specific location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle in Part.
Delete the first "approved" in title. Replace second and fourth "approved" with "identified". Replace third "approved" with "designed".
PANEL STATEMENT: "Approved" is not necessary in the title. In the third case, the word "designed" is more appropriate. Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3536)

14- 238 - (502-11(a)(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) ~~Approved~~ (Identified) Fixtures. Each fixture shall be approved (identified) for Class II locations and shall be clearly marked to indicate the maximum wattage of the lamp for which it is ~~approved~~ (identified). In locations where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, fixtures for fixed or portable lighting and all auxiliary equipment shall be ~~approved~~ (identified) for the specific location.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-237 is identical and addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1955)

14- 239 - (502-11(a)(3)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the fourth sentence as follows:
Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord ~~approved~~ (identified) for hard usage shall be used, and suitable seals shall be provided where the cord enters the fixture and the outlet box or fitting.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1956)

14- 240 - (502-11(a)(3)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the second sentence to read as follows:
For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or a flexible connector ~~approved~~ (identified) for the location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1957)

14- 241 - (502-11(a)(3)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the first sentence to read as follows:
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with ~~approved~~ (identified) fittings, or by other ~~approved~~ (identified) means.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3537)

14- 242 - (502-11(a)(3)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(3) Pendant Fixtures. Pendant fixtures shall be suspended by threaded rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with ~~approved~~ (identified) fittings, or by other ~~approved~~ (identified) means.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3538)

14- 243 - (502-11(a)(3)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of a fitting or a flexible connector ~~approved~~ (identified) for the location shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3539)

14- 244 - (502-11(a)(3)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise the fourth sentence to read as follows:
"Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord ~~approved~~ (identified) for hard usage shall be used, and suitable seals shall be provided where the cord enters the fixture and the outlet box or fitting. Flexible cord shall not serve as the supporting means for a fixture."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1954)

14- 245 - (502-11(a)(4)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3540)

14- 246 - (502-11(a)(4)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(4) Supports. Boxes, box assemblies, or fittings used for the support of lighting fixtures shall be ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1953)

14- 247 - (502-11(b)(1)): Accept in Principle in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
(1) Portable Lighting Equipment. Portable lighting equipment shall be ~~approved~~ (identified) for Class II locations. They shall be clearly marked to indicate the maximum wattage of lamps for which they are ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle in Part.
Replace the first "approved" with "identified"; replace the second "approved" with "designed".
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3541)

14- 248 - (502-11(b)(1)): Accept in Principle in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Portable Lighting Equipment. Portable lighting equipment shall be ~~approved~~ (identified) for Class II locations. They shall be clearly marked to indicate the maximum wattage of lamps for which they are ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle in Part.
Replace the first "approved" with "identified"; replace the second "approved" with "designed".
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1952)

14- 249 - (502-11(b)(2)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the first sentence to read as follows:
(2) Fixed Lighting. Lighting fixtures for fixed lighting, where not of a type ~~approved~~ (identified) for Class II locations, shall provide enclosures for lamps and lampholders that shall be designed to minimize the deposit of dust on lamps and to prevent the escape of sparks, burning material, or hot metal.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3542)

14- 250 - (502-11(b)(2)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(2) Fixed Lighting. Lighting fixtures for fixed lighting, where not of a type ~~approved~~ (identified) for Class II locations, shall provide enclosures for lamps and lampholders that shall be designed to minimize the deposit of dust on lamps and to prevent the escape of sparks, burning material, or hot metal.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1949)

14- 251 - (502-11(b)(4)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the third sentence as follows:
Where wiring between an outlet box or fitting and a pendent fixture is not enclosed in conduit, flexible cord ~~approved~~ (identified) for hard usage shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1950)

14- 252 - (502-11(b)(4)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the second sentence as follows:
For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an ~~approved~~ (identified) fitting or a flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1951)

14- 253 - (502-11(b)(4)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the first sentence as follows:
(4) Pendant Fixtures. Pendant fixtures shall be suspended by thread rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with ~~approved~~ (identified) fittings, or by other ~~approved~~ (identified) means.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3543)

14- 254 - (502-11(b)(4)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(4) Pendant Fixtures. Pendant fixtures shall be suspended by thread rigid metal conduit stems, threaded steel intermediate metal conduit stems, by chains with ~~approved~~ (identified) fittings, or by other ~~approved~~ (identified) means.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction

would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3544)

14- 255 - (502-11(b)(4)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
For rigid stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an ~~approved~~ (identified) fitting or a flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3545)

14- 256 - (502-11(b)(4)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the third sentence to read as follows:
"Where wiring between an outlet box or fitting and a pendant fixture is not enclosed in conduit, flexible cord ~~approved~~ (identified) for hard usage shall be used. Flexible cord shall not serve as the supporting means for a fixture."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved' to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2387)

14- 257 - (502-12, Exception (New)): Accept in Principle
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Add the following Exception:
Exception: Flexible cord approved for hard usage shall be permitted between an outlet box or fitting and a pendant fixture, as provided by Sections 502-11(a)(3) and 502-11(b)(4).
SUBSTANTIATION: The present requirement of this section for the use of extra-hard usage cord in Class II locations conflicts with those that permit hard-usage flexible cord for fixture pendants under Sections 502-11(a)(3) and 502-11(b)(4).
PANEL ACTION: Accept in Principle.
Add an exception to 502-12(1) to read: "Flexible cord listed for hard usage as permitted by Sections 502-11(a)(3) and (b)(4)."
PANEL STATEMENT: The panel's version simplifies the langauge and inserts the exception in the correct location in code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.

(Log #1948)

14- 258 - (502-12(1)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
(1) Be of a type ~~approved~~ (identified) for extra-hard usage,...
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3546)

14- 259 - (502-12(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"(1) Be of a type ~~approved~~ (identified) for extra-hard usage,".
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1947)

14- 260 - (502-12(3)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise as follows:
(3) Be connected to terminals or to supply conductors in an ~~approved~~ (identified) manner,...
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3547)

14- 261 - (502-12(3)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"(3) Be connected to terminals or to supply conductors in an ~~approved~~ (identified) manner,".
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1611)

14- 262 - (502-13(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
In Class II, Division 1 locations, receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of the flexible cord and shall be ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3548)

14- 263 - (502-13(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class II, Division 1. In Class II, Division 1 locations, receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of the flexible cord and shall be ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1612)

14- 264 - (502-14(a)(2)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
Switches, circuit breakers, relays, contactors, fuses and current-breaking contacts for bells, horns, howlers, sirens, and other devices in which sparks or arcs may be produced shall be provided with enclosures ~~approved~~ (identified) for a Class II location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3549)

14- 265 - (502-14(a)(2)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"Switches, circuit breakers, relays, contactors, fuses and current-breaking contacts for bells, horns, howlers, sirens, and other devices in which sparks or arcs may be produced shall be provided with enclosures ~~approved~~ (identified) for Class II location."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1613)

14- 266 - (502-14(a)(3)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first paragraph to read as follows:
Resisters, transformers, choke coils, rectifiers, thermionic tubes, and other heat-generating equipment shall be provided with enclosures ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3550)

14- 267 - (502-14(a)(3)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first paragraph to read as follows:
"Resistors, transformers, choke coils, rectifiers, thermionic tubes, and other heat-generating equipment shall be provided with enclosures ~~approved~~ (identified) for Class II locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1614)

14- 268 - (502-14(a)(5)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
Where dusts are of a combustible, electrically conductive nature, all wiring and equipment shall be ~~approved~~ (identified) for Class II locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3551)

14- 269 - (502-14(a)(5)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"Where dusts are of a combustible, electrically conductive nature, all wiring and equipment shall be ~~approved~~ (identified) for Class II locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1615)

14- 270 - (502-14(a)(6)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(6) Metal Dusts. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, all apparatus and equipment shall be ~~approved~~ (identified) for the specific conditions.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3552)

14- 271 - (502-14(a)(6)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(6) Metal Dusts. Where dust from magnesium, aluminum, aluminum bronze powders, or other metals of similarly hazardous characteristics may be present, all apparatus and equipment shall be ~~approved~~ (identified) for the specific location.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1616)

14- 272 - (502-16(a)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
The locknut-bushing and double-locknut types of contact shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other ~~approved~~ (identified) means of bonding shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2388)

14- 273 - (502-16(a)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
(a) Bonding. Standard locknuts or bushings ~~The locknut-bushing, and double-locknut types of contacts~~ shall not be depended on for bonding purposes~~, but bonding jumpers with proper fittings or other approved means of bonding shall be used~~; bonding shall comply with Sections 250-100 and 250-94. (Balance of paragraph and exception unchanged)
~~FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.~~
SUBSTANTIATION: Present wording conflicts with Section 250-94, which is referenced by Section 250-100. Taken literally, it does not require bonding for standard locknuts that are employed to secure threadless connectors to enclosures, nor around concentric or eccentric knockouts that may not be suitable for bonding, as required under Section 250-94. May also be interpreted to prohibit the use of bonding locknuts and bushings, which are acceptable under Section 250-94. (The balance of this paragraph and the exception are also unnecessary if submitter's proposal for Section 250-100 is accepted).
PANEL ACTION: Reject.
PANEL STATEMENT: These requirements are more stringent than those in Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-191.

(Log #3553)

14- 274 - (502-16(a)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"The locknut bushing and double-locknut types of contact shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other ~~approved~~ (identified) means of bonding shall be used."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

ARTICLE 503 — CLASS III LOCATIONS

(Log #1261)

14- 275 - (503): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In 503-7, change "0.021 in. (533 µm)" to "0.53 mm (0.021 in.)".
In 503-9(c), change "12 in. (305 mm)" to "300 mm (12 in.)" in three places.
In 503-16(b), Exception (a), change "6 ft (1.83 m)" to "1.8 m (6 ft)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Reject.
PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.
OMEARA: The proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #1617)

14- 276 - (503-3(a)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(a) Class III, Division 1. In Class III, Division 1 locations, the wiring method shall be rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, or Type MC or MI cable with ~~approved~~ (identified) termination fittings.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3554)

14- 277 - (503-3(a)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(a) Class III, Division 1. In Class III, Division 1 locations, the wiring method shall be rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, dusttight wireways, or Type MC or MI cable with ~~approved~~ (identified) termination fittings.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1618)

14- 278 - (503-3(a)(2)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with ~~approved~~ (identified) fittings, liquidtight flexible nonmetallic conduit with ~~approved~~ (identified) fittings, or flexible cord in conformance with Section 503-10 shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3555)

14- 279 - (503-3(a)(2)): Accept in Principle
NOTE: The Technical Correlating Committee understands that the word "liquidtight" was inadventently omitted from the second line in the Recommendation.
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"Where necessary to employ flexible connections, dusttight flexible connectors, liquidtight flexible metal conduit with ~~approved~~ (identified) fittings, or flexible nonmetallic conduit with ~~approved~~ (identified) fittings, or flexible cord in conformance with Section 503-10 shall be used."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed fittings are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2852)

14- 280 - (503-3(b)): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Revise as follows:
Exception No 2: Nonincendive field wiring shall be permitted using any of the methods suitable for wiring in ordinary locations.
Separation of Nonincendive Field Wiring Conductors
(a) From Nonincendive Field Wiring Conductors.
(3) Open Wiring. Conductors and cables of nonincendive field wiring circuits not in raceways or cable trays shall be separated at least 1.97 in. (50 mm) and secured from conductors and cables of any other wiring.
Exception: Where either (1) all of the nonincendive field wiring circuit conductors are in Type MI or MC cables or (2) all of the other circuit conductors are in raceways or Type MI or MC cables where the sheathing or cladding is capable of carrying fault current to ground.
(4) In Raceways, Cable Trays, and Cables. Conductors of nonincendive field wiring circuits shall not be placed in any raceway, cable tray, or cable with conductors of any other wiring.
Exception No. 1: Where conductors of nonincendive field wiring circuits are separated from conductors of incendive field wiring circuits by a distance of at least 1.97 in. (50 mm) and secured, or by a grounded metal partition or an approved insulating partition.
FPN: No. 20 gauge sheet metal partitions 0.0359 in. (912 µm) or thicker are generally considered acceptable.
Exception No. 2: Where either (1) all of the nonincendive field wiring circuit conductors or (2) all of the other wiring conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.
FPN: Cables meeting the requirements of Articles 330 and 334 are typical of those considered acceptable.
(3) Within Enclosures.
a.) Conductors of nonincendive field wiring circuits shall be

separated at least 1.97 in. (50 mm) from conductors of any other field wiring, or as specified in Section 503-(?)(a)(2).

b.) All conductors shall be secured so that any conductor that might come loose from a terminal cannot come in contact with another terminal.

FPN No. 1: The use of separate wiring compartments for the nonincendive field wiring and other field wiring terminals is the preferred method of complying with this requirement.

FPN No. 2: Physical barriers such as grounded metal partitions or approved insulating partitions or approved restricted access wiring ducts separated from other such ducts by at least ≤ in. (19 mm) can be used to help ensure the required separation of the wiring.

(b) From Different Nonincendive Field Wiring Circuit Conductors. Different nonincendive field wiring circuits shall be in separate cables or shall be separated from each other by one of the following means.

1. The conductors of each circuit are within a grounded metal shield.

2. The conductors of each circuit have insulation with a minimum thickness of 0.01 in. (254 µm).

Exception: Unless otherwise approved.

SUBSTANTIATION: Apart from the exception in 501-4(b) the current version of the Code does not give any guidance on wiring for nonincendive field wiring circuits. An examination of nonincendive field wiring takes into consideration the faults of opening, shorting, and grounding of the field wiring. When applied to multiple conductor applications such as programmable logic controllers [PLCs] this type of approach can lead to output parameters for the devices which render them unusable. The current version of the Code requires the examination to include situations which, cannot be determined by the manufacturer of the equipment or an NRTL. The installer could determine these parameters but how many would actually consider these in the case where multiple nonincendive circuits are run in a single cable. The situation is similar to that for intrinsically safe wiring, and the proposed text is based on that in Article 504-30. ANSI/ISA S12.12:1994 has requirements which make no distinction between Class.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel believes that there is no technical justification given for separatiion of conductors above what is required in nonhazardous locations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1619)

14- 281 - (503-8(a)): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise to read as follows:

(a) Heaters. Electrically heated utilization equipment shall be ~~approved~~ (identified) for Class III locations.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3556)

14- 282 - (503-8(a)): Accept

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

(a) Heaters. Electrically heated utilization equipment shall be ~~approved~~ (identified) for Class III locations.

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1620)

14- 283 - (503-9(c)): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise second sentence to read as follows:

For stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an ~~approved~~ (identified) fitting or a flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3557)

14- 284 - (503-9(c)): Accept

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise the second sentence to read as follows:

"For stems longer than 12 in. (305 mm), permanent and effective bracing against lateral displacement shall be provided at a level not more than 12 in. (305 mm) above the lower end of the stem, or flexibility in the form of an ~~approved~~ (identified) fitting or a flexible connector shall be provided not more than 12 in. (305 mm) from the point of attachment to the supporting box or fitting."

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction

would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1621)

14- 285 - (503-10(1)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
Be of a type ~~approved~~ (identified) for extra-hard usage;.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3558)

14- 286 - (503-10(1)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(1) Be of a type ~~approved~~ (identified) for extra-hard usage;
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1622)

14- 287 - (503-10(3)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
(3) Be connected to terminals or to supply conductors in an ~~approved~~ (identified) manner;.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3559)

14- 288 - (503-10(3)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
(3) Be connected to terminals or to supply conductors in an ~~approved~~ (identified) manner;
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #921)

14- 289 - (503-13(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Power Supply. Power supply to contact conductors shall be electrically isolated from all other systems and ungrounded, and shall be equipped with an acceptable ground detector that will give an alarm... (remainder unchanged).
SUBSTANTIATION: Editorial. "Isolated" while perhaps understood does not specifically mean ungrounded. Separately derived systems from isolating or isolated secondaries of transformers are required to be grounded by certain Code sections, and ungrounded by some sections. Sections 668-20(b) and 668-21(a) for example clearly specify an ungrounded secondary, which is apparently the intent.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes the present text is clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1794)

14- 290 - (503-14): Accept
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Revise the second sentence to read as follows:
"The rooms shall be constructed to prevent the entrance of ignitable amounts of flyings or lint and shall be well ventilated."
SUBSTANTIATION: The present language is unclear as to what is to be prevented. Either the entrance or accumulation of ignitable amounts is probably intended but neither requirement is stated.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1623)

14- 291 - (503-16(a)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other ~~approved~~ (identified) means of bonding shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2391)

14- 292 - (503-16(a)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
(a) Bonding. Standard locknuts or bushings ~~The locknut-bushing, and double locknut types of contacts~~ shall not be depended on for bonding purposes~~, but bonding jumpers with proper fittings or other approved means of bonding shall be used~~; bonding shall comply with Sections 250-100 and 250-94. (Balance of paragraph and exception unchanged)
~~FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.~~
SUBSTANTIATION: Present wording conflicts with Section 250-94, which is referenced by Section 250-100. Taken literally, it does not require bonding for standard locknuts that are employed to secure threadless connectors to enclosures, nor around concentric or eccentric knockouts that may not be suitable for bonding, as required under Section 250-94. May also be interpreted to prohibit the use of bonding locknuts and bushings, which are acceptable under Section 250-94. (The balance of this paragraph and the exception are also unnecessary if submitter's proposal for Section 250-100 is accepted).
PANEL ACTION: Reject.
PANEL STATEMENT: These requirements are more stringent than those in Article 250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-191.

(Log #3560)

14- 293 - (503-16(a)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other ~~approved~~ (identified) means of bonding shall be used."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

ARTICLE 504 — INTRINSICALLY SAFE SYSTEMS

(Log #1262)

14- 294 - (504): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In 504-30(a)(1), change "1.97 in. (50 mm)" to "50 mm (2 in.)".
In 504-30(a)(2), Exception, change "1.97 in. (50 mm)" to 50 mm (2 in.)".
In 504-30(a)(2), Exception, FPN, change "0.0359 in. (912 µm)" to "0.91 mm (0.0359 in.)".
In 504-30(a)(3)(a), change "1.97 in. (50 mm)" to "50 mm (2 in.)".
In 504-30(a)(3)(b), FPN No. 2, change "3/4 in. (19 mm)" to "19 mm (3/4 in.)".
In 504-30(b)(2), change "0.01 in. (254 µm)" to "0.25 mm (0.01 in.)."
In 504-80(b), change "25 ft (7.62 m)" to "7.5 m (25 ft)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Reject.
PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.
OMEARA: The proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #CP1406)

14- 294a - (504-2): Accept
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee further directs that the action on this Proposal be rewritten to comply with the NEC Style Manual, with respect to the use of mandatory language in Fine Print Notes. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 14
RECOMMENDATION: Replace existing definition of "simple apparatus" with the following:
"An electrical component or combination of components of simple construction with well-defined electrical parameters which does not generate more than 1.5 volt, 100 milliamps and 25 milliwatts, or a passive component which does not dissipate more than 1.3 watts and which is compatible with the intrinsic safety of the circuit in which it is used.
FPN 1: The following apparatus are examples of simple apparatus: a) passive components, for example switches, junction boxes,

resistance temperature devices and simple semiconductor devices such as LED's;
b) sources of generated energy, for example thermocouples and photocells, which do not generate more than 1.5 V, 100 mA and 25 mW.
FPN 2: Simple apparatus should conform to all relevant requirements of ANSI/UL913 but need not be listed. In particular, the following aspects should always be considered.
a) simple apparatus should not achieve safety by the inclusion of voltage and/or current limiting and/or suppression devices;
b) simple apparatus should not contain any means of increasing the available voltage or current, for example circuits for the generation of ancillary power supplies;
c) when simple apparatus is located in the hazardous location, it should be temperature classified. When used in an intrinsically safe circuit within their normal rating and at a maximum ambient temperature of 40°C switches, plugs and sockets and terminals are allocated a T4 temperature classification for Class I Division 1 Group A, B, C, and D or Class I Zone 1 Group IIC applications. Where simple apparatus forms part of an apparatus containing other electrical circuits, the whole should be listed.
FPN 3 - Sensors which utilise catalytic reaction or other electro-chemical mechanisms are not normally simple apparatus. Specialist advice on their application should be sought."
SUBSTANTIATION: The 1999 Edition of IEC 60079-11 defines simple apparatus as
3.11 simple apparatus
An electrical component or combination of components of simple construction with well-defined electrical parameters which is compatible with the intrinsic safety of the circuit in which it is used.
This is then amplified by the following clause.
5.4 Simple apparatus
The following apparatus shall be considered to be simple apparatus:
a) passive components, for example switches, junction boxes, resistors and simple semiconductor devices;
b) sources of stored energy with well defined parameters, for example capacitors or inductors, whose values shall be considered when determining the overall safety of the system;
c) sources of generated energy, for example thermocouples and photocells, which do not generate more than 1,5 V, 100 mA and 25 mW. Any inductance or capacitance present in these sources of energy shall be considered as in b).
Simple apparatus shall conform to all relevant requirements of this standard but need not be certified and need not comply with clause 12. In particular, the following aspects shall always be considered.
a) simple apparatus shall not achieve safety by the inclusion of voltage and/or current limiting and/or suppression devices;
b) simple apparatus shall not contain any means of increasing the available voltage or current, for example circuits for the generation of ancillary power supplies;
c) where it is necessary that the simple apparatus maintains the integrity of the isolation from 'earth' of the intrinsically-safe circuit, it shall be capable of withstanding the test voltage to earth in accordance with 6.4.12. Its terminals shall conform to 6.3.1;
d) non metallic enclosures and enclosures containing light metals when located in the hazardous area shall conform to 7.3 and 8.1 of IEC 60079-0, 1998;
e) when simple apparatus is located in the hazardous area, it shall be temperature classified. When used in an intrinsically safe circuit within their normal rating and at a maximum ambient temperature of 40°C switches, plugs and sockets and terminals are allocated a T6 temperature classification for Group II applications and considered as having a maximum surface temperature of 85°C for Group I applications. Other types of simple apparatus shall be temperature classified in accordance with clauses 4 and 6 of this standard.
Where simple apparatus forms part of an apparatus containing other electrical circuits, the whole shall be certified.
NOTE - Sensors which utilize catalytic reaction or other electro-chemical mechanisms are not normally simple apparatus. Specialist advice on their application should be sought.
In the past, no technical justification has been available from the IEC for the change from the previous definition of 1.3 volts, 0.1 ampere, 25 milliwatts, or 20 microjoules. [I don't know why there is the difference between the US (1.2V) and IEC (1.3V) voltages] The original choice of 1.2 V was, I believe, made in the UK in the 1960's. It was possibly chosen because it was 10% of the 12 volt threshold voltage of hydrogen and unlikely to cause a serious degradation of the safety of an intrinsically safe circuit. The 1.3 V was introduced by CENELEC in 1977 with the publication of the 1st edition of EN50020. A proposal was accepted for the 1994 2nd edition of EN 50020 to change the parameters for simple apparatus. The arguments in favor of changing the definition are that the 1.2 volt limit excludes the use of some silicon solar cells and the possibility of using two silicon diodes in series to suppress the output from a circuit. This combination is frequently used to create apparatus, which although certified has input parameters equivalent to simple apparatus.
The relaxation permits some single cell batteries theoretically but the 25mW/100mA restriction confines the available choice to a very restricted few.
The original 20 mJ requirement is difficult to defend. Adding 20 mJ to a Group A, B circuit, which may be already near its limits, could remove the safety factor of 1.5; yet it is arguably restrictive in Class I Group C, D. It seems reasonable to take into account the known capacitance and inductance since this adequately ensures safety and is accepted practice for cables.
If it is retained, the 20 mJ should have an associated time. A thermocouple producing 10 mV and 1 mA generates 20 microjoules in 2 seconds and hence is excluded by this requirement. 25 mW requires 800 mS and 100 mA and 1.2 V 167 mS.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
COOK: I agree with the definition, but have concerns about FPN 2 and FPN 3. FPN 2 contains information that borders on being requirements which are prohibited from being located in a FPN. The second sentence in FPN 3 causes me great concern. As an authority having jurisdiction, I am not sure who would qualify as a specialist, and I am not sure about equipment that I need to seek a specialist for its application.
JAGUNICH: See ballot for David Wechsler.

(Log #3564)

14- 295 - (504-2): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the third paragraph to read as follows:
"Different intrinsically safe circuits are intrinsically safe circuits in which the possible interconnections have not been evaluated and ~~approved~~ (identified) as intrinsically safe."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2528)

14- 296 - (504-2-Control Drawing): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 1 for information. Companion Proposal 1-121 was rejected by Code-Making Panel 1.
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Control Drawing. A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus that details the allowed interconnections between the intrinsically safe and associated apparatus.

SUBSTANTIATION: Move to Article 100, and modify this definition to allow the term Control Drawing to be used with both intrinsic safety and nonincendive field wiring.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no proposed action.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1624)

14- 297 - (504-2-Different Intrinsically Safe Circuits): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise third paragraph to read as follows:
Different intrinsically safe circuits are intrinsically safe circuits in which the possible interconnections have not been evaluated and ~~approved~~ (identified) as intrinsically safe.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3235)

14- 298 - (504-2-Intrinsically Safe Circuit): Reject
SUBMITTER: Sukanta Sengupta, FMC Corp.
RECOMMENDATION: Add a new paragraph after the first paragraph.
"For Class I and II, Division 2 locations nonincendive circuits are same as intrinsically safe circuits."
SUBSTANTIATION: Insrinsically safe circuits and nonincendive circuits are tested in the same manner in normal conditions(Division 2 conditions).
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's proposal and substantiation is incorrect.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1540)

14- 299 - (504-2-Simple Apparatus): Reject
SUBMITTER: Thomas J. Conlan, Conlan's "The Electrician Inc."
RECOMMENDATION: Revise to read as follows:
Simple Apparatus. A device that will neither generator nor store more than 1.2 volts, 0.1 ampere, ~~25~~ milliwatts or 20 micro joules.
SUBSTANTIATION: Volts times amps = watts
Change to = A device that will neither generate nor store more than 1.2 volts AC/DC, 0.1 ampere, 12 milliwatts or 20 micro joules.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's proposal and substantiation is incorrect. The energy values are not the product of the voltage and the current limits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1625)

14- 300 - (504-4): Accept
Note: The Technical Correlating Committee understands that the Exception will remain as currently written.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
504-4. Equipment Approval. All intrinsically safe apparatus and associated apparatus shall be ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3565)

14- 301 - (504-4): Accept
Note: The Technical Correlating Committee understands that the Exception will remain as currently written.
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
504-4. Equipment Approval. All intrinsically safe apparatus and associated apparatus shall be ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1946)

14- 302 - (504-4, Exception): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise to read as follows:
Exception: Simple apparatus, as described on the control drawing, shall not be required to be ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Principle.
Use the word "listed" instead of identified.
PANEL STATEMENT: "Approved" is not the correct word to be used in this context.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: This proposal was made in a hurry along with the 150 + — proposals dealing with the term "approved". I believe that the proposal should be rejected and that Proposal 14-303 should be accepted. I do not believe that a Code suitable for adoption will usurp that jurisdiction's authority to establish criteria for acceptability of equipment.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3991)

14- 303 - (504-4, Exception): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Delete Section 504-4 Exception:
~~Exception: Simple apparatus, as described on control drawing, shall not be required to be approved.~~
SUBSTANTIATION: Based on Section 110-2 of the NEC, which requires all equipment required or permitted by the NEC to be approved, and the fact that this document is intended for adoption in laws that would be enforced by authorities having jurisdiction, it does not seem acceptable to have a rule that denies the authority having jurisdiction the ability to determine the acceptability of equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: See Panel action on Proposal 14-302.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with the Panel Action . See substantiation and my negative comment on Proposal 14-302.

(Log #401)

14- 304 - (504-10(b)): Reject
SUBMITTER: John Strelow, Oseco, Inc.
RECOMMENDATION: Add the following paragraph to 504-10(b):
Simple apparatus shall be permitted to be installed in hazardous (classified) locations only if installed in intrinsically safe circuits.
SUBSTANTIATION: We make a simple apparatus (burst disk alarm sensor) and this issue has come up several times. (Can a simple apparatus be installed in a hazardous location?).
PANEL ACTION: Reject.
PANEL STATEMENT: Article 504 covers intrinsically safe circuits and does not need to be repeated here.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1626)

14- 305 - (504-10(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
Intrinsically safe apparatus shall be permitted to be installed in any hazardous (classified) locations for which it has been ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1627)

14- 306 - (504-10(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second paragraph to read as follows:
Associated apparatus shall be permitted to be installed in any hazardous (classified) location for which it has been ~~approved~~ (identified), or if protected by other means permitted by Articles 501 through 503 and 505.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3566)

14- 307 - (504-10(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"Intrinsically safe apparatus shall be permitted to be installed in any hazardous (classified) locations for which it has been ~~approved~~ (identified)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3567)

14- 308 - (504-10(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second paragraph to read as follows:
"Associated apparatus shall be permitted to be installed in any hazardous (classified) location for which it has been ~~approved~~ (identified), or if protected by other means permitted by Articles 501 through 503 and 505."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1945)

14- 309 - (504-30(2) Exception No. 1): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception No. 1: Where conductors of intrinsically safe circuits are separated from conductors of nonintrinsically safe circuits by a distance of at least 1.97 in. (50 mm) and secured, or by a grounded metal partition or an ~~approved~~ (identified) insulating partition.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word to use in this context.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with both the proposal and the Panel Action. I agree that an insulating partition would not be identified, however the term "approved" should be deleted. Partitions are not means, methods or manners that need some special attention. I do not believe any additional approval, other than required by 110-2, is needed.

(Log #3561)

14- 310 - (504-30(a)(2) Exception No. 1): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception No. 1: Where conductors of intrinsically safe circuits are separated from conductors of nonintrinsically safe circuits by a distance of at least 1.97 in. (50 mm) and secured, or by a grounded metal partition or an ~~approved~~ (identified) insulating partition.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word to use in this context.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-309.

(Log #1944)

14- 311 - (504-30(a)(3)(b), FPN No. 2): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
FPN No. 2: Physical barriers such as grounded metal partions or ~~approved~~ (identified) insulating partitions or ~~approved~~ (identified) restricted access wiring ducts separated from other such ducts by at least 3/4 in. (19 mm) can be used to help ensure the required separation of the wiring.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word to use in this context.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See negative comment on Proposal 14-310 for partitions. Restricted access wiring ducts are certainly identified and available with listings from many manufacturers under category (ZOYX) in the UL Green Book.

(Log #3562)

14- 312 - (504-30(a)(3)(b), FPN No. 2): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the fine print note to read as follows:
FPN No. 2: Physical barriers such as grounded metal partitions or ~~approved~~ (identified) insulating partitions or ~~approved~~ (identified) restricted access wiring ducts separated from other such ducts by at least 3/4 in. (19 mm) can be used to help ensure the required separation of the wiring.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the appropriate word to use in this context.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-311.

(Log #1943)

14- 313 - (504-30(b), Exception): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception: Unless otherwise ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3563)

14- 314 - (504-30(b), Exception): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception: Unless otherwise ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #922)

14- 315 - (504-60(b)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) ~~Nonhazardous~~ unclassified locations in unclassified ~~nonhazardous~~ locations where metal raceways, cables, cable trays, or auxiliary gutters are used for intrinsically safe system wiring and extended into hazardous (classified) locations ~~associated apparatus shall be bonded~~ bonding shall be in accordance with sections 501-16(a); 502-16(a); 503-16(a); or 505-25 as applicable.
SUBSTANTIATION: The proposal is intended for clarification of intent. Nonhazardous and hazardous are not specific per code intent and can literally apply to locations not related to classified or unclassified locations. Bonding should not be limited to raceways and apparatus which is not defined.
PANEL ACTION: Accept in Principle in Part.
Revise 504-60(b) to read: "(b) Unclassified or Nonhazardous Locations. In unclassified or nonhazardous locations . . .hazardous (classified) locations . . ."
PANEL STATEMENT: This implements the new definitions accepted under Proposal 14-352. The additional text was not accepted because cable trays and auxiliary gutters are covered elsewhere in the code and cables do not require bonding.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: The panel action should be "Accept in Part". See my comments on Proposal 14-2a for use of the term "unclassified."
GOODMAN: This proposal should be "Accept in Part" and not "Accept in Principle in Part". The Panel Action is contrary to the submitter's intent and justification with respect to the term "Unclassified" as a replacement for "Nonhazardous". The correct term is "unclassified". Also see detailed comments under Proposal 14-2a.

(Log #2135)

14- 316 - (504-60(b)): Accept in Principle in Part
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Replace "nonhazardous" with "unclassified" in 2 places.
SUBSTANTIATION: This is a companion to other proposals which provide a definition of unclassified in Articles 100, 500, and 505, and provides correlation. The term "Classified" refers to the type of material/hazard potential involved, i.e., Class I, Division 1, Class II, Division 2, etc. Terms such as nonhazardous and unclassified are used in both the NEC, the Uniform Building Code (UBC) and other NFPA documents. The term nonhazardous infers that the area has "no" hazards while the term "unclassified" more clearly correlates with the condition of being reviewed but found not to need classification. This action provides needed correlation with other NFPA documents, such as NFPA 497. Additionally the term "nonhazardous" is used 7 times within various parts of the NEC and in at least one place in the NEC the meaning of nonhazardous applies to voltages and not classification. A companion proposal has been made to change the term "nonhazardous" to "unclassified" as appropriate elsewhere in the NEC.
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: The action on Proposal 14-315 addresses these issues.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: The panel action should be "Accept". See my comments on Proposal 14-2a.
GOODMAN: This proposal should be "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification with respect to the use of the terms "Unclassified" and "Nonhazardous". This proposal along with the other companion proposals referenced in the submitter's substantiation are designed to remove the term "nonhazardous" from the NEC, not add and define the term. Also see additional comments under Proposal 14-318a.

(Log #2392)

14- 317 - (504-80(b)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
(b) Wiring. Raceways, cable trays, and ~~open wiring~~ cables. (balance unchanged)
SUBSTANTIATION: "Open wiring" (unless the intent is open wiring on insulators) is not one of the wiring methods "suitable for unclassified locations" which Section 504-20 requires to be used for intrinsically safe circuits. "Cables" seems more appropriate.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes that 504-30(a)(1) allows cables to be run as open wiring.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I agree with the submitter's proposal and substantiation.

(Log #4014)

14- 318 - (504-80(b)): Reject
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: This proposal is to revise part (b) to read as follows:
Article 504-80(b) Wiring. Raceways, cable trays, and open wiring for intrinsically safe system wiring shall be identified with permanently affixed labels with the wording "WARNING-Instrinsic Safe Wiring-Keep all wiring methods 2 in. away". The labels shall be so located so as to be visible after installation and placed so that they may be readily traced through the entire length of the installation. Spacing between labels shall not be more than 10 ft.
SUBSTANTIATION: There is never a problem installing an intrinsic safe system initially. However, chances are, the next electrician, data technician, maintenance worker, or telephone technician will not know what an intrinsic safe system is. With this in mind, it would be reasonable to expect these people would not be aware of any special requirements that this system is subject to.
Previous code panels have amended certain warning signs to include some type of command as well as a warning or danger. A simple sign that reads as follows: "DANGER-HIGH VOLTAGE" was subsequently changed to "DANGER-HIGH VOLTAGE-KEEP OUT". An accident probably occurred in the above example and that is why a simple command is now included.
The simple labeling of the cables in a intrinsically safe system is not adequate. The label should include some type of warning, some type of identification as to the hazard, and then finally some type of direction or command. Most workers would not be familiar enough with this wiring system to know that they have to stay at least 2 in. away with their own wiring method. A label identified as "WARNING-Intrinsic Safe Wiring-Keep all wiring methods 2 in. away" would meet this criteria.
The distance of 25 ft is inadequate. When an installer or technician runs their cables above a drop ceiling, it is usually very dark. The distance that one can see above a dark drop veiling is limited, probably to no more than 10 ft. By placing a 10 ft maximum distance between labels, this would assure future installers of a possible hazard yet it would also aid them in their installation.
I would think future installations in the areas around intrinsic safe wiring are difficult to police and would suggest that this type of labeling system may prevent confusion and limit liability.
PANEL ACTION: Reject.
PANEL STATEMENT: This is already addressed in 504-30.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I agree with the submitter's substantiation and do not believe that the additional labeling requirements would be an extreme burden on anyone.
WELDON: The submitter emphasizes that his concerns are not initial installations but rather what follows. This is especially true today as we find more and more inexperienced people doing various electrical upgrades, additions, teledata, and telecomm installations.
The code presently requires labeling intrinsically safe wiring with labels spaced not more than 25 feet that read, "intrinsic safety wiring". The submitter suggests that these labels should read, "Warning - intrinsic safe wiring - keep all wiring methods 2 inches away." He also suggests the space be reduced to 10 feet.
I believe this makes good sense. I regularly see various cables, conductors, and even raceways, haphazardly thrown or pushed through ceilings, strewn as though blown with a wind, literally tied in knots and twists; intertwined like spaghetti running in all directions. Increased warning may at least raise the consciousness of inexperienced under trained people to the possibility of needed caution.

ARTICLE 505 — CLASS I, ZONE 0, 1, AND 2 LOCATIONS

(Log #1263)

14- 319 - (505): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: **In 505-3(b), change the first sentence to read:**
"**All threaded conduit referred to herein shall be threaded with an NPT standard conduit cutting die that provides ~~3/4 in.~~ a taper of 1 in 16 ~~per foot.~~**"
In 505-15(a)(2), change "10 ft (3.05 m)" to "3.0 m (10 ft)".
In 505-15(a)(2), Exception, change "12 in. (305 mm)" to "300 mm (12 in.)".
In Table 505-15, reverse the order of columns for "in." and "mm" as shown below.

Table 505-15. Minimum Distance of Obstruction from Flameproof "d" Flange Openings

	Minimum Distance	
Gas Group	mm	in.
IIC	40	1 37/64
IIB	30	1 3/16
IIA	10	25/64

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Reject.
PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.
OMEARA: The proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #CP1402)

14- 318a - (505): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. Further, it was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel, with further consideration given to the comments expressed in the voting, specifically with respect to comments that the accepted Proposal does not accurately reflect what was agreed upon by the Panel. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-323, 14-324, 14-325, 14-326 14-327, 14-328, 14-329, 14-330, 14-331, 14-334, 14-335, 14-336, 14-338, 14-339, 14-340, 14-341, 14-342, 14-344, 14-345, 14-346, 14-349, 14-350, 14-352, 14-354, 14-355, 14-356, 14-357, 14-358, 14-359, 14-360, 14-361, 14-365, 14-366, 14-368, 14-369, 14-370, 14-371, 14-372, 14-374, and 14-375. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 14
RECOMMENDATION: Revise Article 505 to read as shown:
ARTICLE 505 -- Class I, Zone 0, 1, and 2 Locations
505-1. Scope
This article covers the requirements for the zone classification system as an alternative to the division classification system covered in Article 500 for electrical and electronic equipment and wiring

for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases, vapors, or liquids.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Division 1 or Division 2; Class II, Division 1 or Division 2; and Class III, Division 1 or Division 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, or combustible dusts or fibers, refer to Articles 500 through 504.

505-2 Definitions. For purposes of this article, the following definitions apply.

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where prescribed in a particular Code requirement.

FPN: Suitability of equipment for a specific purpose, environment, or application may be determined by:

3. equipment listing or labeling;

2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or

3. other evidence acceptable to the authority having jurisdiction such as a manufacturer's self evaluation or an owner's engineering judgment.

(See definitions of *Labeled* and *Listed*)

Unclassified Locations. Locations that have been evaluated by the classification process defined in Section 500-~~3~~5(a) or Section 505-~~3~~5 (a) and determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.

Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-~~3~~5 (a) or 505-~~3~~5 (a).

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation, as well as any portable or transportable device having a battery or other electrical power source. (14-6)

Flameproof. Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed.

FPN: See Electrical Apparatus for Use In Class I, Zone 1 and 2 Hazardous (Classified) Locations, Type of Protection — Flameproof "d," ISA S12.22.01-1996; Electrical Apparatus for Explosive Gas Atmospheres, Part 1 — Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus, IEC 79-1-1990 and Amendment No. 1 (1993).

Purged and Pressurized. Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.

FPN No. 1: See Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

FPN No. 2: See Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Electrical Apparatus, Type of Protection "p," IEC 79-2-1983; and Electrical Apparatus for Explosive Gas Atmospheres - Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization, IEC 79-13-1982.

Intrinsic Safety. Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.

FPN No. 1: See Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Hazardous Locations, ANSI/UL 913-1997; Electrical Apparatus for Explosive Gas Atmospheres — Part 11: Intrinsic Safety "i," IEC 60079-11-1999.

FPN No. 2: Intrinsic safety is designated type of protection "ia" by IEC 79-11 for use in Zone 0 locations. Intrinsic safety is designated type of protection "ib" by IEC 79-11 for use in Zone 1 locations.

FPN No. 3: Intrinsically safe associated apparatus, designated by [ia] or [ib], is connected to intrinsically safe equipment ("ia" or "ib" respectively), but is located outside the hazardous (classified) location unless also protected by another type of protection (such as flameproof).

Type of Protection "n." Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.

FPN: see Electrical Apparatus for Explosive Gas Atmospheres, Part 15 — Electrical Apparatus with Type of Protection "n," IEC 79-15-1987.

Oil Immersion "o." Type of protection where electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Oil-Immersion "o," ISA S12.26.01 — 1996; and Electrical Apparatus for Explosive Gas Atmospheres, Part 6 — Oil-Immersion "o," IEC 79-6-1995.

Increased Safety "e." Type of protection where electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Increased Safety "e," ISA S12.16.01-1996; and Electrical Apparatus for Explosive Gas Atmospheres — Part 7: Increased Safety "e," IEC 79-7-1990, Amendment No. 1 (1991), and Amendment No. 2 (1993).

Encapsulation "m." Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation "m," ISA S12.23.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 18: Encapsulation "m," IEC 79-18-1992.

Powder Filling "q." Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Powder Filling "q," ISA S12.25.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 5: Powder Filling, Type of Protection "q," IEC 79-5-1967.

505-~~3~~2. Other Articles

All other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

Exception: As modified by Article 504 and this article.

505-~~3~~4 General

(a) Documentation for Industrial Occupancies.

All areas in industrial occupancies designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design,

install, inspect, maintain, or operate electrical equipment at the location.

FPN: For examples of area classification drawings, see Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 79-10-1995; Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, API RP 505-1997; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997; Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division I or Division 2, API RP 500-1997, Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

(b) Reference Standards.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with standards of the National Fire Protection Association, the American Petroleum Institute, and the International Society for Measurement and Control (ISA), that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.
FPN No. 2: For further information on the classification of locations, see Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 79-10-1995; Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, ANSI/ API RP 505-1997~~6~~; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.
FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.
FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996, and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 or Division 2, API RP 500-1997, Section 6.3.
FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassifed and Class I, Zone 0, Zone 1, and Zone 2 Locations~~Production Platforms~~, ANSI/API RP 14F~~Z~~-2000~~1991~~.
FPN No. 6: For further information on the installation of electrical equipment in hazardous (classified) locations in general, see Electrical Apparatus for Explosive Gas Atmospheres — Part 14: Electrical Installations in Explosive Gas Atmospheres (Other than Mines), IEC 79-14-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 16: Artificial Ventilation for the Protection of Analyzer(s) Houses, IEC 79-16-1990.

505-~~4~~5 Classifications of Locations

(a) Classification of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified.
Each room, section, or area shall be considered individually in determining its classification.

FPN No. 1: See Section 505-~~6~~7 for restrictions on area classification.
FPN No. 2: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in reduced level of classification or in an unclassified location ~~less hazardous or in nonhazardous locations~~ and, thus, to reduce the amount of special equipment required.

Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations.

FPN: For further information regrading classification and ventilaton of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989 (14-39)

(b) Class I Zone Locations.
Class I Zone locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I Zone locations shall include those specified in (1), (2) and (3).

(1) Class I, Zone 0. A Class I, Zone 0 location is a location
(a) In which ignitible concentrations of flammable gases or vapors are present continuously, or
(b) In which ignitible concentrations of flammable gases or vapors are present for long periods of time.

FPN No. 1: As a guide in determining when flammable gases or vapors are present continuously or for long periods of time, refer to Recommended Practice for Classification of Locations for Electrical Installations of Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2, API RP 505-1996; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous Areas, IEC 79-10-1995; and Area Classification Code for Petroleum Installations, Model Code, Part 15, Institute of Petroleum; and Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997.
FPN No. 2: This classification includes locations inside vented tanks or vessels that contain volatile flammable liquids; inside inadequately vented spraying or coating enclosures, where volatile flammable solvents are used; between the inner and outer roof sections of a floating roof tank containing volatile flammable liquids; inside open vessels, tanks and pits containing volatile flammable liquids; the interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors; and inside inadequately ventilated enclosures that contain normally venting instruments utilizing or analyzing flammable fluids and venting to the inside of the enclosures.
FPN No. 3: It is not good practice to install electrical equipment in Zone 0 locations except when the equipment is essential to the process or when other locations are not feasible. [See Section 505-3(a) FPN No. 2.] If it is necessary to install electrical systems in a Zone 0 location, it is good practice to install intrinsically safe systems as described by Article 504.

(2) Class I, Zone 1. A Class I, Zone 1 location is a location
(a) In which ignitible concentrations of flammable gases or vapors are likely to exist under normal operating conditions; or
(b) In which ignitible concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or
(c) In which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitible concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or
(d) That is adjacent to a Class I, Zone 0 location from which ignitible concentrations of vapors could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

FPN No. 1: Normal operations is considered the situation when plant equipment is operating within its

design parameters. Minor releases of flammable material may be part of normal operations. Minor releases include the releases from mechanical packings on pumps. Failures that involve repair or shutdown (such as the breakdown of pump seats and flange gaskets, and spillage caused by accidents) are not considered normal operation.
FPN No. 2: This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another. In areas in the vicinity of spraying and painting operations where flammable solvents are used; adequately ventilated drying rooms or compartments for evaporation of flammable solvents; adequately ventilated locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where volatile flammable liquids are used; adequately ventilated gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in the open, lightly stoppered, or easily ruptured containers; and other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operation, but not classified Zone 0.

(3) Class I, Zone 2. A Class I, Zone 2 location is a location
(a) In which ignitible concentrations of flammable gases or vapors are not likely to occur in normal operation and if they do occur will exist only for a short period; or
(b) In which volatile flammable liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors normally are confined within closed containers of closed systems from which they can escape, only as a result of accidental rupture or breakdown of the containers or system, or as a result of the abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or
(c) In which ignitible concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as a result of failure or abnormal operation of the ventilation equipment; or
(d) That is adjacent to a Class I, Zone 1 location, from which ignitible concentrations of flammable gases or vapors could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN: The Zone 2 classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition.

505-~~5~~6 Material Groups

For purposes of testing, approval, and area classification, various air mixtures (not oxygen enriched) shall be grouped as required in (a), (b), and (c).

FPN: Group I is intended for use in describing atmospheres that contain firedamp (a mixture of gases, composed mostly of methane, found underground, usually in mines). This Code does not apply to installations underground in mines. See Section 90-2(b).

Group II shall be subdivided into IIC, IIB, and IIA, as noted in (a), (b), and (c), according to the nature of the gas or vapor, for protection techniques "d," "ia," "ib," "[ia]," and "[ib]," and, where applicable, "n" and "o."

FPN No. 1: The gas and vapor subdivision as described above is based on the maximum experimental safe gap (MESG), minimum igniting current (MIC), or both. Test equipment for determining the MESG is described in Construction and Verification Tests of Flameproof Enclosures of Electrical Apparatus, IEC 79-1A-1975, Amendment No. 1 (1993) and UL Technical Report No. 58 (1993). The test equipment for determining MIC is described in Spark-Test Apparatus for Intrinsically-Safe Circuits, IEC 79-3-1990. The classification of gases or vapors according to their maximum experimental safe gaps and minimum igniting currents is described in Classification of Mixtures of Gases or Vapours with Air According to Their Maximum Experimental Safe Gaps and Minimum Igniting Currents, IEC 79-12-1978.

FPN No. 2: Verification of electrical equipment utilizing protection techniques "e," "m," "p," and "q," due to design technique, does not require tests involving MESG or MIC. Therefore, Group II is not required to be subdivided for these protection techniques.

FPN No. 3: It is necessary that the meanings of the different equipment markings and Group II classifications be carefully observed to avoid confusion with Class I, Divisions 1 and 2, Groups A, B, C, and D.

(a) Class I Zone Group Classifications. Class I Zone groups shall be as follows:

(1) Group IIC. Atmospheres containing acetylene, hydrogen, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.50 mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.45.

FPN: Group IIC is equivalent to a combination of Class I, Group A, and Class I, Group B, as described in Sections 500-5(a)(1) and (a)(2).

(2) Group IIB. Atmospheres containing acetaldehyde, ethylene, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either maximum experimental safe gap (MESG) values greater than 0.50 mm and less than or equal to 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.45 and less than or equal to 0.80.

FPN: Group IIB is equivalent to Class I, Group C, as described in Section 500-5(a)(3).

(3) Group IIA. Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experiment safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN: Group IIA is equivalent to Class I, Group D as described in Section 500-5(a)(4).

505-~~6~~7 Special Precaution
Article 505 requires equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to the installation and maintenance of electrical equipment in hazardous (classified) locations.
FPN No. 2: Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by Section 505-4(a) may not be suitable for use at temperatures lower than -20ºC (-13ºF) unless they are approved for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zones 0, 1, or 2 at normal ambient temperature.

~~**(a) Supervision of Work.** Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer.~~ (14-348)

(~~a~~b) Dual Classification. In instances of areas within the same facility classified separately, Class I, Zone 2 locations shall be permitted to abut, but not overlap, Class I, Division 2 locations. Class I, Zone 0 or Zone 1 locations shall not abut Class I, Division 1 or Division 2 locations.

(~~b~~c) Reclassification Permitted. A Class I, Division 1 or Division 2 location shall be permitted to be reclassified as a Class I, Zone 0, Zone 1, or Zone 2 location provided all of the space that is classified because of a single flammable gas or vapor source is reclassified under the requirements of this article.

505-~~7~~8 Protection Techniques

The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

FPN: For additional information, see Electrical Apparatus for Use in Class I, Zone 0, 1 Hazardous (Classified) Locations General Requirements, ISA S12.0.01-1997; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279, 1997; and Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements, IEC 79-0-1983, Amendment No. 1 (1987), and Amendment No. 2 (1991).

(a) Flameproof "d." This protection technique shall be permitted for equipment in Class I, Zone 1 or Zone 2 locations.

(b) Purged and Pressurized. This protection technique shall be permitted for equipment in those Class I, Zone 1 or Zone 2 locations for which it is approved.

(c) Intrinsic Safety. This protection technique shall be permitted for equipment in Class I, Zone 0 or Zone 1 locations for which it is approved.

(d) Type of Protection "n." This protection technique shall be permitted for equipment in Class I, Zone 2 locations. Type of protection "n" is further subdivided into nA, nC, and nR.

FPN: See Table 505-10(b) 1 for the descriptions of subdivisions for type of protection "n."

(e) Oil Immersion "o." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(f) Increased Safety "e." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(g) Encapsulation "m." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(h) Powder Filling "q." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

505-~~8~~9 Equipment

(a) Listing.
(1) Equipment that is listed for a Zone 0 location shall be permitted in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is identified ~~listed~~ for a Zone 1 location shall be permitted in a Zone 2 location of the same gas or vapor.

(2) Equipment shall be permitted to be listed for a specific gas or vapor, specific mixtures of gases or vapors, or any specific combination of gases or vapors.

FPN: One common example is equipment marked for "IIB + H2."

(b) Marking
Equipment shall be marked in accordance with (1) or (2).
(1) Division Equipment. Equipment identified ~~approved~~ for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section 500-~~5~~6(d), be permitted to be marked with the following:
a. Class I, Zone 1 or Class I, Zone 2 (as applicable), and
b. Applicable gas classification group(s) in accordance with Table 505-~~8~~9(b)(2), and
c. Temperature classification in accordance with Section 505-~~8~~9(3)

(2) Zone Equipment. Equipment meeting one or more of the protection techniques described in Section 505-~~4~~5 shall be marked with the following in the order shown:
a. Class
b. Zone
c. Symbol "AEx"
d. Protection technique(s) in accordance with Table 505-~~8~~9(b)(2)
e. Applicable gas classification group(s) in accordance with Table 505-~~8~~9(b)(2)
f. Temperature classification in accordance with Section 505-~~8~~9(c)
Exception: Intrinsically safe associated apparatus shall be required to be marked only with (c), (d), and (e).

FPN No. 1: An example of such a required marking is "Class I, Zone 0, AEx ia IIC T6."
Electrical equipment of types of protection "e," "m," "p," or "q," shall be marked Group II. Electrical equipment of types of protection "d," "ia," "ib," "[ia]," or "[ib]" shall be marked Group IIA, or IIB, or IIC, or for a specific gas or vapor. Electrical equipment of types of protection "n" shall be marked Group II unless it contains enclosed-break devices, nonincendive components, or energy-limited equipment or circuits, in which case it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor. Electrical equipment of other types of protection shall be marked Group II unless the type of protection utilized by the equipment requires that it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor.

FPN No. 2: An explanation of the marking that is required follows.

Figure 505-~~8~~9(b)(1).

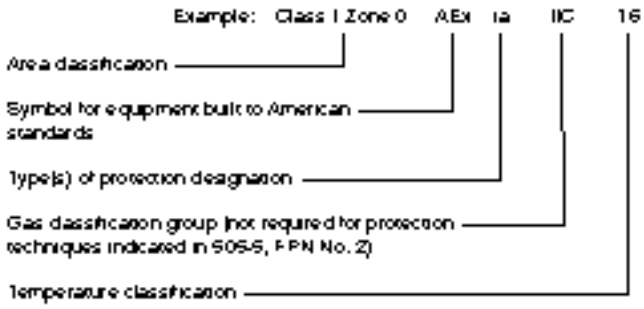

Table 505-~~8~~9(b)(1). Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Intrinsically safe associated	Unclassified or Nonhazardous
	apparatus	
[ib]	Intrinsically safe associated	Unclassified or Nonhazardous
	apparatus	
m	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in	2
	which the contacts are	
	suitably protected other	
	than by restricted breathing	
	enclosure	
nR	Restricted breathing	2
	enclosure	
o	Oil immersion	1
p	Purged and pressurized	1 or 2
q	Powder filled	1

* Does not address use where a combination of techniques is used.

Table 505-~~8~~9(b)(2). Gas Classification Groups

Gas Group	Comment
IIC	See Section 505-6(a)
IIB	See Section 505-6(b)
IIA	See Section 505-6(c)

(c) Class I Temperature

The temperature marking shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994; and Electrical Apparatus for Explosive Gas Atmospheres, Data for Flammable Gases and Vapours, Relating to the Use of Electrical Apparatus, IEC 79-20-1996.

(1) Temperature Classifications. Approved equipment shall be marked to show the operating temperature or temperature ~~range~~ class referenced to a 40ºC (104ºF) ambient. The temperature ~~range~~class, if provided, shall be indicated using the temperature class (T Code) ~~in identification numbers, as~~ shown in Table 505-~~8~~9(c).

Table 505-~~8~~9(c). Classification of Maximum Surface Temperature for Group II Electrical Equipment

Temperature Class (T Code)	Maximum Surface Temperature (ºC)
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

Electrical equipment designed for use in the ambient temperature range between -20ºC and +40ºC shall require no additional temperature marking.
Electrical equipment that is designed for use in a range of ambient temperatures other than -20ºC and +40ºC is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol "Ta" or "Tamb" together with the special range of ambient temperatures. As an example, such a marking might be "-30ºC Ta + 40ºC."
Electrical equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature ~~range~~ class at that ambient temperature.
Exception No. 1: Equipment of the nonheat-producing type, such as conduit fittings, and equipment of the heat-producing type having a maximum temperature of not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature ~~range~~class.
Exception No. 2: Equipment approved for Class I, Division 1 or Division 2 locations as permitted by Sections 505-20(b) and (c) shall be permitted to be marked in accordance with Section 500-5 and Table 500-5(d).

(d) Threading
All threaded conduit referred to herein shall be threaded with an National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides _-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable. Threaded joints shall be made up with at least five threads fully engaged.

Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Threading specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1:1980, and Metric Screw Threads, ISO 965/3:1980.

505-15. Wiring Methods

(a) Zone 0. In Class I, Zone 0 locations, only the following wiring methods shall be permitted.

1. Intrinsically safe wiring in accordance with Article 504.
FPN: Article 504 only includes protection technique "ia."

2. Seals shall be provided within 10 ft (3.05 m) of where a conduit leaves a Zone 0 location. There shall be no unions, couplings, boxes, or fittings, except reducers at the seal, in the conduit run between the seal and the point at which the conduit leaves the location.

Exception: A rigid unbroken conduit that passes completely through the Zone 0 location with no fittings less than 12 in. (305 mm) beyond each boundary, shall not be required to be sealed, if the termination points of the unbroken conduit are in unclassified locations.

3. Seals shall be provided on cables at the first point of termination after entry into the Zone 0 location.
4. Seals shall not be required to be explosionproof or flameproof.

(b) Zone 1. In Class I, Zone 1 locations, all wiring methods permitted for Class I, Division 1 locations shall be permitted.

Where Class I, Division 1 wiring methods are used, sealing and drainage shall be provided in accordance with Sections 501-5(a), (c), (d), and (f), except where the term "Division 1" is used "Zone 1" shall be substituted.

An explosionproof seal, constructed in accordance with Section 501-5(c), shall be provided for each conduit entering an enclosure having type of protection "e" or "d," except where the type of protection "d" enclosure is marked to indicate that a seal is not required.

Wiring methods shall maintain the integrity of protection techniques.

FPN No. 1: For example, equipment with type of protection "e" requires that conduit seals or cable fittings incorporate suitable methods to maintain the "ingress protection" (minimum IP54) of the enclosure; and, for conduit, serve to maintain the explosionproof integrity of the conduit system.

FPN No. 2: Different electrical enclosures provide different degrees of "ingress protection." The measures applied to enclosures of electrical apparatus include
1. The protection of persons against contact with or approach to live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure;
2. The protection of the apparatus inside the enclosure against ingress of solid foreign bodies; and
3. The protection of the apparatus inside the enclosure against harmful ingress of water.

(c) Zone 2. In Class I, Zone 2 locations, all wiring methods permitted for Class I, Division 2 locations shall be permitted. Sealing and drainage shall be provided in accordance with Sections 501-5(b), (c), (e), and (f), except where the term "Division 2" is

used, "Zone 2" shall be substituted and where the term "Division 1" is used, "Zone 1" shall be substituted.

Wiring methods shall maintain the integrity of protection techniques.

(d) Solid Obstacles. Flameproof equipment with flanged joints shall not be installed such that the flange openings are closer than the distances shown in Table 505-15 to any solid obstacle that is not a part of the equipment (such as steelworks, walls, weather guards, mounting brackets, pipes, or other electrical equipment) unless the equipment is listed for a smaller distance of separation.

Table 505-15. Minimum Distance of Obstructions from Flameproof "d" Flange Openings

Gas Group	Minimum Distance In.	Minimum Distance Mm
IIC	1 37/64	40
IIB	1 3/16	30
IIA	25/64	10

505-16. Sealing and Drainage. Seals in conduit and cable systems shall comply with (a) through (e). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 505-16(c)(2)(b). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 505-16(d)(2).

FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Zone 0. In Class I, Zone 0 locations, seals shall be located as follows.
(1) Seals shall be provided within 10 ft (3.05 m) of where a conduit leaves a Zone 0 location. There shall be no unions, couplings, boxes, or fittings, except reducers at the seal, in the conduit run between the seal and the point at which the conduit leaves the location.

Exception: A rigid unbroken conduit that passes completely through the Zone 0 location with no fittings less than 12 (305 mm) beyond each boundary, shall not be required to be sealed, if the termination points of the unbroken conduit are in unclassified locations.

(2) Seals shall be provided on cables at the first point of termination after entry into the Zone 0 location.

(3) Seals shall not be required to be explosionproof or flameproof.

(b) Zone 1. In Class I, Zone 1 locations, seals shall be located as follows.

(1) Conduit seals shall be provided for each conduit entering enclosures having type of protection 'd' or 'e'.

Exception: Where the enclosure having type of protection 'd' is marked to indicate that a seal is not required.

Conduit seals shall be provided for each conduit entering explosionproof equipment as follows.
(a) In each conduit entry into an explosionproof enclosure where either (1) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (2) the entry is 2-in. size or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.
Exception: Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are
1. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
2. Immersed in oil, or
3. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, approved for the location, and marked "factory sealed" or equivalent.
Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal.

(b) Conduit seals shall be installed within 18 in. (457 mm) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.

(c) Where two or more explosionproof enclosures for which conduit seals are required under (b)(2) are connected by nipples or by runs of conduit not more than 36 in. (914 mm) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 18 in. (457 mm) from either enclosure.

(3) In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 18 in. (457 mm) from the pressurized enclosure.
FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.
FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(4) In each conduit run leaving a Class I, Zone 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 1 location.
Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Zone 1 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

(5) Conduits containing cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.

Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

(6) Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (d).

(7) Cable seals shall be provided for each cable entering flameproof or explosionproof enclosures. The seal shall comply with (d).

(8) Cables shall be sealed at the point at which they leave the Zone 1 location.

Exception: Where cable is sealed at the termination point.

(c) Zone 2. In Class I, Zone 2 locations, seals shall be located as follows.

(1) Conduit seals shall be located as follows.

(a) For connections to enclosures that are required to be flameproof or explosionproof, a conduit seal shall be provided in accordance with (b)(1) and (b)(2). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section 505-16(b).

2. In each conduit run passing from a Class I, Zone 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Zone 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Zone 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Zone 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.

Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Zone 2 location into an unclassified location if the following conditions are met:

1. No part of the conduit system segment passes through a Class I, Zone 0 or Class I, Zone 1 location where the conduit contains unions, couplings, boxes, or fittings within 12 in. (305 mm) of the Class I, Zone 0 or Class I, Zone 1 location; and

2. The conduit system segment is located entirely in outdoor locations; and

3. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, and that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and

4. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and

5. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Zone 2 locations.

(2) Cable seals shall be located as follows.

(a) Cables entering enclosures required to be flameproof or explosionproof shall be sealed at the point of entrance. The seal shall comply with (d). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (b)(4).

Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

(b) Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (2)(a). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [0.007 ft3/hour (198 cm3/hour) of air at a pressure of 6 in. of water (1493 pascals)].

FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.

FPN No. 2: The cable core does not include the interstices of the conductor strands.

(c) Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (2)(a), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 6 in. of water (1493 pascals) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.

Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Zone 2 location without seals.

(d) Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Zone 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.

FPN: The cable sheath may be either metal or a nonmetallic material.

(d) Class I, Zones 0, 1 and 2. Where required, seals in Class I, Zones 0, 1 and 2 locations shall comply with the following.

(1) Fittings. Enclosures for connections or equipment shall be provided with an integral means for sealing, or sealing fittings for Class I locations shall be used. Sealing fittings shall be accessible. Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible.

(2) Compound. The compound shall provide a seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF).

(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 5/8 in. (16 mm).
Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.

(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.

(5) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically listed for a higher percentage of fill.

(e) Drainage.

(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

(3) Canned Pumps, Process or Service Connections, Etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend upon a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical conduit system, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the conduit system beyond the additional devices or means, if the primary seal fails.

The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above.

Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.

(14-368)

505-18. Conductors and Conductor Insulation.
1) For Type of Protection "e", field wiring conductors shall be copper. (14-365)
2) Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type approved for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means. (14-181)

505-19. Live Parts. There shall be no exposed live parts.(14-188)

505-20. Equipment

(a) Zone 0. In Class I, Zone 0 locations, only equipment specifically listed and marked as suitable for the location shall be permitted.

Exception: Intrinsically safe equipment listed for use in Class I, Division 1 locations for the same gas, or as permitted by Section 505-7(d), and with a suitable temperature classification ~~rating~~ shall be permitted.

(b) Zone 1. In Class I, Zone 1 locations, only equipment specifically listed and marked as suitable for the location shall be permitted.

Exception: Equipment approved for use in Class I, Division 1 or listed for use in Class I, Zone 0 locations for the same gas, or as permitted by Section 505-7(d) and with a suitable temperature classification ~~rating~~ shall be permitted.

(c) Zone 2 In Class I, Zone 2 locations, only equipment specifically listed and marked as suitable for the location shall be permitted.

Exception No. 1: Equipment listed for use in Class I, Zone 0 or Zone 1 locations for the same gas, or as permitted by Section 505-7(d), and with a suitable temperature classification ~~rating~~, shall be permitted.

Exception No. 2: Equipment approved for use in Class I, Division 1 or Division 2 locations for the same gas, or as permitted by Section 505-7(d), and with a suitable temperature classification ~~rating~~ shall be permitted.

Exception No. 3: In Class I, Zone 2 locations, the installation of open or nonexplosionproof or nonflameproof enclosed motors, such as squirrel-cage induction motors without brushes, switching mechanisms, or similar arc-producing devices that are not identified for use in a Class I, Zone 2 location shall be permitted.

FPN No. 1: It is important to consider the temperature of internal and external surfaces that may be exposed to the flammable atmosphere.

FPN No. 2: It is important to consider the risk of ignition due to currents arcing across discontinuities and overheating of parts in multisection enclosures of large motors and generators. Such motors and generators may need equipotential bonding jumpers across joints in the enclosure and from enclosure to ground. Where the presence of ignitible gases or vapors is suspected, clean air purging may be needed immediately prior to and during start-up periods.

(d) Manufacturer's Instructions. Electrical equipment installed in hazardous (classified) locations shall be installed in accordance with the instructions (if any) provided by the manufacturer.

505-2.Multiwire Branch Circuits. In a Class I, Zone 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously.

505-21. Increased Safety "e" Motors and Generators. In Class I, Zone 1 locations, Increased Safety "e" motors and generators of all voltage ratings shall be listed for Class I, Zone 1 locations, and shall comply with the following.
1. Motors shall be marked with the current ratio, IA/IN, and time, tE;
2. Motors shall have controllers marked with the model or identification number, output rating (horsepower or kilowatt), full-load amperes, starting current ratio (IA/IN), and time (tE) of the motors that they are intended to protect; the controller marking shall also include the specific overload protection type (and setting, if applicable) that is listed with the motor or generator;
3. Connections shall be made with the specific terminals listed with the motor or generator;
4. Terminal housings shall be permitted to be of substantial, nonmetallic, nonburning material provided an internal grounding means between the motor frame and the equipment grounding connection is incorporated within the housing;
5. The provisions of Part C of Article 430 shall apply regardless of the voltage rating of the motor;
6. The motors shall be protected against overload by a separate overload device that is responsive to motor current. This device shall be selected to trip or shall be rated in accordance with the listing of the motor and its overload protection;
7. Sections 430-34 and 430-44 shall not apply to such motors; and
8. The motor overload protection shall not be shunted or cut out during the starting period.

505-25. Grounding and Bonding. Grounding and bonding shall comply with Article 250 and the following additional requirements.
(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.
(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 505-15(c) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.
Exception: In Class I, Zone 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.

SUBSTANTIATION: This complete revision of Article 505 editorially revises the text to make it more easily understood and also incorporates numerous technical and editorial improvements made via other proposals.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
BRIESCH: While the Panel Action to accept the rewrite of Article 505 is supported, the NFPA-Circulated Panel Proposal does not include all of the changes agreed to at the meeting. The e-mail sent by Dave Wechsler subsequent to the meeting is more complete in reflecting the Panel Actions from the meeting regarding all but one issue. This e-mail includes changes to Section 505-9(a)(1), 505-20(b), and 505-20(c) that removed the requirement for listed equipment in Zone 1 and Zone 2 locations. These changes were not discussed and agreed to by the Panel at the meeting.
COOK: I agree with Proposal 14-318a and the substantiation, however, it does not incorporate all of the changes made via other proposals. An updated version that was emailed from Dave Wechsler on 1-26-2000 seems to be more complete with respect to including Panel Actions from the meeting in Hilton Head. The Wechsler versions do include changes in Sections 505-20(b) and (c) that change "listed" to "identified". That thought is completely different than the proposals to change "approved" to "identified". This is a much less restrictive requirement than the current NEC that was not discussed or voted on by the panel. I would be very opposed to this change. See my comments on Proposal 14-2a for use of the term "unclassified." Other changes seem to follow Panel Actions.
ENGLER: Not all of the changes made it into the draft circulated with this ballot, vote is to affirm the text with all of the necessary changes made to it.
GOODMAN: Generally, I agree with the format and arrangement changes. However, in the new Section 505-2 Definitions, the term "Nonhazardous" has been included. This comment recommends the removal of this term, definition, and use for the following reasons:
1. This term was added as part of the Panel Chairman assigned Task Group responsible for reorganizing the information in Article 505. This term and definition are new material and beyond the scope of the Panel Chair's direction.
2. The added term and definition was not part of any proposal made to the Panel and has no substantiation for its inclusion.
3. This term adds an additional area classification location that does not currently exist in related standards and practices (API 505 for example) or in most company documentation systems.
4. The term is misleading. The implication of "nonhazardous" is that there are no hazards. There are hazards other than electrical area classification such as caustics, acids, radiation, etc. Using the term "unclassified" is becoming widely accepted and recognized as specific to electrical area classification. "Nonhazardous" is much too broad.
5. The term is not needed. An area is either "Classified", requiring specifically identified or approved equipment suitable for the location or "Unclassified", not requiring equipment so identified or approved. The term will only add confusion and potential misapplication.
6. By its definition, "Nonhazardous Locations. Locations which are not required to have been evaluated". Whoever makes the determination that the location is not required to be evaluated has just evaluated the location. It is also not at all clear how or who would make that determination.
For the above reasons, the term "Nonhazardous", its definition and use should be removed from Article 505 (and 500).
JAGUNICH: See ballot for David Wechsler.
LAWRENCE: Due the the large number of public proposals received and acted upon, and also due to time constraints, the panel was not able to compile and correlate all aspects of the rewrites of the affected article. Please see David Wechsler's ballot.
OMEARA: Please see the comments on the ballot for David Wechsler.
WECHSLER: While attempts were made to provide NFPA Staff with corrected revisions of this text before the end of the CMP 14 panel meeting, a detailed review of this balloted draft versions has indicated that this does not correctly reflect the panel actions. Additionally, there is conflicting information in several panel action statements that indicates that this text applies to Article 505 and to Article 501. In fact there are panel action rewrites to both Article 505, 501 and 502.
We attribute the problems with this draft to the following:
a) the use of several earlier drafts that were consistently being revised to keep pace with changes made due to committee actions on public proposals.
b) the limited time available to proof and develop this work,
c) the extremely large number of public proposals,
d) the complex nature of the interaction of affected texts within Articles 500, 501, 502 and 505, and the desire of the panel to maintain consistency, and
e) human errors in transcribing this information.
The following text provides a correct revision of this complete work effort for Article 505. This text should be the committee document of record and not that provided with the panel ballot.

ARTICLE 505 -- Class I, Zone 0, 1, and 2 Locations

505-1. Scope [unchanged]
This article covers the requirements for the zone classification system as an alternative to the division classification system covered in Article 500 for electrical and electronic equipment and wiring

for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases, vapors, or liquids.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Division 1 or Division 2; Class II, Division 1 or Division 2; and Class III, Division 1 or Division 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, or combustible dusts or fibers, refer to Articles 500 through 504.

[new] 505-2 Definitions. For purposes of this article, the following definitions apply. [14-320,CP140x]

Identified (as applied to equipment). Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where prescribed in a particular Code requirement.

FPN: Suitability of equipment for a specific purpose, environment, or application may be determined by:

~~1.~~4. equipment listing or labeling;

2. evidence of equipment evaluation from a qualified testing laboratory or inspection agency concerned with product evaluation; or

3. other evidence acceptable to the authority having jurisdiction such as a manufacturer's self evaluation or an owner's engineering judgment.

(See definitions of *Labeled* and *Listed*)

[CP140?-500 rewrite, Panel action Cook actions, correlation w/500]

Unclassified Locations. Locations that have been evaluated by the classification process defined in Section 500-~~3~~5(a) or Section 505-~~3~~5 (a) and determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof. [14-323, CP140x]

Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-~~3~~5 (a) or 505-~~3~~5 (a). [CP140x]

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation, as well as any portable or transportable device having a battery or other electrical power source. (14-6)

Flameproof. Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed.

FPN: See Electrical Apparatus for Use In Class I, Zone 1 and 2 Hazardous (Classified) Locations, Type of Protection — Flameproof "d," ISA S12.22.01-1996; Electrical Apparatus for Explosive Gas Atmospheres, Part 1 — Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus, IEC 79-1-1990 and Amendment No. 1 (1993).

Purged and Pressurized. Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere.

FPN No. 1: See Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

FPN No. 2: See Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Electrical Apparatus, Type of Protection "p," IEC 79-2-1983; and Electrical Apparatus for Explosive Gas Atmospheres - Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization, IEC 79-13-1982.

Intrinsic Safety. Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.

FPN No. 1: See Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Hazardous Locations, ANSI/UL 913-1997; Electrical Apparatus for Explosive Gas Atmospheres — Part 11: Intrinsic Safety "i," IEC 60079-11-1999.

FPN No. 2: Intrinsic safety is designated type of protection "ia" by IEC 79-11 for use in Zone 0 locations. Intrinsic safety is designated type of protection "ib" by IEC 79-11 for use in Zone 1 locations.

FPN No. 3: Intrinsically safe associated apparatus, designated by [ia] or [ib], is connected to intrinsically safe equipment ("ia" or "ib" respectively), but is located outside the hazardous (classified) location unless also protected by another type of protection (such as flameproof).

Type of Protection "n." Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.

FPN: see Electrical Apparatus for Explosive Gas Atmospheres, Part 15 — Electrical Apparatus with Type of Protection "n," IEC 79-15-1987.

Oil Immersion "o." Type of protection where electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Oil-Immersion "o," ISA S12.26.01 — 1996; and Electrical Apparatus for Explosive Gas Atmospheres, Part 6 — Oil-Immersion "o," IEC 79-6-1995.

Increased Safety "e." Type of protection where electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Increased Safety "e," ISA S12.16.01-1996; and Electrical Apparatus for Explosive Gas Atmospheres — Part 7: Increased Safety "e," IEC 79-7-1990, Amendment No. 1 (1991), and Amendment No. 2 (1993).

Encapsulation "m." Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation "m," ISA S12.23.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 18: Encapsulation "m," IEC 79-18-1992.

Powder Filling "q." Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.

FPN: See Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Powder Filling "q," ISA S12.25.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 5: Powder Filling, Type of Protection "q," IEC 79-5-1967.

505-~~3~~2. ~~[505-2]~~ Other Articles

All other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

Exception: As modified by Article 504 and this article.

505-~~3~~4 General

(a) ~~[505-10 (c)]~~ Documentation for Industrial Occupancies.

All areas in industrial occupancies designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

FPN: For examples of area classification drawings, see Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 79-10-1995; Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, API RP 505-1997; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997; Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division I or Division 2, API RP 500-1997, Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

(b) ~~[505-5]~~ Reference Standards.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with standards of the National Fire Protection Association, the American Petroleum Institute, and the International Society for Measurement and Control (ISA), that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.

FPN No. 2: For further information on the classification of locations, see Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 79-10-1995; Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, ANSI/API RP 505-1997~~6~~; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.

FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996, and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 or Division 2, API RP 500-1997, Section 6.3.

FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassifed and Class I, Zone 0, Zone 1, and Zone 2 Locations~~Production Platforms~~, ANSI/API RP 14FZ-2000~~1991~~.

FPN No. 6: For further information on the installation of electrical equipment in hazardous (classified) locations in general, see Electrical Apparatus for Explosive Gas Atmospheres — Part 14: Electrical Installations in Explosive Gas Atmospheres (Other than Mines), IEC 79-14-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 16: Artificial Ventilation for the Protection of Analyzer(s) Houses, IEC 79-16-1990.

505-~~4~~5 Classifications of Locations

(a) ~~[505-3(a)]~~ Classification of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified.

Each room, section, or area shall be considered individually in determining its classification.

FPN No. 1: See Section 505-~~6~~7 for restrictions on area classification.

FPN No. 2: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in reduced level of classification or in an unclassified location ~~less hazardous or in nonhazardous locations~~ and, thus, to reduce the amount of special equipment required. [14-323]

Rooms and areas containing ammonia refrigeration systems that are equipped with adequate mechanical ventilation, may be classified as "unclassified" locations.

FPN: For further information regarding classification and ventilation of areas involving ammonia, see Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994, and Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G2.1-1989 (14-39)

(b) Class I Zone Locations.
Class I Zone locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I Zone locations shall include those specified in (1), (2) and (3).

(1) ~~[505-9 (a)]~~ Class I, Zone 0. A Class I, Zone 0 location is a location
(a) ~~[505-9 (a) (1)]~~ In which ignitible concentrations of flammable gases or vapors are present continuously, or
(b) ~~[505-9 (a) (2)]~~ In which ignitible concentrations of flammable gases or vapors are present for long periods of time.

FPN No. 1: As a guide in determining when flammable gases or vapors are present continuously or for long periods of time, refer to Recommended Practice for Classification of Locations for Electrical Installations of Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2, API RP 505-1996; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous Areas, IEC 79-10-1995; and Area Classification Code for Petroleum Installations, Model Code, Part 15, Institute of Petroleum; and Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997.

FPN No. 2: This classification includes locations inside vented tanks or vessels that contain volatile flammable liquids; inside inadequately vented spraying or coating enclosures, where volatile flammable solvents are used; between the inner and outer roof sections of a floating roof tank containing volatile flammable liquids; inside open vessels, tanks and pits containing volatile flammable liquids; the interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors; and inside inadequately ventilated enclosures that contain normally venting instruments utilizing or analyzing flammable fluids and venting to the inside of the enclosures.

FPN No. 3: It is not good practice to install electrical equipment in Zone 0 locations except when the equipment is essential to the process or when other locations are not feasible. [See Section 505-3(a) FPN No. 2.] If it is necessary to install electrical systems in a Zone 0 location, it is good practice to install intrinsically safe systems as described by Article 504.

(2) ~~[505-9 (b)]~~ Class I, Zone 1. A Class I, Zone 1 location is a location
(a) ~~[505-9 (b) (1)]~~ In which ignitible concentrations of flammable gases or vapors are likely to exist under normal operating conditions; or
(b) ~~[505-9 (b) (2)]~~ In which ignitible concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or
(c) ~~[505-9 (b) (3)]~~ In which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitible concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or

(d) ~~[505-9 (b) (4)]~~ That is adjacent to a Class I, Zone 0 location from which ignitible concentrations of vapors could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

FPN No. 1: Normal operations is considered the situation when plant equipment is operating within its design parameters. Minor releases of flammable material may be part of normal operations. Minor releases include the releases from mechanical packings on pumps. Failures that involve repair or shutdown (such as the breakdown of pump seats and flange gaskets, and spillage caused by accidents) are not considered normal operation.

FPN No. 2: This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another. In areas in the vicinity of spraying and painting operations where flammable solvents are used; adequately ventilated drying rooms or compartments for evaporation of flammable solvents; adequately ventilated locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where volatile flammable liquids are used; adequately ventilated gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in the open, lightly stoppered, or easily ruptured containers; and other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operation, but not classified Zone 0.

(3) ~~[505-9 (c)]~~ **Class I, Zone 2**. A Class I, Zone 2 location is a location

(a) ~~[505-9 (c) (1)]~~ In which ignitible concentrations of flammable gases or vapors are not likely to occur in normal operation and if they do occur will exist only for a short period; or

(b) ~~[505-9 (c) (2)]~~ In which volatile flammable liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors normally are confined within closed containers of closed systems from which they can escape, only as a result of accidental rupture or breakdown of the containers or system, or as a result of the abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or

(c) ~~[505-9 (c) (3)]~~ In which ignitible concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as a result of failure or abnormal operation of the ventilation equipment; or

(d) ~~[505-9 (c) (4)]~~ That is adjacent to a Class I, Zone 1 location, from which ignitible concentrations of flammable gases or vapors could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN: The Zone 2 classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition.

505-~~5~~6 ~~[505-7]~~ Material Groups

~~[505-7]~~ For purposes of testing, approval, and area classification, various air mixtures (not oxygen enriched) shall be grouped as required in (a), (b), and (c).

FPN: Group I is intended for use in describing atmospheres that contain firedamp (a mixture of gases, composed mostly of methane, found underground, usually in mines). This Code does not apply to installations underground in mines. See Section 90-2(b).

Group II shall be subdivided into IIC, IIB, and IIA, as noted in (a), (b), and (c), according to the nature of the gas or vapor, for protection techniques “d,” “ia,” “ib,” “[ia],” and “[ib],” and, where applicable, “n” and “o.”

FPN No. 1: The gas and vapor subdivision as described above is based on the maximum experimental safe gap (MESG), minimum igniting current (MIC), or both. Test equipment for determining the MESG is described in Construction and Verification Tests of Flameproof Enclosures of Electrical Apparatus, IEC 79-1A-1975, Amendment No. 1 (1993) and UL Technical Report No. 58 (1993). The test equipment for determining MIC is described in Spark-Test Apparatus for Intrinsically-Safe Circuits, IEC 79-3-1990. The classification of gases or vapors according to their maximum experimental safe gaps and minimum igniting currents is described in Classification of Mixtures of Gases or Vapours with Air According to Their Maximum Experimental Safe Gaps and Minimum Igniting Currents, IEC 79-12-1978.

FPN No. 2: Verification of electrical equipment utilizing protection techniques “e,” “m,” “p,” and “q,” due to design technique, does not require tests involving MESG or MIC. Therefore, Group II is not required to be subdivided for these protection techniques.

FPN No. 3: It is necessary that the meanings of the different equipment markings and Group II classifications be carefully observed to avoid confusion with Class I, Divisions 1 and 2, Groups A, B, C, and D.

(a) Class I Zone Group Classifications. Class I Zone groups shall be as follows:

(1) ~~[505-7 (a)]~~ Group IIC. Atmospheres containing acetylene, hydrogen, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.50 mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.45.

FPN: Group IIC is equivalent to a combination of Class I, Group A, and Class I, Group B, as described in Sections 500-6 (a) (1)~~5(a)(1)~~ and 6 (a) (2)~~(a)(2~~).

(2) ~~[505-7 (b)]~~ Group IIB. Atmospheres containing acetaldehyde, ethylene, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either maximum experimental safe gap (MESG) values greater than 0.50 mm and less than or equal to 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.45 and less than or equal to 0.80.

FPN: Group IIB is equivalent to Class I, Group C, as described in Section 500-6.~~5~~(a)(3).

(3) ~~[505-7 (c)]~~ Group IIA. Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experiment safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN: Group IIA is equivalent to Class I, Group D as described in Section 500-6.~~5~~(a)(4).

505-~~6~~7 ~~[505-6]~~ Special Precaution

Article 505 requires equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to the installation and maintenance of electrical equipment in hazardous (classified) locations.

FPN No. 2: Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by Section 505-8 (a) ~~4(a)~~ may not be suitable for use at temperatures lower than -20ºC (-13ºF) unless they are approved for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zones 0, 1, or 2 at normal ambient temperature.

~~**(a)** [505-6(a)] **Supervision of Work.** Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer.~~(14-348)

(~~a~~b) ~~[505-6(b)]~~ **Dual Classification.** In instances of areas within the same facility classified separately, Class I, Zone 2 locations shall be permitted to abut, but not overlap, Class I, Division 2 locations.

Class I, Zone 0 or Zone 1 locations shall not abut Class I, Division 1 or Division 2 locations.

(b~~c~~) ~~[505-6(c)]~~ Reclassification Permitted. A Class I, Division 1 or Division 2 location shall be permitted to be reclassified as a Class I, Zone 0, Zone 1, or Zone 2 location provided all of the space that is classified because of a single flammable gas or vapor source is reclassified under the requirements of this article.

(c) Solid Obstacles. Flameproof equipment with flanged joints shall not be installed such that the flange openings are closer than the distances shown in Table 505-7 ~~505-15~~ to any solid obstacle that is not a part of the equipment (such as steelworks, walls, weather guards, mounting brackets, pipes, or other electrical equipment) unless the equipment is listed for a smaller distance of separation. [14-364]

Table 505-7 ~~-15~~. Minimum Distance of Obstructions from Flameproof "d" Flange Openings

Gas Group	Minimum Distance In.	Minimum Distance Mm
IIC	1 37/64	40
IIB	1 3/16	30
IIA	25/64	10

505- ~~7-8~~ ~~[505-4]~~ Protection Techniques
The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

FPN: For additional information, see Electrical Apparatus for Use in Class I, Zone 0, 1 Hazardous (Classified) Locations General Requirements, ISA S12.0.01-1997; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279, 1997; and Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements, IEC 79-0-1983, Amendment No. 1 (1987), and Amendment No. 2 (1991).

~~(a)~~(b) ~~[505-4(a)]~~ Flameproof "d." This protection technique shall be permitted for equipment in Class I, Zone 1 or Zone 2 locations.

(b) ~~[505-4(b)]~~ Purged and Pressurized. This protection technique shall be permitted for equipment in those Class I, Zone 1 or Zone 2 locations for which it is approved.

(c) ~~[505-4(c)]~~ Intrinsic Safety. This protection technique shall be permitted for equipment in Class I, Zone 0 or Zone 1 locations for which it is approved.

(d) ~~[505-4(d)]~~ Type of Protection "n." This protection technique shall be permitted for equipment in Class I, Zone 2 locations. Type of protection "n" is further subdivided into nA, nC, and nR.

FPN: See Table 505-9(b) (1) ~~505-10(b) 1~~ for the descriptions of subdivisions for type of protection "n."

(e) ~~[505-4(e)]~~ Oil Immersion "o." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(f) ~~[505-4(f)]~~ Increased Safety "e." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(g) ~~[505-4(g)]~~ Encapsulation "m." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

(h) ~~[505-4(h)]~~ Powder Filling "q." This protection technique shall be permitted for equipment in Class I, Zone 1 locations.

505-~~8~~9 Equipment

(a) ~~[505-10 (a)]~~ Listing.
(1) Equipment that is listed for a Zone 0 location shall be permitted in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is identified ~~listed~~ for a Zone 1 location shall be permitted in a Zone 2 location of the same gas or vapor.

(2) ~~[505-7(d)]~~ Equipment shall be permitted to be listed for a specific gas or vapor, specific mixtures of gases or vapors, or any specific combination of gases or vapors.

FPN: One common example is equipment marked for "IIB + H2."

(b) ~~[505-10(b)]~~ Marking
Equipment shall be marked in accordance with (1) or (2).
(1) ~~[505-10(b)(1)]~~ Division Equipment. Equipment identified ~~approved~~ for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section 500-~~5~~6(d), be permitted to be marked with the following:
a. Class I, Zone 1 or Class I, Zone 2 (as applicable), and
b. Applicable gas classification group(s) in accordance with Table 505-~~8~~9(b)(2), and
c. Temperature classification in accordance with Section 505-~~8~~9(3)

(2) ~~[505-10(b)(2)]~~ Zone Equipment. Equipment meeting one or more of the protection techniques described in Section 505-~~4~~5 shall be marked with the following in the order shown:
a. Class
b. Zone
c. Symbol "AEx"
d. Protection technique(s) in accordance with Table 505-~~8~~9(b)(2)
e. Applicable gas classification group(s) in accordance with Table 505-~~8~~9(b)(2)
f. Temperature classification in accordance with Section 505-~~8~~9(c)
Exception: Intrinsically safe associated apparatus shall be required to be marked only with (c), (d), and (e).

FPN No. 1: An example of such a required marking is "Class I, Zone 0, AEx ia IIC T6."
Electrical equipment of types of protection "e," "m," "p," or "q," shall be marked Group II. Electrical equipment of types of protection "d," "ia," "ib," "[ia]," or "[ib]" shall be marked Group IIA, or IIB, or IIC, or for a specific gas or vapor. Electrical equipment of types of protection "n" shall be marked Group II unless it contains enclosed-break devices, nonincendive components, or energy-limited equipment or circuits, in which case it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor. Electrical equipment of other types of protection shall be marked Group II unless the type of protection utilized by the equipment requires that it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor.

FPN No. 2: An explanation of the marking that is required follows.

Figure 505-~~8~~9(b)(1) ~~[505-10(b)(1)]~~.

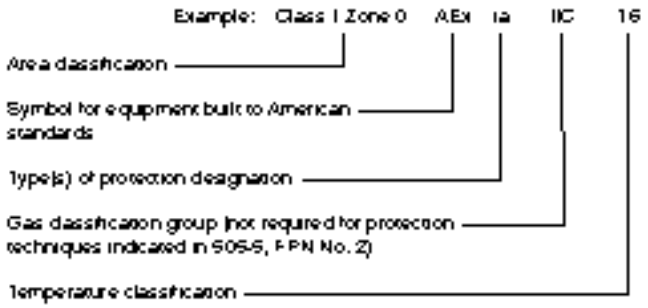

Table 505-~~8~~9(b)(1). Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Intrinsically safe associated apparatus	Unclassified or Nonhazardous
[ib]	Intrinsically safe associated apparatus	Unclassified or Nonhazardous
m	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure	2
nR	Restricted breathing enclosure	2
o	Oil immersion	1
p	Purged and pressurized	1 or 2
q	Powder filled	1

* Does not address use where a combination of techniques is used.

Table 505-~~8~~9(b)(2). ~~[505-10(b)(2)]~~ Gas Classification Groups

Gas Group	Comment
IIC	See Section 505-~~5~~6(a)(1)
IIB	See Section 505-~~5~~6(a) (2)~~(b)~~
IIA	See Section 505-~~5~~6(a)(3)~~(c)~~

(c) ~~[505-8]~~ Class I Temperature

The temperature marking specified below ~~in Section 505-10(b)~~ shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994; and Electrical Apparatus for Explosive Gas Atmospheres, Data for Flammable Gases and Vapours, Relating to the Use of Electrical Apparatus, IEC 79-20-1996.

(1) ~~[505-10(b)(3)]~~ **Temperature Classifications.** Approved equipment shall be marked to show the operating temperature or temperature ~~range~~ class referenced to a 40ºC (104ºF) ambient. The temperature ~~range~~class, if provided, shall be indicated using the temperature class (T Code) ~~in identification numbers, as~~ shown in Table 505-~~8~~9(c).

Table 505-~~8~~9(c). ~~[505-10(b)(3)]~~ Classification of Maximum Surface Temperature for Group II Electrical Equipment

Temperature Class (T Code)	Maximum Surface Temperature (ºC)
T1	≤450
T2	≤300
T3	≤200
T4	≤135
T5	≤100
T6	≤85

Electrical equipment designed for use in the ambient temperature range between -20ºC and +40ºC shall require no additional temperature marking.
Electrical equipment that is designed for use in a range of ambient temperatures other than -20ºC and +40ºC is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol "Ta" or "Tamb" together with the special range of ambient temperatures. As an example, such a marking might be "-30ºC Ta + 40ºC."
Electrical equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature ~~range~~ class at that ambient temperature.

Exception No. 1: Equipment of the nonheat-producing type, such as conduit fittings, and equipment of the heat-producing type having a maximum temperature of not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature ~~range~~ class.

Exception No. 2: Equipment approved for Class I, Division 1 or Division 2 locations as permitted by Sections 505-20(b) and (c) shall be permitted to be marked in accordance with Section 500-~~5~~6(d) and Table 500-~~5~~6(d).

(d) ~~[505-3(b)]~~ **Threading**
All threaded conduit referred to herein shall be threaded with an National (American) Standard Pipe Taper (NPT) standard conduit cutting die that provides 3/4-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable. Threaded joints shall be made up with at least five threads fully engaged.

Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).

(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

FPN: Threading specifications for NPT threads are located in Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1-1983.

(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1-1980, and Metric Screw Threads, ISO 965/3-1980.

505-15.~~[505-15]~~[14-364] Wiring Methods. Wiring methods shall maintain the integrity of protection techniques and shall comply with (a), (b), or (c).

(a) Class I, Zone 0. In Class I, Zone 0 locations, only intrinsically safe wiring methods in accordance with Article 504 shall be permitted.

FPN: Article 504 only includes protection technique "ia."

(b) Class I, Zone 1.

(1) In Class I, Zone 1 locations, the following wiring methods shall be permitted:

(a) Type MC-HL cable listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.

FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

(b) Type ITC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable

polymeric material and provided with termination fittings listed for the application.

(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type TC cable shall be permitted if listed as suitable for use as open wiring and provided with a gas/vaportight overall jacket of suitable polymeric material and provided with separate grounding conductors in accordance with Section 250-122. Cable termination fittings shall be listed for the application. The open wiring shall not exceed lengths of 15 feet.

FPN: Type TC cable listed for use as open wiring meets the crush and impact requirements of Type MC cable.

(d) Type MI cable with termination fittings approved for Class I, Zone 1 or Division 1 locations. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

(e) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.

(f) Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade. Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

(2) Where necessary to employ flexible connections, flexible fittings listed for Class I, Zone 1 or Division 1 locations or flexible cord in accordance with the provisions of Section 505-17 shall be permitted.

(c) Class I, Zone 2.

(1) In Class I, Zone 2 locations, the following wiring methods shall be permitted:

(a) Types MI, MC, MV, or TC cable with approved termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings;
(b) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;
(c) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings;
(d) enclosed gasketed busways, enclosed gasketed wireways;
(e) threaded rigid metal conduit, threaded steel intermediate metal conduit;
(f) Nonincendive field wiring using any of the wiring methods suitable for nonhazardous locations, including Chapter 7 and 8 wiring methods.

(2) Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with approved fittings, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with approved fittings, or flexible cord in accordance with the provisions of Section 505-17 shall be permitted.

FPN: See Section 505-25(b) for grounding requirements where flexible conduit is used.

[new- NFPA check formating]
505-16. Sealing and Drainage. Seals in conduit and cable systems shall comply with (a) through (e). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 505-16(c)(2)(b). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 505-16(d)(2).

FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Zone 0. In Class I, Zone 0 locations, seals shall be located as follows.
(1) Seals shall be provided within 10 ft (3.05 m) of where a conduit leaves a Zone 0 location. There shall be no unions, couplings, boxes, or fittings, except reducers at the seal, in the conduit run between the seal and the point at which the conduit leaves the location.

Exception: A rigid unbroken conduit that passes completely through the Zone 0 location with no fittings less than 12 in. (305 mm) beyond each boundary, shall not be required to be sealed, if the termination points of the unbroken conduit are in unclassified locations.

(2) Seals shall be provided on cables at the first point of termination after entry into the Zone 0 location.

(3) Seals shall not be required to be explosionproof or flameproof.

(b) Zone 1. In Class I, Zone 1 locations, seals shall be located as follows.

(1) Conduit seals shall be provided for each conduit entering enclosures having type of protection 'd' or 'e'.

Exception: Where the enclosure having type of protection 'd' is marked to indicate that a seal is not required.

(2) Conduit seals shall be provided for each conduit entering explosionproof equipment as follows.
a. In each conduit entry into an explosionproof enclosure where either (1) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (2) the entry is 2-in. size or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the

autoignition temperature in degrees Celsius of the gas or vapor involved.

Exception: Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are

1. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
2. Immersed in oil, or
3. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, approved for the location, and marked "factory sealed" or equivalent.
Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal.

b. Conduit seals shall be installed within 18 in. (457 mm) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.

c. Where two or more explosionproof enclosures for which conduit seals are required under (b)(2) are connected by nipples or by runs of conduit not more than 36 in. (914 mm) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 18 in. (457 mm) from either enclosure.

(3) In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 18 in. (457 mm) from the pressurized enclosure.

FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.
FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(4) In each conduit run leaving a Class I, Zone 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 1 location.

Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Zone 1 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

(5) Conduits containing cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.

Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved means. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

(6) Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (d).

(7) Cable seals shall be provided for each cable entering flameproof or explosionproof enclosures. The seal shall comply with (d).

(8) Cables shall be sealed at the point at which they leave the Zone 1 location.

Exception: Where cable is sealed at the termination point.

(c) Zone 2 In Class I, Zone 2 locations, seals shall be located as follows.

(1) Conduit seals shall be located as follows.

(a) For connections to enclosures that are required to be flameproof or explosionproof, a conduit seal shall be provided in accordance with (b)(1) and (b)(2). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section 505-16(b).

(2) In each conduit run passing from a Class I, Zone 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Zone 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Zone 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Zone 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.

Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Zone 2 location into an unclassified location if the following conditions are met:

1. No part of the conduit system segment passes through a Class I, Zone 0 or Class I, Zone 1 location where the conduit

contains unions, couplings, boxes, or fittings within 12 in. (305 mm) of the Class I, Zone 0 or Class I, Zone 1 location; and

2. The conduit system segment is located entirely in outdoor locations; and

3. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and

4. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and

5. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Zone 2 locations.

(3) Cable seals shall be located as follows.

(a) Cables entering enclosures required to be flameproof or explosionproof shall be sealed at the point of entrance. The seal shall comply with (d). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (b)(4).

Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

(b) Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (2)(a). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [0.007 ft3/hour (198 cm3/hour) of air at a pressure of 6 in. of water (1493 pascals)].

FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.

FPN No. 2: The cable core does not include the interstices of the conductor strands.

(c) Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (2)(a), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 6 in. of water (1493 pascals) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.

Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Zone 2 location without seals.

(d) Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Zone 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.

FPN: The cable sheath may be either metal or a nonmetallic material.

(d) Class I, Zones 0, 1 and 2. Where required, seals in Class I, Zones 0, 1 and 2 locations shall comply with the following.

(1) Fittings. Enclosures for connections or equipment shall be provided with an integral means for sealing, or sealing fittings for Class I locations shall be used. Sealing fittings shall be accessible. Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible.

(2) Compound. The compound shall provide a seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF).

(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 5/8 in. (16 mm).

Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.

(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.

(5) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically listed for a higher percentage of fill.

(e) Drainage.

(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

(3) Canned Pumps, Process or Service Connections, Etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend upon a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical conduit system, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the conduit system beyond the additional devices or means, if the primary seal fails.

The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above.

Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.

(14-368)

505-17. Flexible Cords, Class I, Zones 1 and 2. A flexible cord shall be permitted for connection between portable lighting equipment or other portable utilization equipment and the fixed portion of their supply circuit. Flexible cord shall also be permitted for that portion of the circuit where the fixed wiring methods of Section 505-15(b) cannot provide the necessary degree of movement for fixed and mobile electrical utilization equipment, in an industrial establishment where conditions of maintenance and engineering supervision ensure that only qualified persons will install and service the installation, and the flexible cord is protected by location or by a suitable guard from damage. The length of the flexible cord shall be continuous. Where flexible cords are used, the cords shall be as follows:

1. Of a type listed ~~approved~~ for extra-hard usage;
2. Contain, in addition to the conductors of the circuit, a grounding conductor complying with Section 400-23;
3. Connected to terminals or to supply conductors in an approved manner;
4. Be supported by clamps or by other suitable means in such a manner that there will be no tension no the terminal connections; and
5. Be provided with suitable seals where the flexible cord enters boxes, fittings, or enclosures that are required to be explosionproof or flameproof.

Exception: As provided in 505-15(c).

Electric submersible pumps with means for removal without entering the wet-pit shall be considered portable utilization equipment. The extension of the flexible cord within a suitable raceway between the wet-pit and the power source shall be permitted.

Electric mixers intended for travel into and out of open-type mixing tanks or vats shall be considered portable utilization equipment.

FPN: See Section 505-18 for flexible cords exposed to liquids having a deleterious effect on the conductor insulation.

[14-173]

505-19. Conductors and Conductor Insulation.

1) For Type of Protection "e", field wiring conductors shall be copper. (14-365)

2) Where condensed vapors or liquids may collect on, or come in contact with, the insulation on conductors, such insulation shall be of a type approved for use under such conditions; or the insulation shall be protected by a sheath of lead or by other approved means. (14-181)

505-19. Live Parts. There shall be no exposed live parts.(14-188)

505-20. Equipment

(a) Zone 0. In Class I, Zone 0 locations, only equipment specifically listed and marked as suitable for the location shall be permitted.

Exception: Intrinsically safe equipment listed for use in Class I, Division 1 locations for the same gas, or as permitted by Section 505-7(d), and with a suitable temperature classification ~~rating~~ shall be permitted. [correlation Art500 temperature]

(b) Zone 1. In Class I, Zone 1 locations, only equipment specifically identified ~~listed~~ and marked as suitable for the location shall be permitted. [correlation with Cook identifed & Art 500, CP140?, CP140x,]

Exception: Equipment approved for use in Class I, Division 1 or listed for use in Class I, Zone 0 locations for the same gas, or as permitted by Section 505-7(d) and with a suitable temperature classification ~~rating~~ shall be permitted.

(c) Zone 2 In Class I, Zone 2 locations, only equipment specifically identified ~~listed~~ and marked as suitable for the location shall be permitted. [see above]

Exception No. 1: Equipment identified ~~listed~~ for use in Class I, Zone 0 or Zone 1 locations for the same gas, or as permitted by Section 505-9(a)(2)~~505-7(d)~~, and with a suitable temperature classification~~rating~~, shall be permitted.

Exception No. 2: Equipment identified ~~approved~~ for use in Class I, Division 1 or Division 2 locations for the same gas, or as permitted by Section 505-9(a)(2) ~~505-7(d),~~ and with a suitable temperature classification ~~rating~~ shall be permitted.

Exception No. 3: In Class I, Zone 2 locations, the installation of open or nonexplosionproof or nonflameproof enclosed motors, such as squirrel-cage induction motors without brushes, switching mechanisms, or similar arc-producing devices that are not identified for use in a Class I, Zone 2 location shall be permitted.

FPN No. 1: It is important to consider the temperature of internal and external surfaces that may be exposed to the flammable atmosphere.

FPN No. 2: It is important to consider the risk of ignition due to currents arcing across discontinuities and overheating of parts in multisection enclosures of large motors and generators. Such motors and generators may need equipotential bonding jumpers across joints in the enclosure and from enclosure to ground. Where the presence of ignitible gases or vapors is suspected, clean air purging may be needed immediately prior to and during start-up periods.

(d) Manufacturer's Instructions. Electrical equipment installed in hazardous (classified) locations shall be installed in accordance with the instructions (if any) provided by the manufacturer.

505-21. Multiwire Branch Circuits. In a Class I, Zone 1 location, a multiwire branch circuit shall not be permitted.

Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of the multiwire circuit simultaneously. [14-198]

505-22. ~~[505-21]~~ Increased Safety "e" Motors and Generators. In Class I, Zone 1 locations, Increased Safety "e" motors and generators of all voltage ratings shall be listed for Class I, Zone 1 locations, and shall comply with the following.

1. Motors shall be marked with the current ratio, IA/IN, and time, tE;
2. Motors shall have controllers marked with the model or identification number, output rating (horsepower or kilowatt), full-load amperes, starting current ratio (IA/IN), and time (tE) of the motors that they are intended to protect; the controller marking shall also include the specific overload protection type (and setting, if applicable) that is listed with the motor or generator;
3. Connections shall be made with the specific terminals listed with the motor or generator;
4. Terminal housings shall be permitted to be of substantial, nonmetallic, nonburning material provided an internal grounding means between the motor frame and the equipment grounding connection is incorporated within the housing;
5. The provisions of Part C of Article 430 shall apply regardless of the voltage rating of the motor;
6. The motors shall be protected against overload by a separate overload device that is responsive to motor current. This device shall be selected to trip or shall be rated in accordance with the listing of the motor and its overload protection;
7. Sections 430-34 and 430-44 shall not apply to such motors; and
8. The motor overload protection shall not be shunted or cut out during the starting period.

505-25. Grounding and Bonding. Grounding and bonding shall comply with Article 250 and the following additional requirements.

(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.

Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting

means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.

FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.

(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 505-15(c) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.

Exception: In Class I, Zone 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.

a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.

b. Overcurrent protection in the circuit is limited to 10 amperes or less.

c. The load is not a power utilization load.

(Log #2136)

14- 320 - (505): Accept in Principle

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Reorganize Article 505 as indicated below per NEC CMA Proposal 14-1b. With the exception of minor titling changes and a rearrangement of sentences as indicated within one section, this proposal contains no new words, concepts or requirements.

Revise Article 505 as follows:

1) Rename 505-3 as "General"; relocate entire section 505-10 (c) as new item (a) titled "Documentation of Industrial Occupancies." Also relocate section 505-5 Reference Standards to new item (b).

With change:

505-3 General.

(a) Documentation for Industrial Occupancies.

~~505-10 (c) Documentation for Industrial Occupancies.~~ All areas in industrial occupancies designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

FPN: For examples of area classification drawings, see Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 79-10-1995; Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, API RP 505-1997; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997; Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division I or Division 2, API RP 500-1997, Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

(b) Reference Standards.

~~505-5. Reference Standards~~

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with standards of the National Fire Protection Association, the American Petroleum Institute, and the International Society for Measurement and Control (ISA), that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.

FPN No. 2: For further information on the classification of locations, see Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 79-10-1995; Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, API RP 505-1996; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.

FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996, and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 or Division 2, API RP 500-1997, Section 6.3.

FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Design and Installation of Electrical Systems for Offshore Production Platforms, ANSI/API RP 14F-1991.

FPN No. 6: For further information on the installation of electrical equipment in hazardous (classified) locations in general, see Electrical Apparatus for Explosive Gas Atmospheres — Part 14: Electrical Installations in Explosive Gas Atmospheres (Other than Mines), IEC 79-14-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 16: Artificial Ventilation for the Protection of Analyzer(s) Houses, IEC 79-16-1990.

2) Rename and number existing 505-3 as 505-4 and provide a new title "Classification of Locations. Relocate sections 505-9 (a) (b) (c) under this section and renumber accordingly.

With change:

505-4 Classifications of Locations.

~~505-3. Location and General Requirements.~~

(a) Classification of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified.

Each room, section, or area shall be considered individually in determining its classification.

FPN No. 1: See Section 505-6 for restrictions on area classification.

FPN No. 2: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in less hazardous or in nonhazardous locations and, thus, to reduce the amount of special equipment required.

(b) Class I Zone Locations. Class I Zone locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I Zone locations shall include those specified in (1), (2) and (3).

~~505-9. Zone Classification~~

~~The classification into zones shall be in accordance with the following.~~

(1) Class I, Zone 0. A Class I, Zone 0 location is a location

(a) In which ignitible concentrations of flammable gases or vapors are present continuously, or

(b) In which ignitible concentrations of flammable gases or vapors are present for long periods of time.

FPN No. 1: As a guide in determining when flammable gases or vapors are present continuously or for long periods of time, refer to Recommended Practice for Classification of Locations for Electrical Installations of Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2, API RP 505-1996; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous Areas, IEC 79-10-1995; and Area Classification Code for Petroleum Installations, Model Code, Part 15, Institute of Petroleum; and Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997.

FPN No. 2: This classification includes locations inside vented tanks or vessels that contain volatile flammable liquids; inside inadequately vented spraying or coating enclosures, where volatile flammable solvents are used; between the inner and outer roof sections of a floating roof tank containing volatile flammable liquids; inside

open vessels, tanks and pits containing volatile flammable liquids; the interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors; and inside inadequately ventilated enclosures that contain normally venting instruments utilizing or analyzing flammable fluids and venting to the inside of the enclosures.

FPN No. 3: It is not good practice to install electrical equipment in Zone 0 locations except when the equipment is essential to the process or when other locations are not feasible. [See Section 505-3(a) FPN No. 2.] If it is necessary to install electrical systems in a Zone 0 location, it is good practice to install intrinsically safe systems as described by Article 504.

(2) Class I, Zone 1. A Class I, Zone 1 location is a location
(a) In which ignitible concentrations of flammable gases or vapors are likely to exist under normal operating conditions; or
(b) In which ignitible concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or
(c) In which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitible concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or
(d) That is adjacent to a Class I, Zone 0 location from which ignitible concentrations of vapors could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

FPN No. 1: Normal operations is considered the situation when plant equipment is operating within its design parameters. Minor releases of flammable material may be part of normal operations. Minor releases include the releases from mechanical packings on pumps. Failures that involve repair or shutdown (such as the breakdown of pump seats and flange gaskets, and spillage caused by accidents) are not considered normal operation.

FPN No. 2: This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another. In areas in the vicinity of spraying and painting operations where flammable solvents are used; adequately ventilated drying rooms or compartments for evaporation of flammable solvents; adequately ventilated locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where volatile flammable liquids are used; adequately ventilated gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in the open, lightly stoppered, or easily ruptured containers; and other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operation, but not classified Zone 0.

(3) Class I, Zone 2. A Class I, Zone 2 location is a location
(a) In which ignitible concentrations of flammable gases or vapors are not likely to occur in normal operation and if they do occur will exist only for a short period; or
(b) In which volatile flammable liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors normally are confined within closed containers of closed systems from which they can escape, only as a result of accidental rupture or breakdown of the containers or system, or as a result of the abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or
(c) In which ignitible concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as a result of failure or abnormal operation of the ventilation equipment; or
(d) That is adjacent to a Class I, Zone 1 location, from which ignitible concentrations of flammable gases or vapors could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN: The Zone 2 classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition.

3) Make section 505-5 “Material Groups” and relocate section 507 (a) (b) and (c) under this section, renumbering as shown.

With change:

505-5 Material Groups.
~~505-7. Grouping and Classification.~~
For purposes of testing, approval, and area classification, various air mixtures (not oxygen enriched) shall be grouped as required in (a), (b), and (c).

FPN: Group I is intended for use in describing atmospheres that contain firedamp (a mixture of gases, composed mostly of methane, found underground, usually in mines). This Code does not apply to installations underground in mines. See Section 90-2(b).

Group II shall be subdivided into IIC, IIB, and IIA, as noted in (a), (b), and (c), according to the nature of the gas or vapor, for protection techniques “d,” “ia,” “ib,” “[ia],” and “[ib],” and, where applicable, “n” and “o.”

FPN No. 1: The gas and vapor subdivision as described above is based on the maximum experimental safe gap (MESG), minimum igniting current (MIC), or both. Test equipment for determining the MESG is described in Construction and Verification Tests of Flameproof Enclosures of Electrical Apparatus, IEC 79-1A-1975, Amendment No. 1 (1993) and UL Technical Report No. 58 (1993). The test equipment for determining MIC is described in Spark-Test Apparatus for Intrinsically-Safe Circuits, IEC 79-3-1990. The classification of gases or vapors according to their maximum experimental safe gaps and minimum igniting currents is described in Classification of Mixtures of Gases or Vapours with Air According to Their Maximum Experimental Safe Gaps and Minimum Igniting Currents, IEC 79-12-1978.

FPN No. 2: Verification of electrical equipment utilizing protection techniques “e,” “m,” “p,” and “q,” due to design technique, does not require tests involving MESG or MIC. Therefore, Group II is not required to be subdivided for these protection techniques.

FPN No. 3: It is necessary that the meanings of the different equipment markings and Group II classifications be carefully observed to avoid confusion with Class I, Divisions 1 and 2, Groups A, B, C, and D.

(a) Class I Zone Group Classifications. Class I Zone groups shall be as follows:

(1) Group IIC. Atmospheres containing acetylene, hydrogen, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.50 mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.45.

FPN: Group IIC is equivalent to a combination of Class I, Group A, and Class I, Group B, as described in Sections 500-5(a)(1) and (a)(2).

(2) Group IIB. Atmospheres containing acetaldehyde, ethylene, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either maximum experimental safe gap (MESG) values greater than 0.50 mm and less than or equal to 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.45 and less than or equal to 0.80.

FPN: Group IIB is equivalent to Class I, Group C, as described in Section 500-5(a)(3).

(3) Group IIA. Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experiment safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN: Group IIA is equivalent to Class I, Group D as described in Section 500-5(a)(4).

4) Retain 505-6 as is.

5) Make 505-7 "Protection Techniques" and relocate all of 505-4 (a) - (h) under this section.

With change:

505- 7 Protection Techniques.
~~505-4. Protection Techniques.~~
The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

FPN: For additional information, see Electrical Apparatus for Use in Class I, Zone 0, 1 Hazardous (Classified) Locations General Requirements, ISA S12.0.01-1997; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279, 1997; and Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements, IEC 79-0-1983, Amendment No. 1 (1987), and Amendment No. 2 (1991).

(a) Flameproof "d." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Flameproof is a type of protection of electrical equipment in which the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive atmosphere consisting of one or more of the gases or vapors for which it is designed.
FPN No. 2: For further information, see Electrical Apparatus for Use In Class I, Zone 1 and 2 Hazardous (Classified) Locations, Type of Protection — Flameproof "d," ISA S12.22.01-1996; Electrical Apparatus for Explosive Gas Atmospheres, Part 1 — Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus, IEC 79-1-1990 and Amendment No. 1 (1993).

(b) Purged and Pressurized. This protection technique shall be permitted for equipment in those Class I, Zone 1 or Zone 2 locations for which it is approved.

FPN No. 1: In some cases, hazards may be reduced or hazardous (classified) locations limited or eliminated by adequate positive-pressure ventilation from a source of clean air in conjunction with effective safeguards against ventilation failure.
FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.
FPN No. 3: Pressurized "p" is a type of protection of electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere. For further information, see Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Electrical Apparatus, Type of Protection "p," IEC 79-2-1983; and Electrical Apparatus for Explosive Gas Atmospheres - Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization, IEC 79-13-1982.

(c) Intrinsic Safety. This protection technique shall be permitted for equipment in those Class I, Zone 0 or Zone 1 locations for which it is approved.

FPN No. 1: Intrinsic safety is designated type of protection "ia" by IEC 79-11 for use in Zone 0 locations. Intrinsic safety is designated type of protection "ib" by IEC 79-11 for use in Zone 1 locations.
FPN No. 2: For further information, see Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Hazardous Locations, ANSI/UL 913-1997; Electrical Apparatus for Explosive Gas Atmospheres — Part 11: Intrinsic Safety "i," IEC 79-11-1991; and Electrical Apparatus for Explosive Gas Atmospheres — Part 3: Spark-test Apparatus for Intrinsically-safe Circuits, IEC 79-3-1990.
FPN No. 3: Intrinsically safe associated apparatus, designated by [ia] or [ib], is connected to intrinsically safe equipment ("ia" or "ib" respectively), but is located outside the hazardous (classified) location unless also protected by another type of protection (such as flameproof).

(d) Type of Protection "n." This protection technique shall be permitted for equipment in those Class I, Zone 2 locations for which it is approved. Type of protection "n" is further subdivided into nA, nC, and nR.

FPN No. 1: See Table 505-10(b) 1 for the descriptions of subdivisions for type of protection "n."
FPN No. 2: Type "n" protection is a type of protection applied to electrical equipment such that, in normal operation, the electrical equipment is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.
FPN No. 3: For further information, see Electrical Apparatus for Explosive Gas Atmospheres, Part 15 — Electrical Apparatus with Type of Protection "n," IEC 79-15-1987.

(e) Oil Immersion "o." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Oil immersion is a type of protection in which the electrical equipment or parts of the electrical equipment are immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.
FPN No. 2: For further information, see Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Oil-Immersion "o," ISA S12.26.01 — 1996; and Electrical Apparatus for Explosive Gas Atmospheres, Part 6 — Oil-Immersion "o," IEC 79-6-1995.

(f) Increased Safety "e." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Increased safety is a type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.
FPN No. 2: For further information, see Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Increased Safety "e," ISA S12.16.01-1996; and Electrical Apparatus for Explosive Gas Atmospheres — Part 7: Increased Safety "e," IEC 79-7-1990, Amendment No. 1 (1991), and Amendment No. 2 (1993).

(g) Encapsulation "m." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Encapsulation is a type of protection in which the parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.
FPN No. 2: For further information, see Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation "m," ISA S12.23.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 18: Encapsulation "m," IEC 79-18-1992.

(h) Powder Filling "q." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Powder filling is a type of protection in which the parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.
FPN No. 2: For further information, see Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Powder Filling "q," ISA S12.25.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 5: Powder Filling, Type of Protection "q," IEC 79-5-1967.

6) Title section 505-8 Equipment, relocate 505-10 (a) as item (a) (1), relocate 505-7 (d) as (a) (2); create new section (b) titled "Marking" and move under this section 505-10 (b) (1) & (2); create new section (c) titled "Class I Temperature" and move 505-8 and 505-10 (b) (3) under this new section; create new section (d) titled "Threading" and relocate 505-3 (b) under this section. Renumber figures and tables accordingly.

With change:

505-8 Equipment.

(a) Listing.
(1) Equipment that is listed for a Zone 0 location shall be permitted in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is listed for a Zone 1 location shall be permitted in a Zone 2 location of the same gas or vapor.

(2) ~~(d) Other.~~ Equipment shall be permitted to be listed for a specific gas or vapor, specific mixtures of gases or vapors, or any specific combination of gases or vapors.

FPN: One common example is equipment marked for "IIB + H2."

(b) Marking.

~~(b) Marking.~~ Equipment shall be marked in accordance with (1) or (2).
(1) Division Equipment. Equipment approved for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section 500-7(b), be permitted to be marked with the following:
a. Class I, Zone 1 or Class I, Zone 2 (as applicable), and
b. Applicable gas classification group(s) in accordance with Table 505-8(b)(2), and
c. Temperature classification in accordance with Section 505-8(c)

(2) Zone Equipment. Equipment meeting one or more of the protection techniques described in Section 505-4 shall be marked with the following in the order shown:
a. Class
b. Zone
c. Symbol "AEx"
d. Protection technique(s) in accordance with Table 505-10(b)(2)
e. Applicable gas classification group(s) in accordance with Table 505-10(b)(2)
f. Temperature classification in accordance with Section 505-10(b)(3)
Exception: Intrinsically safe associated apparatus shall be required to be marked only with (c), (d), and (e).

FPN No. 1: An example of such a required marking is "Class I, Zone 0, AEx ia IIC T6."

Electrical equipment of types of protection "e," "m," "p," or "q," shall be marked Group II. Electrical equipment of types of protection "d," "ia," "ib," "[ia]," or "[ib]" shall be marked Group IIA, or IIB, or IIC, or for a specific gas or vapor. Electrical equipment of types of protection "n" shall be marked Group II unless it contains enclosed-break devices, nonincendive components, or energy-limited equipment or circuits, in which case it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor. Electrical equipment of other types of protection shall be marked Group II unless the type of protection utilized by the equipment requires that it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor.

FPN No. 2: An explanation of the marking that is required follows.

Figure 505-8(b)(1).

Table 505-8(b)(1). Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Intrinsically safe associated apparatus	Nonhazardous
[ib]	Intrinsically safe associated apparatus	Nonhazardous
m	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure	2
nR	Restricted breathing enclosure	2
o	Oil immersion	1
p	Purged and pressurized	1 or 2
q	Powder filled	1

* Does not address use where a combination of techniques is used.

Table 505-8(b)(2). Gas Classification Groups

Gas Group	Comment
IIC	See Section 505-5(a)
IIB	See Section 505-5(b)
IIA	See Section 505-5(c)

(c) Class I Temperature.

~~505-8. Class I Temperature.~~
The temperature marking specified ~~in Section 505-10(b)~~ shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994; and Electrical Apparatus for Explosive Gas Atmospheres, Data for Flammable Gases and Vapours, Relating to the Use of Electrical Apparatus, IEC 79-20-1996.

(1) ~~(3)~~ Temperature Classifications. Approved equipment shall be marked to show the operating temperature or temperature range referenced to a 40ºC (104ºF) ambient. The temperature range, if provided, shall be indicated in identification numbers, as shown in Table 505-8(c).

Table 505-8(c). Classification of Maximum Surface Temperature for Group II Electrical Equipment

Temperature Class	Maximum Surface Temperature (ºC)
T1	Û450
T2	Û300
T3	Û200
T4	Û135
T5	Û100
T6	Û85

Electrical equipment designed for use in the ambient temperature range between -20ºC and +40ºC shall require no additional temperature marking.
Electrical equipment that is designed for use in a range of ambient temperatures other than -20ºC and +40ºC is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol "Ta" or "Tamb" together with the special range of ambient temperatures. As an example, such a marking might be "-30ºC Ta + 40ºC."
Electrical equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature range at that ambient temperature.
Exception No. 1: Equipment of the nonheat-producing type, such as conduit fittings, and equipment of the heat-producing type having a maximum temperature of not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature range.
Exception No. 2: Equipment approved for Class I, Division 1 or Division 2 locations as permitted by Sections 505-20(b) and (c) shall be permitted to be marked in accordance with Section 500-5(d) and Table 500-5(d).

(d) Threading.
~~(b) Threading.~~ All threaded conduit referred to herein shall be threaded with an NPT standard conduit cutting die that provides _-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable.
Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).
(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.
(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1:1980, and Metric Screw Threads, ISO 965/3:1980.

7) Eliminate Section heading 505-10. No changes are made to other sections that follow 505-10.

Article 505 with recommended changes would appear as follows:

ARTICLE 505 -- Class I, Zone 0, 1, and 2 Locations
505-1. Scope. This article covers the requirements for the zone classification system as an alternative to the division classification system covered in Article 500 for electrical and electronic equipment and wiring for all voltages in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases, vapors, or liquids.

FPN: For the requirements for electrical and electronic equipment and wiring for all voltages in Class I, Division 1 or Division 2; Class II, Division 1 or Division 2; and Class III, Division 1 or Division 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, or combustible dusts or fibers, refer to Articles 500 through 504.

505-2. Other Articles
All other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.
Exception: As modified by Article 504 and this article.

505-3 General.
(a) Documentation for Industrial Occupancies. All areas in industrial occupancies designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electrical equipment at the location.

FPN: For examples of area classification drawings, see Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 79-10-1995; Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, API RP 505-1997; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997; Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division I or Division 2, API RP 500-1997, Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.

(b) Reference Standards.

FPN No. 1: It is important that the authority having jurisdiction be familiar with recorded industrial experience as well as with standards of the National Fire Protection Association, the American Petroleum Institute, and the International Society for Measurement and Control (ISA), that may be of use in the classification of various locations, the determination of adequate ventilation, and the protection against static electricity and lightning hazards.
FPN No. 2: For further information on the classification of locations, see Electrical Apparatus for Explosive Gas Atmospheres, Classification of Hazardous Areas, IEC 79-10-1995; Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2, API RP 505-1996; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997; and Model Code of Safe Practice in the Petroleum Industry, Part 15: Area Classification Code for Petroleum Installations, IP 15, The Institute of Petroleum, London.
FPN No. 3: For further information on protection against static electricity and lightning hazards in hazardous (classified) locations, see Recommended Practice on Static Electricity, NFPA 77-1993; Standard for the Installation of Lightning Protection Systems, NFPA 780-1997; and Protection Against Ignitions Arising Out of Static Lightning and Stray Currents, API RP 2003-1991.
FPN No. 4: For further information on ventilation, see Flammable and Combustible Liquids Code, NFPA 30-1996, and Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 or Division 2, API RP 500-1997, Section 6.3.
FPN No. 5: For further information on electrical systems for hazardous (classified) locations on offshore oil and gas producing platforms, see Design and Installation of Electrical Systems for Offshore Production Platforms, ANSI/API RP 14F-1991.
FPN No. 6: For further information on the installation of electrical equipment in hazardous (classified) locations in general, see Electrical Apparatus for Explosive Gas Atmospheres — Part 14: Electrical Installations in Explosive Gas Atmospheres (Other than Mines), IEC 79-14-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 16: Artificial Ventilation for the Protection of Analyzer(s) Houses, IEC 79-16-1990.

505-4 Classifications of Locations.
(a) Classification of Locations. Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations shall not be classified.
Each room, section, or area shall be considered individually in determining its classification.

FPN No. 1: See Section 505-6 for restrictions on area classification.
FPN No. 2: Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in less hazardous or in nonhazardous locations and, thus, to reduce the amount of special equipment required.

(b) Class I Zone Locations. Class I Zone locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I Zone locations shall include those specified in (1), (2) and (3).

(1) Class I, Zone 0. A Class I, Zone 0 location is a location
(a) In which ignitible concentrations of flammable gases or vapors are present continuously, or
(b) In which ignitible concentrations of flammable gases or vapors are present for long periods of time.

FPN No. 1: As a guide in determining when flammable gases or vapors are present continuously or for long periods of time, refer to Recommended Practice for Classification of Locations for Electrical Installations of Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2, API RP 505-1996; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous Areas, IEC 79-10-1995; and Area Classification Code for Petroleum Installations, Model Code, Part 15, Institute of Petroleum; and Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997.

FPN No. 2: This classification includes locations inside vented tanks or vessels that contain volatile flammable liquids; inside inadequately vented spraying or coating enclosures, where volatile flammable solvents are used; between the inner and outer roof sections of a floating roof tank containing volatile flammable liquids; inside open vessels, tanks and pits containing volatile flammable liquids; the interior of an exhaust duct that is used to vent ignitible concentrations of gases or vapors; and inside inadequately ventilated enclosures that contain normally venting instruments utilizing or analyzing flammable fluids and venting to the inside of the enclosures.

FPN No. 3: It is not good practice to install electrical equipment in Zone 0 locations except when the equipment is essential to the process or when other locations are not feasible. [See Section 505-3(a) FPN No. 2.] If it is necessary to install electrical systems in a Zone 0 location, it is good practice to install intrinsically safe systems as described by Article 504.

(2) Class I, Zone 1. A Class I, Zone 1 location is a location
(a) In which ignitible concentrations of flammable gases or vapors are likely to exist under normal operating conditions; or
(b) In which ignitible concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or
(c) In which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitible concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or
(d) That is adjacent to a Class I, Zone 0 location from which ignitible concentrations of vapors could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

FPN No. 1: Normal operations is considered the situation when plant equipment is operating within its design parameters. Minor releases of flammable material may be part of normal operations. Minor releases include the releases from mechanical packings on pumps. Failures that involve repair or shutdown (such as the breakdown of pump seats and flange gaskets, and spillage caused by accidents) are not considered normal operation.

FPN No. 2: This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another. In areas in the vicinity of spraying and painting operations where flammable solvents are used; adequately ventilated drying rooms or compartments for evaporation of flammable solvents; adequately ventilated locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where volatile flammable liquids are used; adequately ventilated gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in the open, lightly stoppered, or easily ruptured containers; and other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operation, but not classified Zone 0.

(3) Class I, Zone 2. A Class I, Zone 2 location is a location
(a) In which ignitible concentrations of flammable gases or vapors are not likely to occur in normal operation and if they do occur will exist only for a short period; or
(b) In which volatile flammable liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors normally are confined within closed containers of closed systems from which they can escape, only as a result of accidental rupture or breakdown of the containers or system, or as a result of the abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or
(c) In which ignitible concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as a result of failure or abnormal operation of the ventilation equipment; or
(d) That is adjacent to a Class I, Zone 1 location, from which ignitible concentrations of flammable gases or vapors could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

FPN: The Zone 2 classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition.

505-5 Material Groups. For purposes of testing, approval, and area classification, various air mixtures (not oxygen enriched) shall be grouped as required in (a), (b), and (c).

FPN: Group I is intended for use in describing atmospheres that contain firedamp (a mixture of gases, composed mostly of methane, found underground, usually in mines). This Code does not apply to installations underground in mines. See Section 90-2(b).

Group II shall be subdivided into IIC, IIB, and IIA, as noted in (a), (b), and (c), according to the nature of the gas or vapor, for protection techniques “d,” “ia,” “ib,” “[ia],” and “[ib],” and, where applicable, “n” and “o.”

FPN No. 1: The gas and vapor subdivision as described above is based on the maximum experimental safe gap (MESG), minimum igniting current (MIC), or both. Test equipment for determining the MESG is described in Construction and Verification Tests of Flameproof Enclosures of Electrical Apparatus, IEC 79-1A-1975, Amendment No. 1 (1993) and UL Technical Report No. 58 (1993). The test equipment for determining MIC is described in Spark-Test Apparatus for Intrinsically-Safe Circuits, IEC 79-3-1990. The classification of gases or vapors according to their maximum experimental safe gaps and minimum igniting currents is described in Classification of Mixtures of Gases or Vapours with Air According to Their Maximum Experimental Safe Gaps and Minimum Igniting Currents, IEC 79-12-1978.

FPN No. 2: Verification of electrical equipment utilizing protection techniques “e,” “m,” “p,” and “q,” due to design technique, does not require tests involving MESG or MIC. Therefore, Group II is not required to be subdivided for these protection techniques.

FPN No. 3: It is necessary that the meanings of the different equipment markings and Group II classifications be carefully observed to avoid confusion with Class I, Divisions 1 and 2, Groups A, B, C, and D.

(a) Class I Zone Group Classifications. Class I Zone groups shall be as follows:

(1) Group IIC. Atmospheres containing acetylene, hydrogen, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.50 mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.45.

FPN: Group IIC is equivalent to a combination of Class I, Group A, and Class I, Group B, as described in Sections 500-5(a)(1) and (a)(2).

(2) Group IIB. Atmospheres containing acetaldehyde, ethylene, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either maximum experimental safe gap (MESG) values

greater than 0.50 mm and less than or equal to 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.45 and less than or equal to 0.80.

FPN: Group IIB is equivalent to Class I, Group C, as described in Section 500-5(a)(3).

(3) Group IIA. Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experiment safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.80.

FPN: Group IIA is equivalent to Class I, Group D as described in Section 500-5(a)(4).

505-6 Special Precaution. Article 505 requires equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to the installation and maintenance of electrical equipment in hazardous (classified) locations.

FPN No. 2: Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by Section 505-4(a) may not be suitable for use at temperatures lower than -20ºC (-13ºF) unless they are approved for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zones 0, 1, or 2 at normal ambient temperature.

(a) Supervision of Work. Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer.

(b) Dual Classification. In instances of areas within the same facility classified separately, Class I, Zone 2 locations shall be permitted to abut, but not overlap, Class I, Division 2 locations. Class I, Zone 0 or Zone 1 locations shall not abut Class I, Division 1 or Division 2 locations.

(c) Reclassification Permitted. A Class I, Division 1 or Division 2 location shall be permitted to be reclassified as a Class I, Zone 0, Zone 1, or Zone 2 location provided all of the space that is classified because of a single flammable gas or vapor source is reclassified under the requirements of this article.

505- 7 Protection Techniques. The following shall be acceptable protection techniques for electrical and electronic equipment in hazardous (classified) locations.

FPN: For additional information, see Electrical Apparatus for Use in Class I, Zone 0, 1 Hazardous (Classified) Locations General Requirements, ISA S12.0.01-1997; Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations, ANSI/UL 2279, 1997; and Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements, IEC 79-0-1983, Amendment No. 1 (1987), and Amendment No. 2 (1991).

(a) Flameproof "d." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Flameproof is a type of protection of electrical equipment in which the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive atmosphere consisting of one or more of the gases or vapors for which it is designed.

FPN No. 2: For further information, see Electrical Apparatus for Use In Class I, Zone 1 and 2 Hazardous (Classified) Locations, Type of Protection — Flameproof "d," ISA S12.22.01-1996; Electrical Apparatus for Explosive Gas Atmospheres, Part 1 — Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus, IEC 79-1-1990 and Amendment No. 1 (1993).

(b) Purged and Pressurized. This protection technique shall be permitted for equipment in those Class I, Zone 1 or Zone 2 locations for which it is approved.

FPN No. 1: In some cases, hazards may be reduced or hazardous (classified) locations limited or eliminated by adequate positive-pressure ventilation from a source of clean air in conjunction with effective safeguards against ventilation failure.

FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

FPN No. 3: Pressurized "p" is a type of protection of electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere. For further information, see Electrical Apparatus for Explosive Gas Atmospheres - Part 2: Electrical Apparatus, Type of Protection "p," IEC 79-2-1983; and Electrical Apparatus for Explosive Gas Atmospheres - Part 13: Construction and Use of Rooms or Buildings Protected by Pressurization, IEC 79-13-1982.

(c) Intrinsic Safety. This protection technique shall be permitted for equipment in those Class I, Zone 0 or Zone 1 locations for which it is approved.

FPN No. 1: Intrinsic safety is designated type of protection "ia" by IEC 79-11 for use in Zone 0 locations. Intrinsic safety is designated type of protection "ib" by IEC 79-11 for use in Zone 1 locations.

FPN No. 2: For further information, see Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Hazardous Locations, ANSI/UL 913-1997; Electrical Apparatus for Explosive Gas Atmospheres — Part 11: Intrinsic Safety "i," IEC 79-11-1991; and Electrical Apparatus for Explosive Gas Atmospheres — Part 3: Spark-test Apparatus for Intrinsically-safe Circuits, IEC 79-3-1990.

FPN No. 3: Intrinsically safe associated apparatus, designated by [ia] or [ib], is connected to intrinsically safe equipment ("ia" or "ib" respectively), but is located outside the hazardous (classified) location unless also protected by another type of protection (such as flameproof).

(d) Type of Protection "n." This protection technique shall be permitted for equipment in those Class I, Zone 2 locations for which it is approved. Type of protection "n" is further subdivided into nA, nC, and nR.

FPN No. 1: See Table 505-10(b) 1 for the descriptions of subdivisions for type of protection "n."

FPN No. 2: Type "n" protection is a type of protection applied to electrical equipment such that, in normal operation, the electrical equipment is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.

FPN No. 3: For further information, see Electrical Apparatus for Explosive Gas Atmospheres, Part 15 — Electrical Apparatus with Type of Protection "n," IEC 79-15-1987.

(e) Oil Immersion "o." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Oil immersion is a type of protection in which the electrical equipment or parts of the electrical equipment are immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

FPN No. 2: For further information, see Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Oil-Immersion "o," ISA S12.26.01 — 1996; and Electrical Apparatus for Explosive Gas Atmospheres, Part 6 — Oil-Immersion "o," IEC 79-6-1995.

(f) Increased Safety "e." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Increased safety is a type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the

possibility of excessive temperatures and of the occurrence of arcs and sparks.
FPN No. 2: For further information, see Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations, Type of Protection — Increased Safety "e," ISA S12.16.01-1996; and Electrical Apparatus for Explosive Gas Atmospheres — Part 7: Increased Safety "e," IEC 79-7-1990, Amendment No. 1 (1991), and Amendment No. 2 (1993).

(g) Encapsulation "m." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Encapsulation is a type of protection in which the parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.
FPN No. 2: For further information, see Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation "m," ISA S12.23.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 18: Encapsulation "m," IEC 79-18-1992.

(h) Powder Filling "q." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is approved.

FPN No. 1: Powder filling is a type of protection in which the parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.
FPN No. 2: For further information, see Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Powder Filling "q," ISA S12.25.01-1996, and Electrical Apparatus for Explosive Gas Atmospheres — Part 5: Powder Filling, Type of Protection "q," IEC 79-5-1967.

505-8 Equipment.

(a) Listing.
(1) Equipment that is listed for a Zone 0 location shall be permitted in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is listed for a Zone 1 location shall be permitted in a Zone 2 location of the same gas or vapor.

(2) Equipment shall be permitted to be listed for a specific gas or vapor, specific mixtures of gases or vapors, or any specific combination of gases or vapors.

FPN: One common example is equipment marked for "IIB + H2."

(b) Marking. Equipment shall be marked in accordance with (1) or (2).
(1) Division Equipment. Equipment approved for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section 500-5(d), be permitted to be marked with the following:
a. Class I, Zone 1 or Class I, Zone 2 (as applicable), and
b. Applicable gas classification group(s) in accordance with Table 505-8(b)(2), and
c. Temperature classification in accordance with Section 505-8(3)

(2) Zone Equipment. Equipment meeting one or more of the protection techniques described in Section 505-4 shall be marked with the following in the order shown:
a. Class
b. Zone
c. Symbol "AEx"
d. Protection technique(s) in accordance with Table 505-8(b)(2)
e. Applicable gas classification group(s) in accordance with Table 505-8(b)(2)
f. Temperature classification in accordance with Section 505-8(c)
Exception: Intrinsically safe associated apparatus shall be required to be marked only with (c), (d), and (e).

FPN No. 1: An example of such a required marking is "Class I, Zone 0, AEx ia IIC T6."
Electrical equipment of types of protection "e," "m," "p," or "q," shall be marked Group II. Electrical equipment of types of protection "d," "ia," "ib," "[ia]," or "[ib]" shall be marked Group IIA, or IIB, or IIC, or for a specific gas or vapor. Electrical equipment of types of protection "n" shall be marked Group II unless it contains enclosed-break devices, nonincendive components, or energy-limited equipment or circuits, in which case it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor. Electrical equipment of other types of protection shall be marked Group II unless the type of protection utilized by the equipment requires that it shall be marked Group IIA, IIB, or IIC, or a specific gas or vapor.

FPN No. 2: An explanation of the marking that is required follows.

Figure 505-8(b)(1).

Table 505-8(b)(1). Types of Protection Designation

Designation	Technique	Zone*
d	Flameproof enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Intrinsically safe associated apparatus	Nonhazardous
[ib]	Intrinsically safe associated apparatus	Nonhazardous
m	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure enclosure	2
nR	Restricted breathing	2
o	Oil immersion	1
p	Purged and pressurized	1 or 2
q	Powder filled	1

* Does not address use where a combination of techniques is used.

Table 505-8(b)(2). Gas Classification Groups

Gas Group	Comment
IIC	See Section 505-5(a)
IIB	See Section 505-5(b)
IIA	See Section 505-5(c)

(c) Class I Temperature. The temperature marking shall not exceed the ignition temperature of the specific gas or vapor to be encountered.

FPN: For information regarding ignition temperatures of gases and vapors, see Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497-1997; Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994; and Electrical Apparatus for Explosive Gas Atmospheres, Data for Flammable Gases and Vapours, Relating to the Use of Electrical Apparatus, IEC 79-20-1996.

(1) Temperature Classifications. Approved equipment shall be marked to show the operating temperature or temperature range referenced to a 40ºC (104ºF) ambient. The temperature range, if provided, shall be indicated in identification numbers, as shown in Table 505-8 (c).

Table 505-8(c). Classification of Maximum Surface Temperature for Group II Electrical Equipment

Temperature Class	Maximum Surface Temperature (ºC)
T1	Û450
T2	Û300
T3	Û200
T4	Û135
T5	Û100
T6	Û85

Electrical equipment designed for use in the ambient temperature range between -20ºC and +40ºC shall require no additional temperature marking.
Electrical equipment that is designed for use in a range of ambient temperatures other than -20ºC and +40ºC is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol "Ta" or "Tamb" together with the special range of ambient temperatures. As an example, such a marking might be "-30ºC Ta + 40ºC."
Electrical equipment suitable for ambient temperatures exceeding 40ºC (104ºF) shall be marked with both the maximum ambient temperature and the operating temperature or temperature range at that ambient temperature.
Exception No. 1: Equipment of the nonheat-producing type, such as conduit fittings, and equipment of the heat-producing type having a maximum temperature of not more than 100ºC (212ºF) shall not be required to have a marked operating temperature or temperature range
Exception No. 2: Equipment approved for Class I, Division 1 or Division 2 locations as permitted by Sections 505-20(b) and (c) shall be permitted to be marked in accordance with Section 500-5(d) and Table 500-5(d).

(d) Threading. All threaded conduit referred to herein shall be threaded with an NPT standard conduit cutting die that provides 3/4-in. taper per foot. Such conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system, and to ensure the explosionproof or flameproof integrity of the conduit system where applicable.
Equipment provided with threaded entries for field wiring connections shall be installed in accordance with (1) or (2).
(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.
(2) Equipment Provided with Threaded Entries for Metric Threaded Conduit or Fittings. For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adapters to permit connection to conduit or NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings. Listed cable fittings that have metric threads shall be permitted to be used.

FPN: Threading specifications for metric threaded entries are located in Metric Screw Threads, ISO 965/1:1980, and Metric Screw Threads, ISO 965/3:1980.

SUBSTANTIATION: Currently, the introduction to Hazardous (Classified) Locations is presented with little regard to clarity and understanding. The text jumps from "classifications" to "documentation" to "threaded...", to "protection techniques", without ever providing groundwork as to the need for the protection techniques. Under the proposed revision, the reader is moved in a logical sequence, that defines general needs, addresses the classifications of locations, discusses material groups, before ever mentioning equipment. Then with protection techniques, equipment, equipment approvals, equipment markings and equipment designs are addressed. This provides a flow into the more specific sections beyond Article 505.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-318a addresses the submitter's proposed rewrite with one developed by Panel 14.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: Although I agree with a reorganization effort, this proposal seems incomplete. Sections 505-20, 21, and 25 seem to be left out.

(Log #2265)

14- 321 - (505): Reject
SUBMITTER: David Wechsler, Union Carbide Corp.
RECOMMENDATION: Delete "Class I" before the term zone, in all 13 places that it appears within the NEC. Thus, for example, "Class I, Zone 1" would now become simply "Zone 1."
SUBSTANTIATION: Unlike the US Class-Division methodology where a division could apply to flammable gases or to combustible dusts, and thus required the "Class" for appropriate understanding, "Zone 0," "Zone 1," "Zone 2" can only apply to Class I materials. Thus, the use of the term "Class I" before the "zone" term is unnecessary and extraneous since "Zone 0," "FZone 1," "Zone 2" apply only to Class I materials. If ever finalized and adopted, zones that address combustible dusts will have a different numbering system (i.e., Zone 20, 21, 22).
PANEL ACTION: Reject.
PANEL STATEMENT: Class I designation has been accepted for the past several code cycles and has been used successfully by manufacturers and product evaluation and testing organizations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #37)

14- 322 - (505-3, FPN (New)): Reject
NOTE: The following proposal consists of Comment 14-72 on Proposal 14-281 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 14-281 was:

Revise as follows:

505-3. Special Precaution. Article 505 requires equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

(FPN No. 1): It is important that inspection authorities and users exercise more than ordinary care with regard to installation and maintenance of electrical equipment in hazardous (classified) locations.

(FPN No. 2): Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by 505-2(c)1 may not be suitable for use at temperatures lower than -20°C (-13°F) unless they are approved for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zones 0, 1, or 2 at normal ambient temperature.

(a) Supervision of Work. Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer.

(b) Dual Classification. Class I, Zone 2 locations shall be permitted to abut, but not overlap, Class I, Division 2 locations. Class I, Zone 0 or Zone 1 locations shall not abut Class I, Division 1 or Division 2 locations.

(c) Reclassification Permitted. A Class I, Division 1 or Division 2 location shall be permitted to be reclassified as a Class I, Zone 0, Zone 1 or Zone 2 location provided all of the space that is classified because of a single flammable gas or vapor source is reclassified under the requirements of this article.
SUBMITTER: Zdena Zajickova, World Safety Org.
RECOMMENDATION: Add Fine Print Note following 505-3 statement:
"Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer."
(FPN): The term "Qualified Registered Professional Engineer" may be considered applicable to qualified members of the World Safety Organization certified by the WSO Professional Certification Board.
SUBSTANTIATION: The World Safety Organization (WSO) is in Consultative Status Category II (nongovernmental) with the United Nations; and as such is fully recognized throughout the world as a professional organization. Its roster includes over 14,000 members, 1500 national and multinational companies/corporations, and 184 nations. Also included are over 2,000 professionals who are both nationally and internationally certified practitioners in the safety, health and environmental vocations. Since 1975, this organization has been strongly committed to the protection of people, property, resources and the environment. The WSO mandates an evaluation of its members mastery of safety knowledge and application; to include their professional and ethical behavior. Strict standards of professional performance are applied to ensure that WSO certified members, practicing safety, have attained a level of professionalism required to meet or exceed the needs of Government, commerce, and industry on both national and international levels. I have provided more information about the WSO and our certification exams, policy, and program.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 14-348, which deletes this section.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3020)

14- 323 - (505-3(a), FPN No. 2): Accept in Principle
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Replace "nonhazardous" with "unclassified."
SUBSTANTIATION: This is a companion proposal to other proposals which provide a definition of unclassified in Articles 100, 500, and 505, and provides correlation. The term "Classified" refers to the type of material/hazard potential involved, i.e., Class I, Division 1, Class II, Division 2, etc. Terms such as nonhazardous and unclassified are used in both the NEC, the Uniform Building Code (UBC), and other NFPA documents. The term nonhazardous infers that the area has "no" hazards while the term "unclassified" more clearly correlates with the condition of being reviewed but found not to need classification. This action provides needed correlation with other NFPA documents, such as NFPA 497. Additionally the term "nonhazardous" is used 7 times within various parts of the NEC, and in at least one place in the NEC the meaning of nonhazardous applies to voltages and not classification. A companion proposal has been made to change the term "nonhazardous" to "unclassified" as appropriate elsewhere in the NEC.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-318a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3984)

14- 324 - (505-3(b)(1)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
505-3(b)(1) Equipment Provided with Threaded Entries for NPT Threaded Conduit or Fittings. For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used. Threaded entries into flameproof or explosionproof enclosures shall be made up with at least five threads fully engaged.
SUBSTANTIATION: This proposal is the work of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose of the proposal is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-318a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1628)

14- 325 - (505-4(a)): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3571)

14- 326 - (505-4(a)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1629)

14- 327 - (505-4(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
This protection technique shall be permitted for equipment in those Class I, Zone 1 or Zone 2 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3572)

14- 328 - (505-4(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"This protections technique shall be permitted for equipment in those Class I, Zone 1 or Zone 2 locations for which it is ~~approved~~ (identified)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1630)

14- 329 - (505-4(c)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
This protection technique shall be permitted for equipment in those Class I, Zone 0 or Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3573)

14- 330 - (505-4(c)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(c) Intrinsic Safety. This protection technique shall be permitted for equipment in those Class I, Zone 0 or Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1631)

14- 331 - (505-4(d)): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
(d) Type of Protection "n." This protection technique shall be permitted for equipment in those Class I, Zone 2 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2526)

14- 332 - (505-4(d)): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Revise as follows:
(d) Type of Protection "n." This protection technique shall be permitted for equipment in those Class 1, Zone 2 locations for which it is approved. Type of protection "n" is further subdivided into nA, nC, nL, and nR.
FPN No. 1: See Table 505-10(b) (1) for the descriptions of subdivisions for type of protection "n".
FPN No. 2: Type "n" protection is a type of protection applied to electrical equipment such that, in normal operation, the electrical equipment is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.
FPN No. 3: For further information, see Electrical Apparatus for Explosive Gas Atmospheres, Part 15 - Electrical Apparatus with Type of Protection "n" IEC 79-15-1987.

Table 505-10(b)1

Designation	Technique	Zone*
d	Flameproof Enclosure	1
e	Increased safety	1
ia	Intrinsic safety	0
ib	Intrinsic safety	1
[ia]	Intrinsically safe associated apparatus	Nonhazardous
[ib]	Intrinsically safe associated apparatus	Nonhazardous
m	Encapsulation	1
nA	Nonsparking equipment	2
nC	Sparking equipment in which the contacts are suitably protected other than by restricted-breathing enclosure, and energy limitation.	2
nL	energy-limited equipment.	2
nR	Restricted breathing enclosure	2
o	Oil immersion	1
P	Purged and pressurized	1 or 2
q	Powder filled	1

*Does not address use where a combination of techniques is used.

SUBSTANTIATION: The draft IEC 60079-15 which is currently being prepared as an FDIS and on which ISA S12.12.02 will be based has an extra category for Type N apparatus. This is Ex nL of Energy limited. This concept is similar to the nonincendive field wiring apparatus currently permitted in Article 501-4(b) of the 1999 National Electrical Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The referenced document is not yet published.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2527)

14- 333 - (505-4(d)): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: (d) Type of Protection "n." This protection technique shall be permitted for equipment in those Class I, Zone 2 locations for which it is approved. Type of protection "n" is further subdivided into nA, nC, nL, and nR.
FPN No. 1: See Table 505-10(b) 1 for the descriptions of subdivisions for type of protection "n."
FPN No. 2: Type "n" protection is a type of protection applied to electrical equipment such that, in normal operation, the electrical equipment is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.
FPN No. 3: For further information, see Electrical Apparatus for Explosive Gas Atmospheres, Part 15 — Electrical Apparatus with Type of Protection "n," IEC 60079-15.
SUBSTANTIATION: The addition of the "nL" for Energy Limited Apparatus is necessary as this is included within the next edition of IEC60079-15. IEC60079-15 will shortly be published as an FDIS and will be available by the time the 2002 Code is published.
PANEL ACTION: Reject.
PANEL STATEMENT: The referenced document is not yet published.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3570)

14- 334 - (505-4(d)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(d) Type of Protection "n." This protection technique shall be permitted for equipment in those Class I, Zone 2 locations for which it is ~~approved~~ (identified). Type or protection "n" is further subdivided into nA, nC, and nR.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1632)

14- 335 - (505-4(e)): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
(e) Oil Immersion "o." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3569)

14- 336 - (505-4(e)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(e) Oil Immersion "o." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1633)

14- 337 - (505-4(f)): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
(f) Increased Safety "e." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3568)

14- 338 - (505-4(f)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(f) Increased Safety "e." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1634)

14- 339 - (505-4(g)): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
(g) Encapsulation "m." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3574)

14- 340 - (505-4(g)): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(g) Encapsulation "m." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1635)

14- 341 - (505-4(h)): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
(h) Powder Filling "q." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
PANEL STATEMENT: Proposal 14-318a addresses the issues in this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3575)

14- 342 - (505-4(h)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(h) Powder Filling "q." This protection technique shall be permitted for equipment in those Class I, Zone 1 locations for which it is ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3417)

14- 343 - (505-6): Reject
SUBMITTER: Nicholas T. Abbatiello, Spencerport, NY
RECOMMENDATION: Change the ending of the sentence to read:
"...Registered Professional Engineer, or other engineer, in industrial establishments, who is qualified due to demonstrated knowledge and experience."
SUBSTANTIATION: In many industrial establishments, where there are flammable liquid processes, an engineer or engineering staff, who regulates electric classifications in conjunction with authorities having jurisdiction such as Fire Marshals, Insurance Loss Control Engineers, etc. Such person(s) are well experienced and posses demonstrated knowledge that certainly needs to be recognized. A registered professional engineer does not necessarily possess such experience and knowledge. Why would the former be excluded and the latter be included on the basis of the registered professional engineering qualification alone?
PANEL ACTION: Reject.

PANEL STATEMENT: See Proposal 14-348, which deletes this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

Log #3982)

14- 344 - (505-6): Accept in Principle
Note: The Technical Correlating Committee directs that the Panel clarify the Panel Action and Panel Statement on this Proposal. It is not clear what is meant by the statement "The referenced document is not yet published." This action will be considered by the Panel as a Public Comment.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
505-6. Special Precaution. Article 505 requires equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.
FPN No. 1: It is important that inspection authorities and users exercise more than ordinary care with regard to the installation and maintenance of electrical equipment in hazardous (classified) locations.
FPN No. 2: Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by Section 505-4(a) may not be suitable for use at temperatures lower than -20°C (-13°F) unless they are approved for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zones 0, 1, or 2 at normal ambient temperature.
(a) Supervision of Work. Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified Registered Professional Engineer.
(b) Dual Classification. In instances of areas within the same facility classified separately, Class I, Zone 2 locations shall be permitted to abutt, but not overlap, Class I, Division 2 locations. Class I, Zone 0 or Zone 1 locations shall not abutt Class I, Division 1 or Division 2 locations.
(c) Reclassification Permitted. A Class I, Division 1 or Division 2 location shall be permitted to be reclassified as a Class I, Zone 0, Zone 1, or Zone 2 location provided all of the space that is classified because of a single flammable gas or vapor source is reclassified under the requirements of this article.
(d) Solid Obstacles. Flameproof equipment with flanged joints shall not be installed such that the flange openings are closer than the distances shown in Table ~~505-15~~ 505-6 to any solid obstacle that is not a part of the equipment (such as steelworks, walls, weather guards, mounting brackets, pipes, or other electrical equipment) unless the equipment is listed for a smaller distance of separation.
Table ~~505-15.~~ 505-6. Minimum Distance of Obstructions from Flameproof "d" Flange Openings

	Minimum Distance	
Gas Group	in.	mm
IIC	1 37/64	40
IIB	1 3/16	30
IIA	25/64	10

SUBSTANTIATION: This proposal is the work of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The referenced document is not yet published.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1942)

14- 345 - (505-6, FPN No. 2): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
FPN No. 2: Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by Section 505-4(a) may not be suitable for use at temperatures lower than -20°C (-13°F) unless they are ~~approved~~ (identified) for use at lower temperatures.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3576)

14- 346 - (505-6, FPN No. 2): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the fine print note to read as follows:
FPN No. 2: Low ambient conditions require special consideration. Electrical equipment depending on the protection techniques described by Section 505-4(a) may not be suitable for use at temperatures lower than –10°C (-13°F) unless they are ~~approved~~ (identified) for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zones 0, 1, or 2 at normal ambient temperature.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #386)

14- 347 - (505-6(a)): Reject
SUBMITTER: Vojtech D. Ackerman, Bechtel Corp.
RECOMMENDATION: Revise 505-6(a) to read as follows:
(a) Supervision of Work. Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified licensed ~~Registered~~ Professional Engineer.
SUBSTANTIATION: Texas legislature (Senate Bill 623/1997) changed the standard terminology from that of "Registered Engineer" to "Licensed Engineer."
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 14-348, which deletes this section.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with Panel Action on Proposal 14-348 and would agree to include both licensed or registered to describe the term used in various locations for certifying Professional Engineers.

(Log #3021)

14- 348 - (505-6(a)): Accept
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete 505-6(a) and renumber accordingly.
SUBSTANTIATION: The term "qualified registered professional engineer" was introduced into the 1996 NEC as a means of controlling the design under the then newly introduced concept of the US "Zone 0" classification methodology. At that time, information was not as well defined as the current NEC is, and the need to have this type of supervision, as compared with the traditional location area electrical classification and other NEC installations, does not warrant the continued restriction.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
NEGATIVE: 4
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with proposal, substantiation, and Panel Action. Since the inclusion of Article 505 in the 1996 NEC, IAEI has been part of CMP-14 Task Groups for Article 505. UL 2279 Industry Advisory Groups, and two code cycles for CMP-14 and have been made aware of one job that has used Article 505. I am sure that there may have been some additional small scale uses of the zone system, but that could not be considered widespread use of the system. This major project experienced major challenges, even for the the qualified registered Professional Engineers supervising. To remove this level of accountability would not be in the best interest of safety at this time. For those that are truly interested in giving the zone system a chance to succeed in this country, I believe that we should proceed with caution.
GOODMAN: The removal of the entire section for "Supervision of Work" while the NEC requirements for Article 505 are still evolving is not yet warranted. The work as described in the current section should be done "under the supervision of a qualified engineer".
OMEARA: This proposal should be rejected and the existing requirements for a "qualified registered professional engineer" remain in the code, as the concept of zones is not yet in widespread use.
WELDON: The term "qualified registered professional engineer" should remain in the code for at least one more cycle. The complexities of the introduction of Zone 0 into the code are not sufficiently understood within the industry to remove this protective language. The language does no harm while raising the newness of the Zone 0 concept in user's minds. I believe more training programs and more experience in the field by designers, as well as craftsmen, is needed to raise the levels of understanding required to ensure safe installations.

(Log #4419)

14- 349 - (505-7(c)): Accept in Principle
SUBMITTER: Jeffrey M. Shapiro, Int'l Code Consultants/Rep. Int'l Inst. of Ammonia Refrigeration
RECOMMENDATION: Revise text to read as follows:
505.7(c) Group IIA. Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experiment safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.80.
Exception: Areas containing ammonia refrigeration equipment shall be permitted to be classified as nonhazardous locations when (1) continuous mechanical ventilation is provided and failure of the ventilation system actuates an alarm, or (2) vapor detection is provided to automatically activate a mechanical ventilation system and sound an alarm at a detection threshold of 1,000 parts-per-million or less.
FPN: Group IIA is equivalent to Class I, Group D as described in Section 500.5(a)(4).
SUBSTANTIATION: The purpose of this proposal is to clarify application of the code and to make the Class/Zone approach match the Class/Division approach with respect to electrical equipment in ares where ammonia refrigeration systems are present. An exception similar to the one proposed here has been in Section 500.5(a)(4) for Class/Division designations for quite some time, and a proposal has been submitted to revise that exception to exactly match this one in an effort to comprehensively improve the code.
Although the simple fix to this section would have been to simply duplicate the existing exception in Section 500.5(a)(4) here, it seemed more appropraite to fix both sections at once. The existing exception in Section 500.5(a)(4), being somewhat vague, unnecessarily complicates enforcement and introduces the opportunity for inconsistent application of the code for cases involving ammonia refrigeration systems. The intent of that exception, which is established through Section 500.5(a)(4) FPN No. 4, is to permit a reduction in the hazard classification for ammonia based on prescriptive allowances in ASHRAE 15.
The referenced provisions in ASHRAE 15 are set forth in Sections 8.14(g) and (h) of that document, which provide the following:
"(g) When refrigerants of Groups A2, A3, B2, and B3 are used, the machinery room shall conform to Class I, Division 2 of the National Electrical Code. When refrigerant Groups A1 and B1 are used, the machinery room is not required to meet Class I, Division 2 of the National Electrical Code.
Exception: When ammonia is used, the requirements of Class I, Division 2 of the National Electrical Code shall not apply providing the requirements of 8.14(h) are met.
(h) When ammonia is used, the machinery room is not required to meet Class I, Division 2 of the National Electrical Code providing (1) the mechanical ventilation system in the machinery room is run continuously and failure of the mechanical ventilation system actuates an alarm or (2) the machinery room is equipped with a vapor detector that will automatically start the mechanical ventilation system and actuate an alarm at a detection level not to exceed 1,000 ppm."
Unlike many gases that support combustion [Lower Explosive Limit (LEL)] at concentrations of 10,000 to 20,000 parts per million (ppm), ammonia is not ignitable until the concentration reaches approximately 150,000 ppm. Because ammonia has a low propensity toward ignition, having such a high LEL, a narrow flammable range and a high required ignition energy, the U.S. Department of Transportation and other code writing organizations do not regulate ammonia as a "flammable gas" even though it can support combustion in limited circumstances.
The existing exception for ammonia in Section 500.5(a)(4) has been regarded as necessary to clarify that areas containing ammonia refrigeration equipment should be classified as nonhazardous locations when controls specified in ASHRAE 15 are followed because of ammonia's unique properties. Since the technical aspects of ASHRAE 15's provisions related to classified locations are fairly short, it seems more appropriate to provide these regulations with NFPA 70 as opposed to forcing the code user to reference another standard (the proponent has contacted ASHRAE to acquire permission to include the conceptual information from ASHRAE 15 in the NEC based on this proposal). This will make the NEC easier to apply and more definitive in its application.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-318a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2393)

14- 350 - (505-9(b)(4), FPN No. 1): Accept
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: In the first sentence, change "operations" to "operation." In the final sentence, change "seats" to "seals."
SUBSTANTIATION: To correct apparent typographical errors.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3418)

14- 351 - (505-9(c)(5) (New)): Reject
SUBMITTER: Nicholas T. Abbatiello, Spencerport, NY
RECOMMENDATION: Add a subparagraph (5) to read:
"Locations, within enclosed equipment and machines in industrial establishments where the conditions of design, maintenance and supervision ensure that only qualified persons will build and service the installation, not complying with (1) through (4) above which otherwise would be designated as Zone 1 shall be permitted to be classified to Zone 2;
(i) when maintained at or below 25 percent of the Lower Flammable Limit, or
(ii) where the electrical equipment not rated for Division 1 but only rated for Division 2, is reliably interlocked by Listed and Labeled flammable gas detectors which will deenergize the equipment if 60 percent of the Lower Flammable Limit is exceeded. Consideration shall be given to rate at which the concentration can reach 100 percent versus the time for the deenergized equipment to come to a safe state.
FPN: For additional information, refer to NFPA 69-1997, Explosion Prevention Systems, and ISA S84.01-1996, Application of Safety Instrumented Systems for Process Industries."
SUBSTANTIATION: The current requirements do not address machinery interiors where protection against hazards, such as deflagration, by concentration reduction of the flammable gas or vapor. NFPA 34, Flammable or Combustible Liquids, Dipping and Coating Process, 1995, and Article 516, Spray Application, Dipping, and Coating Processes require interiors to be Zone 1. NFPA 69 recognizes the 25 percent or below control and above 60 percent deenergization for protection against deflagration. Why can't there then be allowance for Zone 2 equipment since the concentration is not normally flammable? This would provide equivalent safety as the likelihood, rather than the consequence, of an ignition in explosionproof equipment is reduced.
PANEL ACTION: Reject.
PANEL STATEMENT: The text proposed is too vague. The submitter has not addressed all of the issues pertinent to area classification when using gas detection equipment, as detailed in the referenced standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3022)

14- 352 - (505-9(d) (New)): Accept in Principle
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add the following text:
505-9(d) Unclassified Locations. Locations which are neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof.
SUBSTANTIATION: The term "classified" refers to the type of material/hazard potential involved, i.e., Class I, Division 1, Class II, Division 2, etc. Terms such as nonhazardous and unclassified are used in both the NEC and other NFPA documents. The term nonhazardous infers that the area has "no" hazards while the term "unclassified" more clearly correlates with the condition of being reviewed but found not to need classification. This action provides needed correlation with other NFPA documents, such as NFPA 497. A companion proposal has been made to change the term "nonhazardous" to "unclassified" elsewhere in the NEC and to define this term in Article 500.
PANEL ACTION: Accept in Principle.
Add new definitions of "Unclassified" and "Nonhazardous" to read as follows:
"Unclassified Locations. Locations that have been evaluated by the classification process defined in Section 500-35(a) or Section 505-3 5 (a) and determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; or any combination thereof."
"Nonhazardous Locations. Locations which are not required to have been evaluated by the process defined in 500-5 (a) or 505-5(a)."
PANEL STATEMENT: The panel agrees with the submittal and believes that the classification process results in not one definition, but two: the one provided by the submitter for "unclassified" and the second for "nonhazardous".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: The panel action should be "Accept". See my comments on Proposal 14-2a.
GOODMAN: This proposal should be "Accept" and not "Accept in Principle". The Panel Action is contrary to the submitter's intent and justification with respect to the use of the term "Unclassified". This proposal along with the other companion proposals referenced in the submitter's substantiation are designed to remove the term "nonhazardous" from the NEC, not add and define the term and definition. Also see comments under Proposal 14-18a.

(Log #1810)

14- 353 - (505-10(b), FPN (New)): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Add a fine print note to read as follows:
FPN: Where the equipment is marked with a certificate number the format of the certificate number is in the form AEx XYZ 02 0123. Where XYZ represents the NRTL issuing the certificate, the first two digits represent the year of issue of the certificate and the final four digits represent the index number of the certificate. A suffix X represents Special Conditions of Installation or Use, or a suffix U indicates that the product is an Ex Component.
SUBSTANTIATION: The IEC 60079 Series of standards, on which the ANSI/ISA S12 series of standards, and ANSI/UL2279 are both based, require a certificate number as part of the apparatus marking. ISA and UL have both taken this requirement out of their versions of the Zone standards. Manufacturers are increasingly asking for certificates as evidence to users that the product is Listed. If the format of the certificate number is consistent between the NRTLs, then the users and the AHJs, will be able to find the information needed quickly, especially on items such as Ex components. See also proposal on 110(3)(b).
PANEL ACTION: Reject.
PANEL STATEMENT: This is not an installation issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1636)

14- 354 - (505-10(b)(1)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise the first sentence to read as follows:
Equipment ~~approved~~ (identified) for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section 500-5(d), be permitted to be marked with the following:.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3577)

14- 355 - (505-10(b)(1)): Accept

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise the first sentence to read as follows:

"Equipment ~~approved~~ (identified) for Class I, Division 1 or Class I, Division 2 shall, in addition to being marked in accordance with Section 500-5(d), be permitted to be marked with the following:"

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3019)

14- 356 - (Table 505-10(b)(1)): Accept in Principle

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Replace "nonhazardous" with "unclassified" (2 places).

SUBSTANTIATION: This is a companion proposal to other proposals which provide a definition of unclassified in Articles 100, 500, and 505, and provides correlation. The term "Classified" refers to the type of material/hazard potential involved, i.e., Class I, Division 1, Class II, Division 2, etc. Terms such as nonhazardous and unclassified are used in both the NEC, the Uniform Building Code (UBC), and other NFPA documents. The term nonhazardous infers that the area has "no" hazards while the term "unclassified" more clearly correlates with the condition of being reviewed but found not to need classification. This action provides needed correlation with other NFPA documents, such as NFPA 497. Additionally the term "nonhazardous" is used 7 times within various parts of the NEC, and in at least one place in the NEC the meaning of nonhazardous applies to voltages and not classification. A companion proposal has been made to change the term "nonhazardous" to "unclassified" as appropriate elsewhere in the NEC.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Proposal 14-318a addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #4240)

14- 357 - (Figure 505-10(b)(1)): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Rename this drawing "Figure 505-10(b)(2)".

SUBSTANTIATION: This is the subject of Section 505-10(b)(2) FPN No. 2. Due to a printing layout error in the first printing, it appears on a different page, resulting in widespread confusion. Although that is a printing error, NFPA staff, in my opinion, can be forgiven on this one since its subject is far more intimately connected with the second paragraph. If it were properly named by the panel, it probably would have been printed in its proper location. In fact, it might be titled "Figure 505-10(b)(2) FPN No. 2".

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The Figure will be correctly numbered in accordance with the editorial rewrite.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1637)

14- 358 - (505-10(b)(3)): Accept in Principle in Part

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise the first sentence to read as follows:

~~Approved~~ (identified) equipment shall be marked to show the operating temperature or temperature range referenced to a 40°C (104°F) ambient.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Principle in Part.

Delete the word "approved" and change "temperature range" to "temperature class"

PANEL STATEMENT: There is no need to use "approved" because all equipment covered by Article 505 is required to be listed. The change related to temperature class is to correlate with other editorial changes.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3578)

14- 359 - (505-10(b)(3)): Accept in Principle in Part

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

(3) Temperature Classifications. ~~Approved~~ (Identified) equipment shall be marked to show the operating or temperature range referenced to a 40°C (104°F) ambient. The temperature range, if provided, shall be indicated in identification numbers, as shown in Table 505-10(b)(3).

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: Proposal 14-358 is identical and addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1941)

14- 360 - (505-10(b)(3) Exception No. 2): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise to read as follows:

Exception No. 2: Equipment ~~approved~~ (identified) for use in Class I, Division 1 or Division 2 locations as permitted by Sectins 505-20(b) and (c) shall be permitted to be marked in accordance with Section 500-5(d) and Table 500-5(d).

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3579)

14- 361 - (505-10(b)(3) Exception No. 2): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception No. 2: Equipment ~~approved~~ (identified) for Class I, Division 1 or Division 2 locations as permitted by Sections 505-20(b) and (c) shall be permitted to be marked in accordance with Section 500-5(d) and Table 500-5(d).
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1491)

14- 362 - (505-10(b)(3) Exception No. 3): Reject
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: Exception No. 3: Ex Components shall not be marked with a Temperature Class as shown in Table 505-10(b)(3) but with the maximum temperature rise in degrees C when operating under the maximum electrical operating parameters
SUBSTANTIATION: Since Ex Components should not be used alone, the addition of a temperature class could lead users to believe that the component is actually listed apparatus. The temperature rise will be helpful when selecting components for use as part of apparatus intended to be listed.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a product certification issue, not an installation issue. See also Proposal 14-32.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3990)

14- 363 - (505-15):
Note: It was the action of the Technical Correlating Committee that this Proposal be reported as Reject to correlate with the action of the Technical Correlating Committee on Proposal 14-364.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise the entire 505-15 as follows:
505-15. Wiring Methods. Wiring methods shall maintain the integrity of protection techniques and shall comply with (a), (b), or (c).
(a) Class I, Zone 0. In Class I, Zone 0 locations, only intrinsically safe wiring methods in accordance with Article 504 shall be permitted.
FPN: Article 504 only includes protection technique "ia."
(b) Class I, Zone 1. In Class I, Zone 1 locations, the following wiring methods shall be permitted:
(1) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.
Exception No. 1: Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade.
Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.
(2) Type MI cable with termination fittings listed for Class I, Zone 1 or Division 1. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.
Exception No. 1: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC-HL cable, listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated aluminum sheath, an overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.
FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC-HL cable.
Exception No. 2: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, listed Type ITC-HL cable with a gas/vaportight continuous corrugated aluminum sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application shall be permitted.
Where necessary to employ flexible connections, flexible fittings listed for Class I, Zone 1 or Division 1 locations or flexible cord installed in accordance with the provisions of Section 505-17 shall be permitted.
(c) Class I, Zone 2. In Class I, Zone 2 locations, ~~apply~~ the following wiring methods shall be permitted:
(1) Threaded rigid metal conduit, threaded steel intermediate metal conduit,
(2) enclosed gasketed busways, enclosed gasketed wireways,
(3) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings.
(4) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;
(5) Types MI, MC, MV, or TC cable with approved termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings.
Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with approved fittings, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with approved fittings, or flexible cord approved for extra-hard usage and provided with approved bushed fittings shall be permitted. An additional conductor for grounding shall be included in the flexible cord.
FPN: See Section 505-25(b) for grounding requirements where flexible conduit is used.
SUBSTANTIATION: This proposal is the word of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose of the proposal is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-364 addresses these issues.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #4392)

14- 364 - (505-15):

Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" because less than two-thirds of the members eligible to vote have voted in the affirmative.

SUBMITTER: Joseph H. Kuczka, W. McBride/ H. Bockle, Killark Electric Mfg. Co./ARCO/Killark-Stahl, Inc.

RECOMMENDATION: This proposal is a revision to the proposal submitted by the Task Group that was established by the Chairman of CMP-14. Replace the wording of the Task Group for this section with the wording of this proposal:

505.15. Wiring Methods. Wiring methods shall maintain the integrity of protection techniques and shall comply with (a), (b), or (c).

(a) Class I, Zone 0. In Class I, Zone 0 locations, only intrinsically safe wiring methods in accordance with Article 504 shall be permitted.

FPN: Article 504 only includes protection technique "ia."

(b) Class I, Zone 1. In Class I, Zone 1 locations, the following wiring methods shall be permitted.

(1) Type MC-HL cable, or ITC-HL cable listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated aluminum sheath, and overall jacket of suitable polymeric material, separate grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.

FPN: See Sections 334.3 and 334.4 for restrictions on use of Type MC-HL cable.

Exception No. 1: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, listed Type TC cable with a gas/vaportight overall jacket of suitable polymeric material, complying with the requirements of Article 340.4(6), with separate grounding conductors in accordance with Section 250.122, and provided with termination fittings listed for the application shall be permitted between enclosures utilizing the increased safety method of protection technique "e", within the Zone 1 location.

(2) Type MI cable with termination fittings approved for Class I, Zone 1 or Division 1 locations. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

(3) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.

Exception No. 1: Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade.

Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

Where necessary to employ flexible connections, flexible fittings listed for Class I, Zone 1 or Division 1 locations or flexible cord installed in accordance with the provisions of Section 505.17 shall be permitted.

(c) Class I, Zone 2. In Class I, Zone 2 locations, the following wiring methods shall be permitted:

(1) Types MI, MC, MV, or TC cable with approved termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings.

(2) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use.

(3) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings.

(4) Enclosed gasketed busways, enclosed gasketed wireways.

(5) Threaded rigid metal conduit, threaded steel intermediate metal conduit,

Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with approved fittings, liquidtight flexible metal conduit with approved fittings, liquidtight flexible nonmetallic conduit with approved fittings, or flexible cord approved for extra-hard usage and provided with approved bushed fittings shall be permitted. An additional conductor for grounding shall be included in the flexible cord.

FPN: See Section 505.25(b) for grounding requirements where flexible conduit is used.

SUBSTANTIATION: 1. Changes concerning MC-HL and ITC-HL Cables.

(a) The wiring methods for Class I, Zone 1 have been reorganized listing MC-HL and ITC-HL cable first because in Class I, Zone 1 locations, cable is the primary wiring method.

(b) The permission to use MC-HL and ITC-HL cables in Class I, Zone 1 locations has been changed from Exceptions to the main body of the text. Since cable is the primary wiring method in Class I, Zone 1 locations, it does not make sense to list them as exceptions.

(c) The restriction for MC-HL and ITC-HL of using only "in industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation" has been removed from the Exceptions for these cables. There is no reason to maintain this restriction in the text, since the level of risk in a Class I, Zone 1 location is not as great as in a Class I, Division 1 location, and in addition, in the Zone System, the classification, of areas, selection of equipment and wiring methods must be under the supervision of a qualified, Registered Professional Engineer. Cable is the preferred wiring method in Class I, Zone 1 locations of knowledgeable users, and is at least as safe as a conduit system.

(d) The Exception to Types MC-HL and ITC-HL cables recognizes and permits the use of a special Tray Cable that meets the requirements of Article 340.4(6) between enclosures within Class I, Zone 1 that use the type of protection increased safety. This type of cable is appropriate for connection between enclosures utilizing the type of protection "e" since this type of protection does not contain a source of ignition. TC cables complying with Article 340.4(6) must meet the crush and impact requirements of Type MC cable, cannot be located where it is subject to physical damage and must be identified for use. The Exception to permit this specific Type TC cable between enclosures with type protection "e" is an important Exception because it recognizes perhaps the most important wiring method in Class I, Zone 1 locations. The wiring methods of Class I, Zone 1 locations are Increased Safety, Flameproof and Intrinsic Safety, and without this exception, the wiring methods would not be complete.

This wiring method recognizes the important fact of the Zone System that Class I, Zone 1 does not have the same level of risk as Class I, Division 1 locations. A cable that meets the crush and impact requirements of MC cable, must be protected from physical abuse, can only be used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation and where the Classification of areas, selection of equipment and wiring methods are under the supervision of a qualified Registered Professional Engineer is not a source of ignition and is safe for connection between enclosures using the type of protection "e". The level of protection afforded by this type of TC cable is consistent with the level of protection provided by enclosures with type of protection "e".

2. Changes for Class I, Zone 2. The wiring methods of Class I, Zone 2 are essentially the same as Class I, Division 2 except the methods have been reorganized to have cable types listed first and also presented in a numerical list for clarity, rather than grouped together in one continuous paragraph.

The Exception for Nonincendive field wiring was not included since Nonincendive is not included in the Zone Protection Techniques.

PANEL ACTION: Accept in Principle.

Revise 505-15 to read:

"505-15. Wiring Methods. Wiring methods shall maintain the integrity of protection techniques and shall comply with (a), (b), or (c).

(a) Class I, Zone 0. In Class I, Zone 0 locations, only intrinsically safe wiring methods in accordance with Article 504 shall be permitted.

FPN: Article 504 only includes protection technique "ia."

(b) Class I, Zone 1.

(1) In Class I, Zone 1 locations, the following wiring methods shall be permitted:

(a) Type MC-HL cable listed for use in Class I, Zone 1 or Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material, separate equipment grounding conductors in accordance with Section 250-122, and provided with termination fittings listed for the application.

FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

(b) Type ITC-HL cable listed for use in Class I, Zone 1 or

Division 1 locations, with a gas/vaportight continuous corrugated metallic sheath, an overall jacket of suitable polymeric material and provided with termination fittings listed for the application.

(c) In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type TC cable shall be permitted if listed as suitable for use as open wiring and provided with a gas/vaportight overall jacket of suitable polymeric material and provided with separate equipment grounding conductors in accordance with Section 250-122. Cable termination fittings shall be listed for the application. The open wiring shall not exceed lengths of 15 feet.

FPN: Type TC cable listed for use as open wiring meets the crush and impact requirements of Type MC cable.

(d) Type MI cable with termination fittings approved for Class I, Zone 1 or Division 1 locations. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings.

(e) Threaded rigid metal conduit, or threaded steel intermediate metal conduit.

(f) Rigid nonmetallic conduit complying with Article 347 shall be permitted where encased in a concrete envelope a minimum of 2 in. (50.8 mm) thick and provided with not less than 24 in. (610 mm) of cover measured from the top of the conduit to grade. Threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 24 in. (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway. An equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

(2) Where necessary to employ flexible connections, flexible fittings listed for Class I, Zone 1 or Division 1 locations or flexible cord in accordance with the provisions of Section 505-17 shall be permitted.

(3) All boxes and fittings shall be listed for Class I, Zone 1 or identified for Class I, Division 1.

(c) Class I, Zone 2.

(1) In Class I, Zone 2 locations, the following wiring methods shall be permitted:

(a) Types MI, MC, MV, or TC cable with listed termination fittings, or in cable tray systems and installed in a manner to avoid tensile stress at the termination fittings;

(b) Type ITC cable in cable trays, in raceways, supported by messenger wire, afforded mechanical protection and run as open wiring, or directly buried where the cable is listed for this use;

(c) Type PLTC cable in accordance with the provisions of Article 725, or in cable tray systems. PLTC shall be installed in a manner to avoid tensile stress at the termination fittings;

(d) enclosed gasketed busways, enclosed gasketed wireways;

(e) threaded rigid metal conduit, threaded steel intermediate metal conduit;

(f) Nonincendive field wiring using any of the wiring methods suitable for nonhazardous locations, including Chapter 7 and 8 wiring methods.

(2) Where provision must be made for limited flexibility, flexible metal fittings, flexible metal conduit with listed fittings, liquidtight flexible metal conduit with listed fittings, liquidtight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with listed bushed fittings shall be used. An additional conductor for grounding shall be included in the flexible cord.

FPN: See Section 505-25(b) for grounding requirements where flexible conduit is used."

PANEL STATEMENT: A. Changes concerning MC-HL and ITC-HL Cables.

a). Cable is the preferred wiring method in Class I, Zone 1 locations for knowledgeable users, and is at least as safe as a conduit system.

b). The wiring methods for Class I, Zone 1 have been reorganized listing MC-HL cable first because in Class I, Zone 1 locations, cable is the primary wiring method. ITC-HL Cable was separated from MC-HL cable to avoid requiring the separate equipment grounding conductor in ITC-HL Cable.

c). The restriction for MC-HL and ITC-HL of using only "in industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation" has been removed from the Exception and inserted as positive language.

d). The Exception to types MC-HL, and ITC-HL cables recognizes and permits the use of a special Tray Cable that meets the requirements of Article 340-4(6), that is listed per UL Standard 1277 and marked as suitable as "Open Wiring". This special TC cable must meet the crush and impact requirements of type MC cable, cannot be located where it is subject to physical damage and must be identified for use (marked as suitable as "Open Wiring"). The wiring methods of Class I, Zone 1 locations are Increased Safety, Flameproof and Intrinsic Safety, and without this cable, the wiring methods would not be complete. Where this special Type TC Cable is connected to explosionproof or flameproof enclosures the cable will be terminated with a listed cable terminator that maintains the type of protection of the enclosure. (See Proposal 14-368.)

This wiring method recognizes the important fact of the Zone System that Class I, Zone 1 locations do not have the same level of risk as Class I, Division 1 locations. Special Type TC Cable that meets the crush and impact requirements of MC cable, must be protected from physical abuse, can only be used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation.

B. Changes concerning the use of the words "listed" and "identified"

a.) The word "approved" was changed to "listed" since all equipment and cables used in Zone areas is required to be "listed". (Where Division equipment is used in Zone areas, it shall be "identified".)

C. Changes for Class I Zone 2.

a.) The wiring methods of Class I, Zone 2 are essentially the same as Class I, Division 2 except the methods have been reorganized to have cable types listed first and also presented in a numerical list for clarity, rather than grouped together in one continuous paragraph.

b.) The exception for nonincendive field wiring has been modified and written in mandatory language.

c.) The language for provisions for flexibility was revised similar to 501-4 per Proposal 14-318a, rewrite of Article 501.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 5

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

COOK: I agree with the regorganization of the section. I do not agree with removing the "in industrial establishments with restricted public access" restrictions on the MC-HL and ITC-HL cables. The purpose for this restriction was to keep these wiring methods out of the special occupancies, where regular maintenance is not as likely to occur and cables that might be damaged might not be noticed. Physical damage was a great concern when this wiring method was included in hazardous locations. I am no less concerned now. I also have great concern including TC cable in Zone 1 areas. Physical damage is a great concern for this wiring method and the crush and impact test of UL 1569 is much less severe than UL 2225.

GOODMAN: The majority of this proposal is acceptable and properly sets the requirements. However, the requirements under new Section 505-15(b)(1)(c) as contained in the Panel Action should not be accepted. This section allows the use of TC cable run as open wiring in a Zone 1 location in industrial establishments. There are several problems associated with this section and the Panel Action as follows:

1. The Panel Statement (d) references TC cable identified in Article 340-4(6). This Article pertains to open wiring in ordinary locations in industrial establishments and not Hazardous (Classified) Locations.

2. The 15 ft acceptable length of open wiring is arbitrary and without any substantiation.

3. The type TC cable proposed for Zone 1 is required to meet impact and crush requirements for MC cable. However, MC cable is not currently acceptable or even proposed to be acceptable in Zone 1 locations unless rated MC-HL. MC-HL cable must meet a more restrictive UL standard (UL 2225) than does MC (UL 1569).

4. Zone 1 MC-HL cable has a continuous corrugated gas/vaportight metallic sheath and an overall jacket. The proposed type TC cable has only a gas/vaportight overall jacket and is inherently inferior from a physical standpoint. Additionally, cuts, abrasions, or other physical damage will undermine the gas/vaportight integrity of the TC cable. There are also no production or field tests to ensure gas/vaportightness of the TC jacket.

5. The submitter requested approval for use of type TC cable in the connection of type protection "e" (increased safety) enclosures. The Panel Action capriciously and with no substantiation extended the acceptance to all protection types including "d" flameproof where the enclosure must withstand an internal explosion.

6. The term "not subject to physical abuse" has an excellent intent, but is very nebulous and does not offer the assurity necessary for classified Zone 1 locations.

7. The Panel substantiation states that "Zone 1 locations do not have the same level of risk as Division 1 locations" and implies that the considerably lesser TC cable should then be permitted. However, by definition, Zone 1 and Division 1 are literally identical "location in which ignitable concentrations of flammable gases or vapors are likely to exist under normal operating conditions".

8. There is no technical substantiation for the use of the TC cable in a Zone 1 location.

For the above reasons, the proposed Section 505-15(b)(1)(c) should be removed.

KUCZKA: Panel Action should have been Accept in Part. The Panel should have accepted the proposal except for 505-5(b)(1)(c) including the Fine Print Note. There is no fact finding report submitted supporting the use of Type TC cable in Class I, Zone 1 simply because it is listed for use as open wiring.

LAWRENCE: Although I strongly support the reformatting of the section, the submitter's original limitations on the introduction of "open wiring" TC cable should be maintained, i.e., the limitation to six feet of "open wiring" and the limitation of only "e" to "e" connections. There is insufficient technical substantiation for the panel's action to expand the submitter's proposal.

ZIPSE: The Panel Action on 505-15 allows Type TC listed as open wiring to be used in a Zone 1 location. We believe this to be a potentially unsafe practice with insufficient technical documentation given to support the change. We believe that Zone 1 cables should continue to require a metallic armor until more evidence is presented to support a lesser requirement.

Cables and glands suitable for use in Division 1 and Zone 1 application requirements have been established in the United States and in Canada with existing Standards UL 2225 and CSA C22.2, No. 174. The performance requirements in these standards drastically exceed the MC requirements. (See the following comparison). The physical abuse requirements of crush and impact are higher than that required by TC cable suitable for open wiring. There are low temperature impact requirements and flame propagation requirements that are not required for TC or MC cables. The basis for these standards include the requirements of a gas/vaportight continuous sheath. This is not a requirement for Type MC or Type TC. The overall jacket of a type TC cable is gas/vaportight only by definition, not be a physical specification or description. The only requirement is that there are no defects “that are visible with a normal or corrected vision without magnification”. There are no electrical or mechanical tests to verify the reliability, gas/vaportight properties, or sheath continuity. There is also no easy way to confirm the condition of TC cable jacket after installation.

The concept that a TC cable listed for use as open wiring, that meets the crush and impact test of MC cable, and has the same physical withstand properties of ALL TYPES of MC is incorrect. Type MC cable with a gas/vaportight continuous corrugated aluminum sheath has a typical crush resistance value of 200 percent of the MC requirement as stated below:

CRUSH TEST – UL - 1569

Size	Typical - MC	Typical - CWCMC
#14	1000	2000
#2	2000	5000

The use of TC cable listed for open wiring that merely meets the MC requirements will reduce the physical crush margin of safety by 50 percent from that of the MC-HL cable currently allowed in Division 1 locations. TC cable that has crush and impact capabilities has an application in industry – but not in a Zone 1 classified location.

See the following Performance Requirement Comparison:

REQUIREMENTS OF HL TYPE MC CABLE

	Performance Requirements	
	UL – 2225	UL – 1569
	HL Type MC	Type MC
	Impact Test	
#14 AWG	25 ft pounds	15 ft pounds
#2 AWG	50 ft pounds	50 ft pounds
	Crush Test	
#14 AWG	1500lbf	1000lbf
#2 AWG	2000lbf	2000lbf
Low Temperature Impact at – 25°C	9lbft	Not Required
Flame Test	IEEE – 1202/FT4	UL – 1685
Identified separate Ground wire	Required	Not Required

(Log #3023)

14- 365 - (505-15(b)): Accept in Principle

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Add to end of first sentence:

...except that conductors of aluminum shall not be connected to apparatus with the type of protection "e."

SUBSTANTIATION: Per ISA S12.16.01-1998 (IEC 79-7 Mod) titled Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection – Increased Safety "e," Section 4.1 titled Terminals for external (field) connections, it states:

"Terminals for connection to external circuits shall be generously dimensioned to permit the effective connection of copper conductors of cross-section equal to at least that corresponding to the rated current of the electrical apparatus."

Annex I of the referenced ANSI standard provides the following reasoning for the requirement for copper conductors: Due to the U.S. experience with other-than-copper conductors, the importance of a reliable connection, and the need to use anti-oxidant materials that could compromise spacings, other conductor materials for field connections were prohibited.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: This has been addressed by the action on Proposal 14-181.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1977)

14- 366 - (505-15(b), Exception (New)): Accept in Principle

SUBMITTER: Peter J. Schram, Delray Beach, FL

RECOMMENDATION: Add the following exception after the second paragraph of Section 505-15(b):

Exception: A cable entering an enclosure having type of protection "e" shall not be required to be sealed at the enclosure.

SUBSTANTIATION: There is no engineering reason for requiring a cable seal at the entrance to an increased safety enclosure. It was never the intent of CMP 14 to require a cable seal at the entrance to an increased safety enclosure. This is evident by the specific omission of cables from the third paragraph and from the FPN No. 1. Also see the ROC Comment 14-96a Panel Comment for the 1999 NEC processing. However a strict reading of the second paragraph of Section 505-15(b) and the referenced Section 501-5(d)(1) would seem to indicate a cable seal is required. This proposal is intended to correct this oversight in the 1999 NEC.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Proposal 14-368 addresses the concerns of the submitter. The submitter's exception has been placed in positive language in the revised section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2531)

14- 367 - (505-15(c)): Reject
Note: The Technical Correlating Committee directs that the Panel clarify the Panel Statement on this Proposal. The Panel should address the technical merits of the proposal. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Nicholas Ludlam, Factory Mutual Research
RECOMMENDATION: (c) Zone 2. In Class I, Zone 2 locations, all wiring methods permitted for Class I, Division 2 locations shall be permitted. Sealing and drainage shall be provided in accordance with Sections 501-5(b), (c), (e), and (f), except where the term "Division 2" is used, "Zone 2" shall be substituted and where the term "Division 1" is used, "Zone 1" shall be substituted. Wiring methods shall maintain the integrity of protection techniques.
Exception: Energy-limited field wiring shall be permitted to be wired using any of the methods suitable for nonincendive field wiring.
SUBSTANTIATION: Energy limited circuits are similar in concept to nonincendive field wiring circuits. The relaxation permitted by 501-4(b) for nonincendive field wiring should also apply to Energy-limited field wiring.
PANEL ACTION: Reject.
PANEL STATEMENT: This introduces material from a standard that has not yet been published.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3986)

14- 368 - (505-16): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
505.16. Sealing and Drainage. ~~501-5. Sealing and Drainage.~~
Sealing in conduit and cable systems shall comply with (a) through ~~(f)~~(e). Sealing compound shall be of a type approved for the conditions and use. Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.
FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section ~~501-5(e)(2).~~ 505.16(c)(2)(b). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See ~~Section 501-5(c)(2).~~ 505.16(d)(2).
FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.
(a) Zone 0. In Class I, Zone 0 locations, seals shall be located as follows:
~~(1) Intrinsically safe wiring in accordance with Article 504.~~
~~FPN: Article 504 only includes protection technique "ia."~~
~~(2)~~ (1) Seals shall be provided within 10 ft (3.05 m) of where a conduit leaves a Zone 0 location. There shall be no unions, couplings, boxes, or fittings, except reducers at the seal, in the conduit run between the seal and the point at which the conduit leaves the location.
Exception: A rigid unbroken conduit that passes completely through the Zone 0 location with no fittings less than 12 in. (305 mm) beyond each boundary, shall not be required to be sealed, if the termination points of the unbroken conduit are in unclassified locations.
~~(3)~~ (2) Seals shall be provided on cables at the first point of termination after entry into the Zone 0 locations.
~~(4)~~ (3) Seals shall not be required to be explosionproof or flameproof.
(b) Zone 1. In Class I, Zone 1 locations, seals shall be located as follows:
(1) Conduit seals shall be provided for each conduit entering enclosures having type of protection "d" or "e".
Exception: Where the enclosure having type of protection "d" is marked to indicate that a seal is not required.
Conduit seals shall be provided for each conduit entering explosionproof equipment as follows.
(a) In each conduit entry into an explosionproof enclosure where either (1) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (2) the entry is 2-in. size or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.
Exception: Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are
1. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
2. Immersed in oil, or
3. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, approved for the location, and marked "factory sealed" or equivalent.
Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal.
(b) Conduit seals shall be installed within 18 in. (457 mm) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.
(c) Where two or more explosionproof enclosures for which conduit seals are required under (b)(2) are connected by nipples or by runs of conduit not more than 36 in. (914 mm) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 18 in. (457 mm) from either enclosure.
(3) In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 18 in. (457 mm) from the pressurized enclosure.
FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.
FPN No. 2: For further information, see NFPA 496, Standard for Purged and Pressurized Enclosures for Electrical Equipment, 1998 edition.
(4) In each conduit run leaving a Class I, Zone 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for approved explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 1 location.
Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Zone 1 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.
(5) Conduits contains cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the ~~Division~~ Zone 1 location after removing the jacket and any other coverings so that the sealing compound

will surround each individual insulated conductor and the outer jacket.

Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

(6) Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (d).

(7) Cable seals shall be provided for each cable entering flameproof or explosionproof enclosures. The seal shall comply with (d).

(8) Cables shall be sealed at the point at which they leave the Zone 1 location.

Exception: Where cable is sealed at the termination point.

(c) Zone 2. In Class I, Zone 2 locations, seals shall be located as follows:

(1) Conduit seals shall be located as follows

a. For connections to enclosures that are required to be flameproof or explosionproof, a conduit seal shall be provided in accordance with (b)(1) and (b)(2). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section ~~501-4(a).~~ 505.16(b).

2. In each conduit run passing from a Class I, ~~Division~~ Zone 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the ~~Division~~ Zone 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the ~~Division~~ Zone 2 location, and a threaded connection shall be used at the sealing fitting. Except for approved explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the ~~Division~~ Zone 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, ~~Division~~ Zone 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, ~~Division~~ Zone 2 location into the unclassified location. T he unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.

Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, ~~Division~~ Zone 2 location shall not require a seal at the boundary.

FPN: For further information, refer to NFPA 496, Standard for Purged and Pressurized Enclosures for Electrical Equipment, 1998 edition.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, ~~Division~~ Zone 2 location into an unclassified location if the following conditions are met:

1. No part of the conduit system segment passes through a Class I, ~~Division~~ Zone 0 or Class I, Zone 1 location where the conduit contains unions, couplings, boxes, or fittings within 12 in> (305 mm) of the Class I, ~~Division~~ Zone 0 or Class I, Zone 1 location; and

2. The conduit system segment is located entirely in outdoor locations; and

3. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and

4. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and

5. The conduit system segment is sealed at its entry to each enclosure or fittings housing terminals, splices, or taps in Class I, ~~Division~~ Zone 2 locations.

(2) Cable seals shall be located as follows:

(a) Cables entering enclosures required to be flameproof or explosionproof ~~that are required to be approved for Class I locations~~ shall be sealed at the point of entrance. The seal shall comply with (d). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed ~~in an approved fitting~~ in the ~~Division~~ Zone 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (b)(4).

Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, ~~Division~~ Zone 2 location shall not require a seal at the boundary.

Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

(b) Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapor through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (2)(a). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [0.007 ft^3/hr (198 cm^3/hr) of air at a pressure of 6 in. of water (1493 pascals).]

FPN No. 1: See ANSI/UL 886-1994, Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

FPN No. 2: The cable core does not include the interstices of the conductor strands.

(c) Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (2)(a), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 6 in. of water (1493 pascals) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.

Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, ~~Division~~ Zone 2 location without seals.

(d) Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the ~~Division~~ Zone 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.

FPN: The cable sheath may be either metal or a nonmetallic material.

~~(c)~~ (d) Class I, ~~Divisions~~ Zones 0, 1 and 2. Where required, seals in Class I, ~~Divisions~~ Zones 0, 1 and 2 locations shall comply with the following:

(1) Fittings. Enclosures for connections or equipment shall be provided with an ~~approved~~ integral means for sealing, or sealing fittings ~~approved~~ for Class I locations shall be used. Sealing fittings shall be accessible.

(2) Compound. Sealing compound shall be approved and shall provide a seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93°C (200°F).

(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 5/8 in. (16 mm).

Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.

(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.

~~(5) Assemblies. In an assembly where equipment that may produce arcs, sparks, or high temperatures is located in a compartment separate from the compartment containing splices or taps, and an integral seal is provided where conductors pass from one compartment to the other, the entire assembly shall be approved for Class I locations. Seals in conduit connections to the~~

~~compartment containing splices or taps shall be provided in Class I, Division 1 locations where required by (a)(1)(b).~~

~~(6)~~ (5) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically listed for a higher percentage of fill.

(e) ~~(f)~~ Drainage.

1. Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.

2. Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduits systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.

3. Canned Pumps, Process or Service Connections, etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend upon a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical conduit system, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the conduit system beyond the additional devices or means, if they primary seal fails.

The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above.

Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.

SUBSTANTIATION: This proposal is the word of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose of this proposal is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.

PANEL ACTION: Accept in Principle.

Replace existing 505-16 with the following text.

505-16. Sealing and Drainage. Seals in conduit and cable systems shall comply with (a) through (e). Sealing compound shall be used in Type MI cable termination fittings to exclude moisture and other fluids from the cable insulation.

> FPN No. 1: Seals are provided in conduit and cable systems to minimize the passage of gases and vapors and prevent the passage of flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable. Unless specifically designed and tested for the purpose, conduit and cable seals are not intended to prevent the passage of liquids, gases, or vapors at a continuous pressure differential across the seal. Even at differences in pressure across the seal equivalent to a few inches of water, there may be a slow passage of gas or vapor through a seal, and through conductors passing through the seal. See Section 505-16(c)(2)(b). Temperature extremes and highly corrosive liquids and vapors can affect the ability of seals to perform their intended function. See Section 505-16(d)(2).
>
> FPN No. 2: Gas or vapor leakage and propagation of flames may occur through the interstices between the strands of standard stranded conductors larger than No. 2. Special conductor constructions, e.g., compacted strands or sealing of the individual strands, are means of reducing leakage and preventing the propagation of flames.

(a) Zone 0. In Class I, Zone 0 locations, seals shall be located as follows.

(1) Seals shall be provided within 10 ft (3.05 m) of where a conduit leaves a Zone 0 location. There shall be no unions, couplings, boxes, or fittings, except reducers at the seal, in the conduit run between the seal and the point at which the conduit leaves the location.

Exception: A rigid unbroken conduit that passes completely through the Zone 0 location with no fittings less than 12 in. (305 mm) beyond each boundary, shall not be required to be sealed, if the termination points of the unbroken conduit are in unclassified locations.

(2) Seals shall be provided on cables at the first point of termination after entry into the Zone 0 location.

(3) Seals shall not be required to be explosionproof or flameproof.

(b) Zone 1. In Class I, Zone 1 locations, seals shall be located as follows.

(1) Conduit seals shall be provided for each conduit entering enclosures having type of protection 'd' or 'e'.

Exception: Where the enclosure having type of protection 'd' is marked to indicate that a seal is not required.

Conduit seals shall be provided for each conduit entering explosionproof equipment as follows.

(a) In each conduit entry into an explosionproof enclosure where either (1) the enclosure contains apparatus, such as switches, circuit breakers, fuses, relays, or resistors, that may produce arcs, sparks, or high temperatures that are considered to be an ignition source in normal operation, or (2) the entry is 2-in. size or larger and the enclosure contains terminals, splices, or taps. For the purposes of this section high temperatures shall be considered to be any temperatures exceeding 80 percent of the autoignition temperature in degrees Celsius of the gas or vapor involved.

Exception: Conduit entering an enclosure where such switches, circuit breakers, fuses, relays, or resistors are
1. Enclosed within a chamber hermetically sealed against the entrance of gases or vapors, or
2. Immersed in oil, or
3. Enclosed within a factory-sealed explosionproof chamber located within the enclosure, approved for the location, and marked "factory sealed" or equivalent.

Factory-sealed enclosures shall not be considered to serve as a seal for another adjacent explosionproof enclosure that is required to have a conduit seal.

(b) Conduit seals shall be installed within 18 in. (457 mm) from the enclosure. Only explosionproof unions, couplings, reducers, elbows, capped elbows, and conduit bodies similar to L, T, and Cross types that are not larger than the trade size of the conduit shall be permitted between the sealing fitting and the explosionproof enclosure.

(c) Where two or more explosionproof enclosures for which conduit seals are required under (b)(2) are connected by nipples or by runs of conduit not more than 36 in. (914 mm) long, a single conduit seal in each such nipple connection or run of conduit shall be considered sufficient if located not more than 18 in. (457 mm) from either enclosure.

(3) In each conduit entry into a pressurized enclosure where the conduit is not pressurized as part of the protection system. Conduit seals shall be installed within 18 in. (457 mm) from the pressurized enclosure.

FPN No. 1: Installing the seal as close as possible to the enclosure will reduce problems with purging the dead airspace in the pressurized conduit.

FPN No. 2: For further information, see Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

(4) In each conduit run leaving a Class I, Zone 1 location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 1 portion of the conduit from being communicated to the conduit beyond the seal. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 1 location.

Exception: Metal conduit containing no unions, couplings, boxes, or fittings that passes completely through a Class I, Zone 1 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not require a conduit seal if the termination points of the unbroken conduit are in unclassified locations.

(5) Conduits containing cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 1 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor and the outer jacket.

Exception: Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be permitted to be considered as a single conductor by sealing the cable in the conduit within 18 in. (457 mm) of the enclosure and the cable end within the enclosure by an approved means to minimize the entrance of gases or vapors and prevent the propagation of flame into the cable core, or by other approved methods. For shielded cables and twisted pair cables, it shall not be required to remove the shielding material or separate the twisted pair.

(6) Each multiconductor cable in conduit shall be considered as a single conductor if the cable is incapable of transmitting gases or vapors through the cable core. These cables shall be sealed in accordance with (d).

(7) Cable seals shall be provided for each cable entering flameproof or explosionproof enclosures. The seal shall comply with (d).

(8) Cables shall be sealed at the point at which they leave the Zone 1 location.

Exception: Where cable is sealed at the termination point.

(c) Zone 2. In Class I, Zone 2 locations, seals shall be located as follows.

(1) Conduit seals shall be located as follows.

(a) For connections to enclosures that are required to be flameproof or explosionproof, a conduit seal shall be provided in accordance with (b)(1) and (b)(2). All portions of the conduit run or nipple between the seal and such enclosure shall comply with Section 505-16(b).

2. In each conduit run passing from a Class I, Zone 2 location into an unclassified location. The sealing fitting shall be permitted on either side of the boundary of such location within 10 ft (3.05 m) of the boundary, and shall be designed and installed so to minimize the amount of gas or vapor within the Zone 2 portion of the conduit from being communicated to the conduit beyond the seal. Rigid metal conduit or threaded steel intermediate metal conduit shall be used between the sealing fitting and the point at which the conduit leaves the Zone 2 location, and a threaded connection shall be used at the sealing fitting. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point at which the conduit leaves the Zone 2 location.

Exception No. 1: Metal conduit containing no unions, couplings, boxes or fittings that passes completely through a Class I, Zone 2 location with no fittings less than 12 in. (305 mm) beyond each boundary shall not be required to be sealed if the termination points of the unbroken conduit are in unclassified locations.

Exception No. 2: Conduit systems terminating at an unclassified location where a wiring method transition is made to cable tray, cablebus, ventilated busway, Type MI cable, or open wiring shall not be required to be sealed where passing from the Class I, Zone 2 location into the unclassified location. The unclassified location shall be outdoors or, if the conduit system is all in one room, it shall be permitted to be indoors. The conduits shall not terminate at an enclosure containing an ignition source in normal operation.

Exception No. 3: Conduit systems passing from an enclosure or room that is unclassified as a result of pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

FPN: For further information, refer to Standard for Purged and Pressurized Enclosures for Electrical Equipment, NFPA 496-1998.

Exception No. 4: Segments of aboveground conduit systems shall not be required to be sealed where passing from a Class I, Zone 2 location into an unclassified location if the following conditions are met:

1. No part of the conduit system segment passes through a Class I, Zone 0 or Class I, Zone 1 location where the conduit contains unions, couplings, boxes, or fittings within 12 in. (305 mm) of the Class I, Zone 0 or Class I, Zone 1 location; and

2. The conduit system segment is located entirely in outdoor locations; and

3. The conduit system segment is not directly connected to canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the conduit system; and

4. The conduit system segment contains only threaded metal conduit, unions, couplings, conduit bodies, and fittings in the unclassified location; and

5. The conduit system segment is sealed at its entry to each enclosure or fitting housing terminals, splices, or taps in Class I, Zone 2 locations.

(2) Cable seals shall be located as follows.

(a) Cables entering enclosures required to be flameproof or explosionproof shall be sealed at the point of entrance. The seal shall comply with (d). Multiconductor cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall be sealed in the Zone 2 location after removing the jacket and any other coverings so that the sealing compound will surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors. Multiconductor cables in conduit shall be sealed as described in (b)(4).

Exception No. 1: Cables passing from an enclosure or room that is unclassified as a result of Type Z pressurization into a Class I, Zone 2 location shall not require a seal at the boundary.

Exception No. 2: Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs provided the termination is by an approved means to minimize the entrance of gases or vapors and prevent propagation of flame into the cable core.

(b) Cables with a gas/vaportight continuous sheath and that will not transmit gases or vapors through the cable core in excess of the quantity permitted for seal fittings shall not be required to be sealed except as required in (2)(a). The minimum length of such cable run shall not be less than that length that limits gas or vapor flow through the cable core to the rate permitted for seal fittings [0.007 ft3/hour (198 cm3/hour) of air at a pressure of 6 in. of water (1493 pascals)].

FPN No. 1: See Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, ANSI/UL 886-1994.

FPN No. 2: The cable core does not include the interstices of the conductor strands.

(c) Cables with a gas/vaportight continuous sheath capable of transmitting gases or vapors through the cable core shall not be required to be sealed except as required in (2)(a), unless the cable is attached to process equipment or devices that may cause a pressure in excess of 6 in. of water (1493 pascals) to be exerted at a cable end, in which case a seal, barrier, or other means shall be provided to prevent migration of flammables into an unclassified area.

Exception: Cables with an unbroken gas/vaportight continuous sheath shall be permitted to pass through a Class I, Zone 2 location without seals.

(d) Cables that do not have gas/vaportight continuous sheath shall be sealed at the boundary of the Zone 2 and unclassified location in such a manner as to minimize the passage of gases or vapors into an unclassified location.

FPN: The cable sheath may be either metal or a nonmetallic material.

(d) Class I, Zones 0, 1 and 2. Where required, seals in Class I, Zones 0, 1 and 2 locations shall comply with the following.

(1) Fittings. Enclosures for connections or equipment shall be provided with an integral means for sealing, or sealing fittings for Class I locations shall be used. Sealing fittings shall be accessible. Sealing fittings shall be listed for use with one or more specific compounds and shall be accessible.
(2) Compound. The compound shall provide a seal against passage of gas or vapors through the seal fitting, shall not be affected by the surrounding atmosphere or liquids, and shall not have a melting point of less than 93ºC (200ºF).
(3) Thickness of Compounds. In a completed seal, the minimum thickness of the sealing compound shall not be less than the trade size of the sealing fitting and, in no case, less than 5/8 in. (16 mm).
Exception: Listed cable sealing fittings shall not be required to have a minimum thickness equal to the trade size of the fitting.
(4) Splices and Taps. Splices and taps shall not be made in fittings intended only for sealing with compound, nor shall other fittings in which splices or taps are made be filled with compound.
(5) Conductor Fill. The cross-sectional area of the conductors permitted in a seal shall not exceed 25 percent of the cross-sectional area of a rigid metal conduit of the same trade size unless it is specifically listed for a higher percentage of fill.

(e) Drainage.

(1) Control Equipment. Where there is a probability that liquid or other condensed vapor may be trapped within enclosures for control equipment or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such liquid or condensed vapor.
(2) Motors and Generators. Where the authority having jurisdiction judges that there is a probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to minimize entrance of liquid. If means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture and shall be considered an integral part of the machine.
(3) Canned Pumps, Process or Service Connections, Etc. For canned pumps, process or service connections for flow, pressure, or analysis measurement, etc., that depend upon a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the electrical conduit system, an additional approved seal, barrier, or other means shall be provided to prevent the flammable or combustible fluid from entering the conduit system beyond the additional devices or means, if the primary seal fails.
The additional approved seal or barrier and the interconnecting enclosure shall meet the temperature and pressure conditions to which they will be subjected upon failure of the primary seal, unless other approved means are provided to accomplish the purpose above.
Drains, vents, or other devices shall be provided so that primary seal leakage will be obvious.

PANEL STATEMENT: The proposed text has been editorially amended to correlate with the text in Article 501-5 and also reflects other changes made via other proposals. See also Proposal 14-318a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1940)

14- 369 - (505-20(b), Exception): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
Exception: Equipment ~~approved~~ (identified) for use in Class I, Division 1 or listed for use in Class I, Zone 0 locations for the same gas, or as permitted by Section 505-7(d) and with a suitable temperature rating shall be permitted.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3580)

14- 370 - (505-20(b), Exception): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception: Equipment ~~approved~~ (identified) for use in Class I, Division 1 or listed for use in Class I, Zone 0 locations for the same gas, or as permitted by Section 505-7(d) and with a suitable temperature rating shall be permitted.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1939)

14- 371 - (505-20(c) Exception No. 2): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
Exception No. 2: Equipment ~~approved~~ (identified) for use in Class I, Division 1 or Division 2 locations for the same gas, or as permitted by Section 505-7(d), and with a suitable temperature rating shall be permitted.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3581)

14- 372 - (505-20(c) Exception No. 2): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception No. 2: Equipment ~~approved~~ (identified) for use in Class I, Division or Division 2 locations for the same gas, or as

permitted by Section 505-7(d) and with a suitable temperature rating shall be permitted.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1737)

14- 373 - (505-20(e)): Reject
SUBMITTER: Jon Miller, Richard Poling, Detector Electronics Corp.
RECOMMENDATION: Add new Section 505-20(e) to read as follows:
(e) Permanently mounted combustible gas detection equipment may be used as a means for reducing the need for special electrical equipment when:
• combustible gas detection equipment is listed and marked both as performance tested and as suitable for use in hazardous (classified) locations,
• performance listed combustible gas detection equipment is installed in accordance with industrial practices,
• used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and
• appropriate alarms with ventilation or interlocks are provided.
FPN No. 1: For suggested minimum performance specifications and guidance in the selection of gas detection equipment, see ISA S12.13.01, Performance Requirements, Combustible Gas Detectors.
FPN No. 2: For suggested installation, operation and maintenance guidance, see RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments.
FPN No. 3: For guidance in the installation of gas detection equipment, see ANSI/API RP 505, Recommended Practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, or Zone 2.
SUBSTANTIATION: Equipment necessary to be placed in hazardous (classified) locations which cannot meet specific hazardous location protection techniques currently requires purged/pressurized protection techniques. This is not always possible or desirable under all installation considerations. For many years gas detection equipment has been used as a method of protection in petroleum facilities in accordance with ANSI/API RP 505, Recommended Practice for Classification of Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2 and within hazardous location facilities in Canada in accordance with the Canadian Electrical Code (CEC) with no reported incidents. Gas detection equipment is capable of providing indication of the presence of combustible gases prior to reaching lower explosive limits and is capable of providing alarms with ventilation or interlocks. To ensure proper gas detection equipment functionality under such critical conditions, an existing ISA standard S12.13.01, Performance Requirements, Combustible Gas Detectors, will provide guidance on gas detection equipment performance requirements and an existing ISA recommended practice RP12.13.02, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments, will provide user guidance on the proper use of gas detection equipment. In conclusion, this additional method of protection should be considered for equipment which cannot meet the proper hazardous (classified) location requirements, but is necessary to be installed in such locations.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: While the panel agrees with the principle of selectively applying gas detection in Class I areas, the evaluation process that is required to support this complex operating condition extends beyond merely a simple installation requirement. The NEC is primarily an electrical installation document.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3983)

14- 374 - (505-25):
Note: The Technical Correlating Committee directs the Panel to reconsider this Proposal and revise the 6 ft (1.83m) dimension in accordance with the Technical Correlating Committee's directive regarding metrication of the NEC. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and communicated to the Panel prior to the Panel Meeting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise the text to read as follows:
505-25. Grounding and Bonding. Grounding and bonding shall comply with Article 250 and the following additional requirements.
(a) Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended on for bonding purposes, but bonding jumpers with proper fittings or other approved means of bonding shall be used. Such means of bonding shall apply to all intervening raceways, fittings, boxes, enclosures, etc., between Class I locations and the point of grounding for service equipment or point of grounding of a separately derived system.
Exception: The specific bonding means shall only be required to the nearest point where the grounded circuit conductor and the grounding electrode are connected together on the line side of the building or structure disconnecting means as specified in Sections 250-32(a), (b), and (c), provided the branch-circuit overcurrent protection is located on the load side of the disconnecting means.
FPN: See Section 250-100 for additional bonding requirements in hazardous (classified) locations.
(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 505-15(c) and is to be relied on to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-102.
Exception: In Class I, Zone 2 locations, the bonding jumper shall be permitted to be deleted where all the following conditions are met.
a. Listed liquidtight flexible metal conduit 6 ft (1.83 m) or less in length, with fittings listed for grounding, is used.
b. Overcurrent protection in the circuit is limited to 10 amperes or less.
c. The load is not a power utilization load.
SUBSTANTIATION: This proposal is the work of a Task Group including Ed Briesch, Bill Lawrence, Dave Wechsler, Lon Ballard, Larry Fuhrman, and Will McBride. This Task Group was not balloted. The purpose of the proposal is to provide clear guidelines for wiring, sealing, and installation in Article 505, without having to refer to Article 501.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2293)

14- 375 - (505-26, and Exception (New)): Accept
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Add a new section as follows:
"Multiwire Branch Circuits. In a Class I Zone 1 location, a multiwire branch circuit shall not be permitted.
Exception: Where the disconnect device(s) for the circuit opens all ungrounded conductors of a multiwire circuit simultaneously."
SUBSTANTIATION: The same safety hazard exists in Class I Zone 1 areas as exists in Class I Division 1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

ARTICLE 511 — COMMERCIAL GARAGES, REPAIR AND STORAGE

(Log #1264)

14- 376 - (511): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Technical Correlating Committee National Electrical Code

In 511-4(a), Exception, change "2 ft (610 mm)" to "600 mm (24 in.)" in two places in this exception.

In 511-7(a), change "12 ft (3.66 m)" to "3.7 m (12 ft)".

In 511-7(b), change "12 ft (3.66 m)" to "3.7 m (12 ft)".

RECOMMENDATION: In 511-3(a)(6)(3), change "18 in. (457 mm)" to "450 mm (18 in.)" in the title and the body of this section.

In 511-9(c), change "6 in. (152 mm)" to "150 mm (6 in.)".

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Reject.

PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.

OMEARA: This proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.

ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #CP1407)

14- 376a - (511 through 515): Accept

Note: It was the action of the Technical Correlating Committee that the Panel Action on this Proposal be correlated with the Article 511 rewrite in Proposal 14-377, the Article 513 rewrite in Proposal 14-417, the Article 514 rewrite in Proposal 14-454, and the Article 515 rewrite in Proposal 14-474. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 14

RECOMMENDATION: All changes based on text as reorganized by Proposals 14-377, 14-417, 14-454 and 14-474

1. 516 not included, most of the text that needed to be changed is extracted from NFPA 33, and also includes dust, which is problematic at this time for Zones.
2. Specific changes for 511 are:
a) 511-4; (a) After "Article 501" add "or Article 505 for the Division or Zone in which they are used".
b) 511-4; (b) Same change as (a)
c) 511-9; After "501-5" add "and 505-16", and delete "Section 501.5(d)(2)".
d) 511-16(b); After 501-16 add "for Class I, Division 1 and 2 locations and Article 505-25 for Class I, Zone 0,1 and 2 locations".
3. Specific changes for 513 are:
a) 513-4; (a) Same change as 511-4 (a)
b) 513-4; (b) Change text beginning "requirements" to read "applicable provisions of Article 501 or Article 505 for the Division or Zone in which they are used".
c) 513-10; (d)(1) After "Class I, Division 2" add "or Zone 2".
d) 513-10; (e)(2) Same as 513-10 (d)(1)
e) 513-9; After "501-5" add "and Section 505-16". In second sentence delete "in Section 501-5(a)(4) and (b)(2)".
f) 513-16(b); After 501-16 add "for Class I, Division 1 and 2 locations and Article 505-25 for Class I, Zone 0,1 and 2 locations".
4. Specific changes for 514 are:
a) 514-4; After "Article 501" add "or Article 505 for the Division or Zone in which they are used".
b) 514-8; After "Division 1" add "or Zone 1" (This occurs twice). After "Division 2" add "or Zone 2". (occurs one time).
c) 514-9; Delete "be provided .... and (b)(2) shall".
d) 515-16; After 501-16 add "for Class I, Division 1 and 2 locations and Article 505-25 for Class I, Zone 0,1 and 2 locations".
5. Specific changes for 515 are:
a) 515-4; Same as 514-4
b) 515-7; After "Article 501" add "or Article 505".
c) 515-9; Delete "in Sections 501-5(a)(4) and (d)(2)" and add after "Division 1" add "or Zone 1".
d) 515-16; After 501-16 add "for Class I, Division 1 and 2 locations and Article 505-25 for Class I, Zone 0,1 and 2 locations".

SUBSTANTIATION: These changes align Articles 511-515 with the Zone system as covered in Article 505 per proposals submitted to do this. Article 516 was not included because of the mix of gas and dust hazards covered. The change to 505-13 is necessary to align the Division and Zone requirements for conductor insulation. Affected are Proposals 14-383, 14-421, 14-462, 14-478.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

COOK: Since Article 505 was included in the 1996 NEC, I am only aware of one major project that utilized the Zone concept. This was a project that was provided significant financial and engineering backing that it proved to be a significant challenge to install. To permit this to happen in the Specific Occupancies, Articles 5-11-515, <u>which will not have the financial and engineering support will be a mistake in my opinion.</u> If Proposal 14-348 is accepted and the supervision of qualified registered professional engineering is removed, we would be allowing a segment of the electrical industry that has little or no experience with the zone concept to use a method that is still quite complex. These facilities are places where our families have access on daily basis.

I also do not believe the concept has been adopted in the current editions of NFPA Standards for these occupancies.

I do not agree with the substantiation that says "for the 1996 National Electrical Code, extensive substantiation was provided to demonstrate that the zone method of classification provided equal if not higher levels of safety as compared to the division method". The substantiation that I remember from 1996 only indicated that this option was desired and needed by certain users. None of the questions raised in the Comments on Affirmative and comments on negative ballots were ever addressed by CMP-14. See comments 14-3, 14-4, 14-5, 14-6, 14-7, 14-8, 14-10, 14-12, 14-14, 14-15, 14-45, and 14-164 in the 1995 ROC.

I believe that the zone system has merit and because Article 505 was accepted through the NFPA process, I am committed to working to improve the NEC requirements. I do not support the expansion of the zone concept into the specific occupancies at this time.

COMMENT ON AFFIRMATIVE:

JAGUNICH: See ballot for David Wechsler.

(Log #3972)

14- 377 - (511): Accept in Principle

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-380, 14-381, 14-382, 14-383, 14-384, 14-385, 14-389, 14-390, 14-391, 14-392, 14-396, 14-397, 14-398, 14-401, 14-402, 14-406, 14-408, 14-409, 14-410, and 14-412.

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Revise the entire Article 511 as follows:

Article 511 — Commercial Garages, Repair and Storage

511.1. Scope. These occupancies shall include locations used for service and repair operations in connection with self-propelled vehicles (including, but not limited to, passenger automobiles, buses, trucks, and tractors) in which volatile flammable liquids are used for fuel or power.

511.3. Classifications of Locations.

(a) Unclassified Locations. Parking garages used for parking or storage and where no repair work is done except exchange of parts and routine maintenance requiring no use of electrical equipment, open flame, welding, or the use of volatile flammable liquids are not classified.

FPN: For further information, see NFPA 88A, Standard for Parking Structures, 1995 edition, and NFPA 88B, Standard for Repair Garages, 1997 edition.

(b) Classified Locations. Areas in which flammable fuel is transferred to vehicle fuel tanks shall conform to Article 514.

(1) Class I Location. Classification in accordance with Article 500.

(a) Up to a Level of 18 in. (457 mm) Above the Floor. For each floor, the entire area up to a level of 18 in. (457 mm) above the floor shall be considered to be a Class I, Division 2 location.

Exception: Where the enforcing agency determines that there is mechanical ventilation providing a minimum of four air changes per hour.

(b) Any Pit or Depression Below Floor Level. Any pit or depression below floor level shall be considered to be a Class I, Division 1 location, which shall extend up to said floor level.

Exception No. 1: Any pit or depression in which six air changes per hour are exhausted at the floor level of the pit shall be permitted to be judged by the enforcing agency to be a Class I, Division 2 location.

Exception No. 2: Lubrication and service rooms without dispensing shall be classified in accordance with Table 514.2.

(c) Areas Adjacent to Defined Locations or with Positive-Pressure Ventilation. Areas adjacent to defined locations in which flammable vapors are not likely to be released, such as stock rooms, switchboard rooms, and other similar locations, shall not be classified where mechanically ventilated at a rate of four or more air changes per hour or where effectively cut off by walls or partitions.

(d) Adjacent Areas by Special Permission. Adjacent areas that by reason of ventilation, air pressure differentials, or physical spacing are such that, in the opinion of the authority enforcing this Code, no ignition hazard exists, shall be unclassified.

511.4. Wiring and Equipment in Class I Locations.

(a) Wiring Located in Class I Locations. Within Class I locations as classified in Section 511.3, wiring shall conform to applicable provisions of Article 501.

(1) Raceways. Raceways embedded in a masonry wall or buried beneath a floor shall be considered to be within the Class I location above the floor if any connections or extensions lead into or through such areas.

Exception: Rigid nonmetallic conduit that complies with Article 347 shall be permitted where buried under not less than 2 ft (610 mm) of cover. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 2 ft (610 mm) of the underground run to emergency or to the point of connection to the aboveground raceway and an equipment grounding conductor shall be included to provide electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

(b) Equipment Located in Class I Locations. Within Class I locations as defined in Section 511.3, equipment shall conform to applicable provisions of Article 501.

(1) Fuel-Dispensing Units. Where fuel-dispensing units (other than liquid petroleum gas, which is prohibited) are located within buildings, the requirements of Article 514 shall govern.

Where mechanical ventilation is provided in the dispensing area, the control shall be interlocked so that the dispenser cannot operate without ventilation as prescribed in Section 500.7(b).

(2) Portable Lighting Equipment. Portable lighting equipment shall be equipped with handle, lampholder, hook, and substantial guard attached to the lampholder or handle. All exterior surfaces that might come in contact with battery terminals, wiring terminals, or other objects shall be of nonconducting material or shall be effectively protected with insulation. Lampholders shall be of an unswitched type and shall not provide means for plug-in of attachment plugs. The outer shell shall be of molded composition or other suitable material. Unless the lamp and its cord are supported or arranged in such a manner that they cannot be used in the locations classified in Section 511.3, they shall be of a type approved for Class I, Division 1 locations.

511.7 Wiring and Equipment Installed Above Class I Locations.

(a) Wiring in Spaces Above Class I Locations.

(1) Fixed Wiring Above Class I Locations. All fixed wiring above Class I locations shall be in metal raceways, rigid nonmetallic conduit, electrical nonmetallic tubing, flexible metal conduit, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit or shall be Type MC, MI, manufactured wiring systems, or PLTC cable in accordance with Article 725, or Type TC cable. Cellular metal floor raceways or cellular concrete floor raceways shall be permitted to be used only for supplying ceiling outlets or extensions to the area below the floor, but such raceways shall have no connections leading into or through any Class I location above the floor.

(2) Pendant. For pendants, flexible cord suitable for the type of service and approved for hard usage shall be used.

(b) Electrical Equipment Installed Above Class I Locations.

(1) Fixed Electrical Equipment. Electrical equipment in a fixed position shall be located above the level of any defined Class I location or shall be approved for the location.

(a) Arcing Equipment. Equipment that is less than 12 ft (3.66 m) above the floor level and that may produce arcs, sparks, or particles of hot metal, such as cutouts, switches, charging panels, generators, motors, or other equipment (excluding receptacles, lamps, and lampholders) having make-and-break or sliding contacts, shall be of the totally enclosed type or constructed so as to prevent the escape of sparks or hot metal particles.

(b) Fixed Lighting. Lamps and lampholders for fixed lighting that is located over lanes through which vehicles are commonly driven or that may otherwise be exposed to physical damage shall be located not less than 12 ft (3.66 m) above floor level, unless of the totally enclosed type or constructed so as to prevent escape of sparks or hot metal particles.

(2) Attachment Plug Receptacles. Attachment plug receptacles installed in a fixed position shall be located above the level of any defined Class I location or shall be approved for the location.

511.9. Special Equipment.

(a) Battery Charging Equipment. Battery chargers and their control equipment, and batteries being charged, shall not be located within locations classified in Section 511.3.

(b) Electric Vehicle Charging Equipment.

(1) General. All electrical equipment and wiring shall be installed in accordance with Article 625, except as noted in Section 511.9(b)(2) and (3). Flexible cords shall be of a type approved for extra-hard usage.

(2) Connector Location. No connector shall be located within a Class I location as defined in Section 511.3.

(3) Plug Connections to Vehicles. Where plugs are provided for direct connection to vehicles, the point of connection shall not be within a Class I location as classified in Section 511.3, and, where the cord is suspended from overhead, it shall be arranged so that the lowest point of sag is at least 6 in. (152 mm) above the floor. Where an automatic arrangement is provided to pull both cord and plug beyond the range of physical damage, no additional connector shall be required in the cable or at the outlet.

511.10. Sealing. Approved seals conforming to the requirements of Section 501.5 shall be provided, and Section 501.5(b)(2) shall apply to horizontal as well as vertical boundaries of the defined Class I locations.

511.11. Ground-Fault Circuit-Interrupter Protection for Personnel. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in areas where electrical diagnostic equipment, electrical hand tools, or portable lighting equipment are to be used shall have ground-fault circuit-interrupter protection for personnel.

511.16. Grounded and Grounding Requirements.

(a) General Grounding Requirements. All metal raceways, the metal armor or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250.

(b) Supplying Circuits with Grounded and Grounding Conductors in Class I Locations. Grounding in Class I locations shall comply with Section 501.16.

(1) Circuits Supplying Portable Equipment or Pendants. Where a circuit supplies portables or pendants and includes a grounded conductor as provided in Article 200, receptacles, attachment plugs, connectors, and similar devices shall be of the grounding type, and the grounded conductor of the flexible cord shall be connected to the screw shell of any lampholder or to the grounded terminal of any utilization equipment supplied.

(2) Approved Means. Approved means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment.

SUBSTANTIATION: 1. All Section numbering has been changed to decimal or point system to conform to the NEC Style Manual.

2. Deleted Section 511-2 and incorporated the text into 511.3 in a new (a) for unclassified locations and (b) for classified locations.

3. Title have been added to major subsections to provide clarity and comply with the NEC Style Manual.

4. Old Section 511-3(b), fourth line to the seventh line starting with the word “except” has been reformatted into a new Exception No. 1 and the existing exception has been relabeled as Exception No. 2. Exceptions to the general rule should not be located in

positive text. It is more recognizable as an exception and easier for the user to identify it as an exception.

5. Old Sections 511-3(e) and (f) dealing with dispensers and portable lighting equipment has been relocated into subsections 511.4(b)(1) and (2) since they are really dealing with equipment in a classified location.

6. Old Section 511-4 has been divided into two new subsections. Section 511.4(a) deals with wiring in Class I locations and Section 511.4(b) deals with electrical equipment located in a Class I location.

7. The word "defined" has been change in old Sections 511-4 and 511-9(b) to "classified" since Section 511.3 does not define the classified locations; that is done Section 500-7. Section 511.3 provides area classifications for various locations. This also provides consistency for the text throughout the Article. See Old Sections 511-3(f) and 511-8.

8. Old Section 511-5 has been changed to 511.6 and 511-6 has been changed to 511.7 to provide consistency between the article dealing with specific hazardous location occupancies.

9. Section 511.9 has been relabeled as Special Equipment. Old Section 511-8 covering battery charging equipment has been relocated into Section 511.9(a) and old Section 511-9 for electric vehicle charging equipment has been relocated as Section 511.9(b).

10. Section 511.16 was relabeled with a new (a) and (b). New subsection (a) provides general requirements for grounding in Class I locations. New subsection 511.16(b) deals with the text that was located in former Section 511-6(c). The text that was in Section 511-6(c) is really dealing with grounded and grounding conductors and should be located within the Section dealing with grounding.

PANEL ACTION: Accept in Principle.

Accept the proposal as presented, but renumber 511-9 to 511-10; renumber 511-10 to 511-9; renumber 511-11 to 511-12

PANEL STATEMENT: The minor changes implement a standardized numbering format for Articles 511 through 516.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3993)

14- 378 - (511): Accept in Principle

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Revise the entire Article 511 as follows:

Article 511 — Commercial Garages, Repair and Storage

511.1. Scope. These occupancies shall include locations used for service and repair operations in connection with self-propelled vehicles (including, but not limited to, passenger automobiles, buses, trucks, and tractors) in which volatile flammable liquids are used for fuel or power.

511.3. Locations. Areas in which flammable fuel is transferred to vehicle fuel tanks shall conform to Article 514. Parking garages used for parking or storage and where no repair work is done except exchange of parts and routine maintenance requiring no use of electrical equipment, open flame, welding, or the use of volatile flammable liquids are not classified.

FPN: For further information, see NFPA 88A, Standard for Parking Structures, 1995 edition and NFPA 88B, Standard for Repair Garages, 1997 edition.

Where fuel-dispensing units (other than liquid petroleum gas, which is prohibited) are located within buildings, the requirements of Article 514 shall govern.

Where mechanical ventilation is provided in the dispensing area, the controls shall be interlocked so that the dispenser cannot operate without ventilation as prescribed in Section 500.7(b).

(a) Class I Locations. Classification under Article 500.

(1) Up to a Level of 18 in. (457 mm) Above the Floor. For each floor, the entire area up to a level of 18 in. (457 mm) above the floor shall be considered to be a Class I, Division 2 location.

Exception: Where the enforcing agency determines that there is mechanical ventilation providing a minimum of four air changes per hour.

(2) Any Pit or Depression Below Floor Level. Any pit or depression below floor level shall be considered to be a Class I, Division 1 location, which shall extend up to said floor level, except that any pit or depression in which six air changes per hour are exhausted at the floor level of the pit shall be permitted to be judged by the enforcing agency to be a Class I, Division 2 location.

Exception: Lubrication and service rooms without dispensing shall be classified in accordance with Table 514.2.

(b) Unclassified Locations.

(1) Areas Adjacent to Defined Locations or with Positive-Pressure Ventilation. Areas adjacent to defined locations in which flammable vapors are not likely to be released, such as stock rooms, switchboard rooms, and other similar locations, shall not be classified where mechanically ventilated at a rate of four or more air changes per hour or where effectively cut off by walls or partitions.

(2) Adjacent Areas by Special Permission. Adjacent areas that by reason of ventilation, air pressure differentials, or physical spacing are such that, in the opinion of the authority enforcing this Code, no ignition hazard exists, shall be unclassified.

511.4. Wiring and Equipment in Class I Locations.

(a) Wiring. Within Class I locations as defined in Section 511.3, wiring and equipment shall conform to applicable provisions of Article 501.

(b) Equipment.

Portable Lighting Equipment. Portable lighting equipment shall be equipped with handle, lampholder, hook, and substantial guard attached to the lampholder or handle. All exterior surfaces that might come in contact with battery terminals, wiring terminals, or other objects shall be of nonconducting material or shall be effectively protected with insulation. Lampholders shall be of an unswitched type and shall not provide means for plug-in of attachment plugs. The outer shell shall be of molded composition or other suitable material. Unless the lamp and its cord are supported or arranged in such a manner that they cannot be used in the locations classified in Section 511.3, they shall be of a type approved for Class I, Division 1 locations.

511.5. Wiring and Equipment Embedded, Underslab, or Underground. Raceways embedded in a masonry wall or buried beneath a floor shall be considered to be within the Class I location above the floor if any connections or extensions lead into or through such areas.

Exception: Rigid nonmetallic conduit that complies with Article 347 shall be permitted where buried under less than 2 ft (610 mm) of cover. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 2 ft (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway and an equipment grounding conductor shall be included to provide electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

511.6. Sealing. Approved seals conforming to the requirements of Section 501.5 shall be provided, and Section 501.5(b)(2) shall apply to horizontal as well as vertical boundaries of the defined Class I locations.

511.7 Wiring and Equipment Not Within Class I Locations.

(a) Fixed Wiring Above Class I Locations. All fixed wiring above Class I locations shall be in metal raceways, rigid nonmetallic conduit, electrical nonmetallic tubing, flexible metal conduit, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit or shall be Type MC, MI, manufactured wiring systems, or PLTC cable in accordance with Article 725, or Type TC cable. Cellular metal floor raceways or cellular concrete floor raceways shall be permitted to be used only for supplying ceiling outlets or extensions to the area below the floor, but such raceways shall have no connections leading into or through any Class I location above the floor.

(b) Pendants. For pendants, flexible cord suitable for the type of service and approved for hard usage shall be used.

(c) Grounded and Grounding Conductors. Where a circuit supplies portables or pendants and includes a grounded conductor as provided in Article 200, receptacles, attachment plugs, connectors, and similar devices shall be of the grounding type, and the grounded conductor of the flexible cord shall be connected to the screw shell of any lampholder or to the grounded terminal of any utilization equipment supplied. Approved means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment.

(d) Attachment Plug Receptacles. Attachment plug receptacles in a fixed position shall be located above the level of any defined Class I location or shall be approved for the location.

(e) Arcing Equipment. Equipment that is less than 12 ft (3.66 m) above the floor level and that may produce arcs, sparks, or particles of hot metal, such as cutouts, switches, charging panels,

generators, motors, or other equipment (excluding receptacles, lamps, and lampholders) having make-and-break or sliding contacts, shall be of the totally enclosed type or constructed so as to prevent the escape of sparks or hot metal particles.

(f) Fixed Lighting. Lamps and lampholders for fixed lighting that is located over lanes through which vehicles are commonly driven or that may otherwise be exposed to physical damage shall be located not less than 12 ft (3.66 m) above floor level, unless of the totally enclosed type of construction so as to prevent escape of sparks or hot metal particles.

511.8 Special Equipment.

(a) Battery Charging Equipment. Battery chargers and their control equipment, and batteries being charged, shall not be located within locations classified in Section 511.3.

(b) Electric Vehicle Charging.

(1) General. All electrical equipment and wiring shall be installed in accordance with Article 625, except as noted in Section 511.9(b) and (c). Flexible cords shall be of a type approved for extra-hard usage.

(2) Connector Location. No connector shall be located within a Class I location as defined in Section 511-3.

(3) Plug Connections to Vehicles. Where plugs are provided for direct connection to vehicles, the point of connection shall not be within a Class I location as defined in Section 511.3, and, where the cord is suspended for overhead, it shall be arranged so that the lowest point of sag is at least 6 in. (152 mm) above the floor. Where an automatic arrangement is provided to pull both cord and plug beyond the range of physical damage, no additional connector shall be required in the cable or at the outlet.

(c) Ground-Fault Circuit-Interrupter Protection for Personnel. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in areas where electrical diagnostic equipment, electrical hand tools, or portable lighting equipment are to be used shall have ground-fault circuit-interrupter protection for personnel.

511.6. Grounding. All metal raceways, the metal armors or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded a provided in Article 250. Grounding in Class I locations shall comply with Section 501.16.

SUBSTANTIATION: This proposal is the work of a Task Group including Donny Cook, Fred Walker, Gordon Johnson, Don Zipsi, Mark Goodman, Kevin Earley, Mark Ode, Bob Benedetti, and Richard Hild. The Task Group was not balloted. The purpose of the proposal is to provide parallel numbering from Article 511 through 516 to comply with Section 2.4.1 of the NEC Style Manual.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See Proposal 14-377.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2394)

14- 379 - (511-1): Reject

SUBMITTER: William E. Bickner, Stillwater, MN

RECOMMENDATION: Revise as shown below:

511-1. Scope. These occupancies shall include locations for service and repair operations in connection with self-propelled vehicles (including, but not limited to, passenger automobiles, buses, trucks, ~~and~~ tractors, motorcycles, all-terain vehicles, snowmobiles, lawn and garden equipment, and boats) in which volatile flammable liquids are used for fuel or power.

SUBSTANTIATION: CMP 14 has rejected similar past proposals with panel statements such as "Article 511 is based on the requirements of NFPA 88A and 88B, which do not mention motor boats. CMP 14 has no jurisdiction over the definition of self-propelled vehicles, and does not agree" (1992 TCR, proposal 14-186). In fact, NFPA 88B also does not refer to "passenger automobiles," "tractors," "buses," or "self-propelled vehicles," as does NEC Section 511-1. In defining a repair garage, NFPA 88B refers to "motorized vehicles or automobiles." A "motorized vehicle," in the broadest sense, as defined in dictionaries, is "a means, equipped with a motor, of carrying or transporting something," and rationally includes the types of vehicles proposed to be added. It appears that the committee used its own terms in writing the scope statement, and would therefore be free to modify the scope to suit the needs of the NEC user. The panel may be correct in not including other equipment, but whatever its determination, there is a need to clarify the intent of this section, which is variously interpreted in the field. Although, as the committee has suggested, Section 500-5 may be used to determine the classification of areas where such equipment is serviced or repaired (1992 TCR, proposal 14-184), that is also true of the types of vehicles presently listed in 511-1, and is obviously impractical, as evidenced by the existence Article 511. If it is not the panel's intent to include such vehicles, a clear statement to that effect would be useful.

PANEL ACTION: Reject.

PANEL STATEMENT: NFPA 88B is limited to automotive vehicles and boats are covered by Article 555 and the panel believes there is no need for the list of vehicles covered by Article 511 to be all-inclusive.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #2395)

14- 380 - (511-1): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: William E. Bickner, Stillwater, MN

RECOMMENDATION: Revise as shown below:

511-1. Scope. These occupancies shall include locations used for service and repair operations in connection with self-propelled vehicles (including, but not limited to, passenger automobiles, buses trucks, and tractors) in which volatile flammable liquids or flammable gases are used for fuel or power.

SUBSTANTIATION: Vehicles using fuels such as liquified petroleum gas or compressed natural gas should be included in this article, as they are not specifically covered elswhere in the Code. The reference to LPG in NEC Section 511-3(e) and CNG in Section 3-1.1 of NFPA 88B indicates an intent to cover vehicles using those fuels. NFPA 88B, Section 3-1.1 requires an additional 18 in classified location at the ceiling of repair garages for vehicles using CNG, which is not addressed in NEC Article 511 or other NEC Articles. A separate proposal has been submitted to add that requirement to Section 511-3(a).

PANEL ACTION: Accept.

PANEL STATEMENT: Panel 14 recognizes that the scope is the jurisdiction of the Correlating Committee and recommends acceptance of this change.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #2396)

14- 381 - (511-2): Accept in Principle in Part

SUBMITTER: William E. Bickner, Stillwater, MN

RECOMMENDATION: Revise Section 511-2 according to the following:

511-2. Locations. Areas in which flammable fuel is transferred to vehicle fuel tanks shall conform to Article 514 and the applicable provisions of Articles 511 and 501. Buildings or portions of buildings without dispensing which are used for lubrication, inspection, and minor maintenance work, such as tune-ups and brake system repairs, but not for major repairs, painting, or body work, shall be classified in accordance with Table 514-2 and shall conform to the applicable provisions of Articles 511 and 501.

(balance of paragraph unchanged)

Delete the exception to 511-3(b) in its entirity.

SUBSTANTIATION: In its present location, the exception to Section 511-3(b) appears to apply only to (b), a pit or "depression below floor level," but is presumably intended to apply to lubrication and service areas in general. The proposed change corrects this by changing the exception to an independent statement and relocating it to Section 511-2 to be grouped with the other statements regarding the applicability of Articles 511 and 514. Some Code users may miss the point that this exception applies to classification only, so the proposed change also clarifies that wiring and equipment must conform to Articles 501 and 511. The term "service room" is undefined, making the applicability of the exception unclear. The added material clarifies this, using

language from the definition of the term "automotive service station" in NFPA 88B.
A separate proposal has been submitted to delete the exception to Section 511-3(b).
PANEL ACTION: Accept in Principle in Part.
Add the word "also" after the word "shall" in the first sentence of existing 511-2.
PANEL STATEMENT: The changes indicate that 511 applies also, not just 514. The exception, however, must be retained to indicate that only below-grade areas are being addressed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #310)

14- 382 - (511-2 and FPN): Accept
SUBMITTER: Technical Committee on Automotive and Marine Service Stations
RECOMMENDATION: Add a new second paragraph and a new fine print note to read as follows:
"The storage, handling, or dispensing into motor vehicles of alcohol-based windshield washer fluid in areas used for the service and repair operations of the vehicles shall not cause such areas to be classified as hazardous (classified) locations.
(FPN): For further information, see NFPA 30A, Automotive and Marine Service Station Code, Subsection 7-3.5."
SUBSTANTIATION: The purpose of this proposal is to correlate NFPA 30A and the NEC. The delineation and classification of areas for the purpose of installing electrical wiring and electrical utilization equipment in automotive service stations, automotive repair facilities, and similar occupancies is the responsibility of the Technical Committee on Automotive and Marine Service Stations. During the code cycle for the 1996 edition of NFPA 30A, the Technical Committee reviewed a report "Fire Safety and Health Evaluation of Methanol in an Instant Oil-Change Store" (10/24/94, Ashland Chemical Company, Analytical Services and Technology, Environmental Analysis Laboratory). Based on the technical analysis and information in this report, the fire data gathered by NFPA's Fire Analysis and Research Dept., and the requirements of NFPA 30A, Subsections 2-3.1 and 2-3.2, the Technical Committee added subsection 7-3.5 to Chapter 7, Electrical Equipment, to the 1996 edition of NFPA 30A. By incorporating the proposed new text into Section 511-2 of NFPA 70, potential misunderstandings and conflicts between fire officials and electrical inspectors can be avoided.
The Technical Committee reviewed Article 514 of NFPA 70 and felt that, since 514-1, second paragraph requires "... lubritoriums, service rooms,... and similar occupancies shall comply with Articles 510 and 511 with respect to electrical wiring and equipment...", it is recommending that the most appropriate place to correlate this requirement with NFPA 30A is Section 511-2. If Panel 14 determines that another location(s) or alternate wording to meet the writing style of the National Electrical Code is needed, the Technical Committee on Automotive and Marine Service Stations would have no issue with such Panel actions, since correlation of the two codes is our only concern.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3024)

14- 383 - (511-3): Accept
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise text as follows:
Classification under Article 500 or 505.
(a) Up to a Level of 18 in. (457 mm) Above the Floor. For each floor, the entire area up to a level of 18 in. (457 mm) above the floor shall be considered to be a Class I, Division 2, or Zone 2 location.
Exception: Where the enforcing agency determines that there is mechanical ventilation providing a minimum of four air changes per hour.
(b) Any Pit or Depression Below Floor Level. Any pit or depression below floor level shall be considered to be a Class I, Division 1 or Zone 1 location, which shall extend up to said floor level, except that any pit or depression in which six air changes per hour are exhausted at the floor level of the pit shall be permitted to be judged by the enforcing agency to be a Class I, Division 2 or Zone 2 location.
SUBSTANTIATION: This proposal is to recognize the alternate method for classification that was introduced into the 1996 National Electrical Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-376a.

(Log #2397)

14- 384 - (511-3(a)): Accept in Principle
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Add the following between the existing text and the exception:
"Where compressed natural gas (CNG) vehicles are repaired or stored, the area within 18 in of the ceiling shall be classified as Class I, Division 2."
SUBSTANTIATION: The proposed addition is taken directly from Section 3-1.1 of NFPA 88B, and should be included in this article to address this potential problem and to be consistent with that standard.
PANEL ACTION: Accept in Principle.
Add a new paragraph to 511-3 as follows:
"(b)x Within 18" of the Ceiling. Where compressed natural gas (CNG) vehicles are repaired or stored, the area within 18 in of the ceiling shall be classified as Class I, Division 2, except where ventilation of at least 4 air changes per hour is provided."
Renumber as appropriate.
PANEL STATEMENT: The panel's version is extracted directly from NFPA 88B.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #4355)

14- 385 - (511-3(a)): Accept in Principle
SUBMITTER: Marty Kumm, Board of Electricity, State of Minnesota
RECOMMENDATION: Revise text to read as follows:
(a) Up to a Level of 18 in. (457 mm) Above the Floor. For each floor, the entire area up to a level of 18 in. (457 mm) above the floor shall be considered to be a Class I, Division 2 location.
Exception: Where the enforcing agency determines that there is mechanical ventilation providing a minimum of four air changes per hour or one cubic foot per minute of exchanged air for each square foot of floor area with the exhaust air being taken within 18 in. of the floor.
SUBSTANTIATION: The hazard in this type of occupancy is more closely related to the floor area and the number of vehicle or hazardous material that may be parked or located in such occupancies. By relaying only on 4 air changes per hour, the occupancies with high ceilings are being penalized. These occupancies have to provide a very large ventilation system when the hazard present is not any greater, because the basic square footage is the same. Using the square footage as a basis for the ventilation would allow these high ceiling buildings an option that might save some cost and provide for the same level of safety. This would provide 4 air changes per hour for a building with a ceiling up to 15 ft high. This would also help bring the National Electrical Code into sync with other model building codes within the U.S.
PANEL ACTION: Accept in Principle.
Change the wording of the existing exception to read:
"Exception: Where the enforcing agency determines that there is mechanical ventilation providing a minimum of four air changes per hour or one cubic foot per minute of exchanged air for each square foot of floor area. Ventilation shall provide for air exchange across the entire floor area within 12 in (0.3m) of the floor."
PANEL STATEMENT: The panel's version provides more flexibility and ensures that the area in question has sufficient

ventilation. The change from 18 in to 12 in is consistent with Table 514-2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2340)

14- 386 - (511-3(a) Exception No. 2 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add the following Exception:
Exception No 2: Lubrication and service rooms without dispensing.
SUBSTANTIATION: This new exception will hopefully clarify that lubrication and service rooms without dispensing are not classified locations. Support for this can be found in NEC 511-3(b) Exception No. 1. A pit in these locations is a Class I Division II area per Table 514-2. If in fact this is true the area above the pit should not be classified (except as required by the aforementioned table).
If the area above the pit is in fact a Class I Division II location, the pit should be a Class I Division I location to remain consistent with other code sections relating to pits. This would then require a change to 517-3(b) exception to state that it would be a Class I Division II location with the proper ventilation.
Presently it appears that both the pit and work floor area in this type of occupancy are Class I Division II areas.
PANEL ACTION: Reject.
PANEL STATEMENT: This new exception is not warranted. Existing requirements apply.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2398)

14- 387 - (511-3(b)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Delete the exception to Section 511-3(b).
SUBSTANTIATION: See submitters proposal for Section 511-2, which would relocate and modify the material presently covered by this exception.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception must be retained to indicate that only below-grade areas are being addressed. See also Proposal 14-381.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #4305)

14- 388 - (511-3(c)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
(c) Areas Adjacent to Defined Locations or with Positive-Pressure Ventilation. Areas adjacent to defined locations in which flammable vapors are not likely to be released, such as stock rooms, switchboard rooms, and other similar locations, shall not be classified where (1) mechanically ventilated at a rate of four or more air changes per hour, ~~or where~~ (2) effectively cut off by walls or partitions, (3) the floors of the areas are elevated not less than 18 in. above the adjacent garage floor, or (4) the floors of the areas are separated from the adjacent garage floor by tight curbs or partitions not less than 18 in. high .
SUBSTANTIATION: Article 510 of the 1953 and 1956 NEC and 511 of the 1959 through 1971 NEC contained the following provision concerning commercial garages: "Adjacent areas in which flammable vapors are not likely to be released, such as stock rooms, switchboard rooms, and other similar locations, having floors elevated at least 18 inches above adjacent garage floor, or separated therefrom by tight curbs or partitions at least 18 inches high, shall not be classed as hazardous." The present provisions of Section 511-3(c) were part of the rewrite of Article 511 proposed by NECA (1974 NEC "Preprint", Proposal No. 38 to CMP 14.), which was adopted verbatim.
The relevant part of the substantiation for this proposal stated: "This means that the entire area, whether single or multi-storied, be treated as hazardous up to at least 18 inches above the floor. Going further with the code wording , it is necessary to build curbs 18 inches high at the entrance to each elevator or escalator in a storage garage. The inspectors recognized how ridiculous this requirement was and did not enforce it."
The change had the desired effect of allowing adjacent locations to be unclassified without differences in floor elevations or curbs or concurrence of the authority having jurisdiction as provided under the 1968 and later editions of the Code. However, it eliminated the 18 inch height differential or curb as a permitted means of separation. This omission was apparently unintentional, since the intent was to relax this requirement, not disallow it. This reasonable, time-tested practice was permitted by the Code for more than 20 years, is still permitted by some authorities having jurisdiction, and should be reinstated to allow more flexibility in wiring such locations.
PANEL ACTION: Reject.
PANEL STATEMENT: Requierements in previous editions of the NEC back to 1953 are not justification for this change. The submitter's proposals are already permitted by the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1638)

14- 389 - (511-3(f)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise fifth sentence to read as follows:
Unless the lamp and its cord are supported or arranged in such a manner that they cannot be used in the locations classified in Section 511-3, they shall be of a type ~~approved~~ (identified) for Class I, Division 1 locations.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3582)

14- 390 - (511-3(f)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the fifth sentence to read as follows:
"Unless the lamp and its cord are supported or arranged in such a manner that they cannot be used in the locations classified in Section 511-3, they shall be of a type ~~approved~~ (identified) for Class I, Division 1 locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #38)

14- 391 - (511-3(g), 511-1, and Appendix A (New)): Accept in Principle

NOTE: The following proposal consists of Comment 14-107 on Proposal N/A in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE.

SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc./Rep. Convenient Automotive Services Inst. (CASI)

RECOMMENDATION: New text for correlation between NFPA 30A and the NEC.

Add new Section 511-3(g) to read as follows:

(g) Methyl Alcohol-Based Windshield Washer Fluid* Where alcohol-based windshield washer fluids are stored, handled, or dispensed into motor vehicles, electrical wiring and electrical equipment shall be designed and installed for general purpose (nonclassified) locations.

Add new paragraph to 514-1:

*Where alcohol-based windshield washer fluids are stored, handled, or dispensed into motor vehicles, electrical wiring and electrical equipment shall be designed and installed for general purpose (nonclassified) locations.

Add to Appendix A - Extracts:

511-3(g) Automotive and Marine Service Station Code, NFPA 30A-1996, Section 7-3.5.

514-1 Automotive and Marine Service Station Code, NFPA 30A-1996, Section 7-3.5.

SUBSTANTIATION: In the past NFPA staff would correlate extracted material between NFPA 30A and the NEC. In my review of the ROP for the proposed 1999 NEC, I realized that the correlation of the change in the 1996 edition of NFPA 30A (effective dated 8/9/96) was not passed on to the Panel 14 to incorporate into the 1999 edition of the NEC. Without this correlation between the two Codes, electrical inspectors will not have the revised requirements to NFPA 30A, Table 7, which is the basis of the NEC Table 514-2. By incorporating the new electrical classification of NFPA 30A, Section 7-3.5, into the NEC, potential misunderstanding and conflicts between fire and electrical inspectors can be avoided

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 14-382.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #39)

14- 392 - (511-3(g), 511-1, and Appendix A): Accept in Principle

NOTE: The following proposal consists of Comment 14-108 on Proposal N/A in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE.

SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc.

RECOMMENDATION: Add text to read as follows:

511-3(g) Methyl Alcohol-Based Windshield Washer Fluid. Where alcohol-based windshield washer fluids are stored, handled, or dispensed into motor vehicles, electrical wiring and electrical equipment shall be designed and installed for general purpose (nonclassified) locations.

Add new paragraph 514-1: Where alcohol-based windshield washer fluids are stored, handled, or dispensed into motor vehicles, electrical wiring and electrical equipment shall be designed and installed for general purpose (nonclassified) locations.

Add to Appendix A - Extracts

511-3(g) Automotive and Marine Service Station Code, NFPA 30A-1996 Section 7-3.5

514-1 Automotive and Marine Service Station Code, NFPA 30A-1996 Section 7-3.5

SUBSTANTIATION: In the past NFPA Staff would correlate extracted material between NFPA No. 30A and the NEC Codes. In my review of the Report on Proposals for the proposed 1998 NEC I realized that the correlation of the change in the 1996 edition of NFPA No. 30A (effective dated 8/9/96) was not passed on to the Panel 14 to incorporate into the 1998 edition of the NEC. Without this correlation between the two Codes, electrical inspectors will not have the revised requirements to NFPA No. 30A Table 7, which is the basis of the NEC Table 514-2. By incorporating the new electrical classification of NFPA No. 30A, Section 7-3.5, into the NEC, potential misunderstandings and conflicts between fire and electrical inspectors can be avoided.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See Proposal 14-382.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2399)

14- 393 - (511-4): Reject

SUBMITTER: William E. Bickner, Stillwater, MN

RECOMMENDATION: Modify the last sentence before the exception as follows:

"Raceways embedded in a masonry wall or buried beneath a floor shall be considered to be within the Class I location above the floor if any connections or extensions lead into or through such areas and have any union, coupling, box, or fitting within, or within 12 in of a boundary of, the Class I location."

SUBSTANTIATION: This proposal would make this requirement consistent with Exception No. 1 to Section 501-5(b)(2), which permits seals to be deleted under the same conditions as those of the proposal, presumably because significant amounts of flammable gases cannot enter such conduits. Rigid or intermediate metal conduit are the only raceways permitted for such installations in view of Section 501-4(b), which would result in an equivalent condition.

PANEL ACTION: Reject.
PANEL STATEMENT: Article 501 already applies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3977)

14- 394 - (511-4): Reject

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Revise text to read as follows:

511-4. Wiring and Equipment in Class I Locations. Within Class I locations as defined in Section 511-3, wiring and equipment shall conform to applicable provisions of Article 501. Raceways embedded in a masonry wall or buried beneath a floor shall be ~~considered to be within the Class I location above the floor if any connections or extensions lead into or through such areas.~~ sealed with a listed seal when it emerges from below grade or from being embedded in a masonry wall.

SUBSTANTIATION: To provide common wording for conduit systems installed below grade from Articles 511 through 516.

PANEL ACTION: Reject.
PANEL STATEMENT: The requirements of Article 501 already apply and a seal may not be required in every case.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: The purpose for the proposal was to provide common wording for underground or in slab wiring and associated seals in the specific occupancies. The submitter assumed that the restrictions for this wiring are based on hazardous materials entering the raceways and trying to prevent the migration of the liquids, gases or vapors to an ignition source at the end of the raceway. See Panel Statement on Proposal 14-428. It seems that the hazardous materials associated with at least Articles 511-515 are very similar and that preventing this migration could be done with

common wording. Since different words are used in each Article, the code language leads users to believe that gas entering a raceway under a commercial garage will react differently than gas entering a raceway under a drive at a dispensing station. I do not believe this is true and believe that common language could be used. Based on the various words shown below, and questions that are asked over and over, I believe the existing wording causes confusion and should be changed. If this set of words is a problem, some technical reason should be provided for rejecting the proposal, so that acceptable wording could be proposed.

Underground Wiring & Sealing Requirements in 1999 NEC read:

511-4 Wiring and Equipment in Class I Locations. Within Class I locations as defined in Section 511-3, wiring and equipment shall conform to applicable provisions of Article 501. Raceways embedded in a masonry wall or buried beneath a floor shall be considered to be within the Class I location above the floor if any connections or extensions lead into or through such areas.

511-5 Sealing. Approved seals conforming to the requirements of Section 501-5 shall be provided and Section 501-5(b)(2) shall apply to horizontal as well as vertical boundaries of the defined Class I locations.

513-4 Wiring and Equipment in Class I Locations. All wiring and equipment that is or may be installed or operated within any of the Class I locations defined in Section 513-3 shall comply with the applicable provisions of Article 501. All wiring installed in or under the hangar floor shall comply with the requirements for Class I, Division 1 locations.

513-8 Sealing. Approved seals shall be provided in accordance with Section 501-5. Sealing requirements specified in Sections 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Raceways embedded in a concrete floor or buried beneath a floor shall be considered to be within the Class I location above the floor.

514-8 Underground Wiring. Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit. Any portion of electrical wiring or equipment that is below the surface of a Class I, Division 1 or Division 2 location (as defined in Table 514-2) shall be considered to be in a Class I , Division 1 location, which shall extend at least to the point of emergence above grade. Refer to Table 300-5.

514-7 Sealing

(a) At Dispenser. An approved seal shall be provided in each conduit run entering or leaving a dispenser or any cavities or enclosures in direct communication therewith. The sealing fitting shall be the first fitting after the conduit emerges from the earth or concrete.

(b) At Boundary. Additional seals shall be provided in accordance with Section 501-5. Sections 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations.

515-5 Underground Wiring

(a) Wiring Method. Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit or, where buried under not less than 2 ft (610 mm) of cover, shall be permitted in rigid nonmetallic conduit or an approved cable. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 2 ft (610 mm) of the conduit run to emergence or to the point of connection to the aboveground raceway. Where cable is used, it shall be enclosed in threaded rigid metal conduit or threaded steel intermediate metal conduit from the point of lowest buried cable level to the point of connection to the aboveground raceway.

515-6 Sealing. Sealing requirements in Sections 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Buried raceways under defined Class I locations shall be considered to be within a Class I, Division 1 location.

516-7 Wiring and Equipment Above Class I and II Locations

(a) Wiring. All fixed wiring above the Class I and II locations shall be in metal raceways, rigid nonmetallic conduit, or electrical nonmetallic tubing, or shall be Type MI, TC, or MC cable. Cellular metal floor raceways shall be permitted only for supplying ceiling outlets or extensions to the area below the floor of a Class I or II location, but such raceways shall have no connections leading into or through the Class I or II location above the floor unless suitable seals are provided.

(Log #2131)

14- 395 - (511-4(a) Exceptions No. 2 and No. 3): Accept in Principle

Note: The Technical Correlating Committee understands that the reference in the Panel Statement should be to Proposal 14-59a.

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Revise to read as follows:

Exception No. 2: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type MC cable, listed for use in Class I, Division 1 locations with a gas/vaportight continuous corrugated aluminum sheath, an overall jacket of suitable polymeric material, separate grounding conductors, Type MC-HL, in accordance with Section 250-122, and provided with termination fittings listed for the application shall be permitted.

FPN: See Sections 334-3 and 334-4 for restrictions on use of Type MC cable.

Exception No. 3: In industrial establishments with restricted public access, where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, Type ITC cable, listed for use in Class I, Division 1 locations, with a gas/vaportight continuous corrugated aluminum sheath, an overall jacket of suitable polymeric materials, Type ITC-HL, and provided with termination fittings listed for the application shall be permitted.

SUBSTANTIATION: Cable that complies with the requirements of this exception and listed in accordance with UL Standard 2225, is marked with the prefix "-HL". Since this is the required marking of the cable to describe the requirements, the marking should be shown in this section. It is also suggested that the detailed cable requirements in this exception may be dropped after one or two additional code cycles, after users are familiar with the cable marking requirements.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The panel believes this proposal applies to Article 501, not 511, and is being addressed by Proposal 14-318a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1639)

14- 396 - (511-5): Accept in Part

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise first sentence to read as follows:

~~Approved~~ (identified) seals conforming to the requirements of Section 501-5 shall be provided, and Section 501-5(b)(2) shall apply to horizontal as well as vertical boundaries of the defined Class I locations.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept in Part.

Delete the word "approved".

PANEL STATEMENT: The requirement is already covered in 501-5.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3583)

14- 397 - (511-5): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
511-5 Sealing. ~~Approved~~ (Identified) seals conforming to the requirements of Section 501-5 shall be provided, and Section 501-5(b)(2) shall apply to horizontal as well as vertical boundaries of the defined Class I locations.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete the word "approved".
PANEL STATEMENT: The requirement is already covered in 501-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3025)

14- 398 - (511-6): Accept
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise text as follows:
511-6. Wiring in Spaces Above Class I Locations.
(a) Fixed Wiring Above Class I Locations. All fixed wiring above Class I locations shall be in metal raceways, rigid nonmetallic conduit, electrical nonmetallic tubing, flexible metal conduit, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit or shall be Type MC, MI, manufactured wiring systems, or PLTC cable in accordance with Article 725, or Type TC cable, or Type ITC cable in accordance with Article 727. Cellular metal floor raceways or cellular concrete floor raceways shall be permitted to be used only for supplying ceiling outlets or extensions to the area below the floor, but such raceways shall have no connections leading into or through any Class I location above the floor.
SUBSTANTIATION: This proposal adds type ITC to the list of various cable types and wiring methods suitable for use in spaces above Class I locations.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2400)

14- 399 - (511-6(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Delete terms and correct construction as shown:
(a) Fixed Wiring Above Class I Locations. All fixed wiring above Class I locations shall be in metal raceways, rigid nonmetallic conduit, electrical nonmetallic tubing, ~~flexible metal conduit, liquidtight flexible metal conduit,~~ or liquidtight flexible nonmetallic conduit or shall be Type MC, MI, or TC cable, PLTC cable in accordance with Article 725, or manufactured wiring systems~~, or PLTC cable in accordance with Article 725 or Type TC cable~~. (balance unchanged)
SUBSTANTIATION: The wiring methods proposed to be deleted are all defined as raceways in Article 100. If it was intended to list the types of metal raceways, which seems unnecessary as they are all permitted by inclusion of the term "metal raceways" in this section, the list should also include rigid metal conduit, intermediate metal conduit, flexible metallic tubing, electrical metallic tubing, underfloor raceways, cellular metal floor raceways, surface metal raceways, metal wireways, and busways.
The references to cable wiring methods are rearranged to provide a more coherent sentence.
PANEL ACTION: Reject.
PANEL STATEMENT: The current text correctly expresses the intent of Code Making Panel 14.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I agree with submitter's proposal and substantiation.

(Log #2401)

14- 400 - (511-6(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Delete text and correct construction as shown below:
(a) Fixed Wiring Above Class I Locations. All fixed wiring above Class I locations shall be in ~~metal~~ raceways, ~~rigid nonmetallic conduit, electrical nonmetallic tubing, flexible metal conduit, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit~~ or shall be Type MC, MI, or TC cable, PLTC cable in accordance with Article 725, or manufactured wiring systems~~, or PLTC cable in accordance with Article 725 or Type TC cable~~. (balance unchanged)
SUBSTANTIATION: The specific metallic wiring methods proposed to be deleted are defined as raceways in Article 100. If it was intended to list the types of metal raceways, which seems unnecessary as they are all permitted by inclusion of the term "metal raceways" in this section, the list should also include rigid metal conduit, intermediate metal conduit, flexible metallic tubing, electrical metallic tubing, underfloor raceways, cellular metal floor raceways, surface metal raceways, metal wireways, and busways.
The only types of raceways defined as such but not expressly permitted under the present wording, are surface nonmetallic raceways, and nonmetallic wireways. Cellular metal floor raceways and cellular concrete floor raceways are, and would continue to be, permitted under the same limited conditions. Because electrical nonmetallic tubing is permitted, it would seem reasonable permit surface nonmetallic raceways and wireways, which arguably provide protection at least as effective as ENT or the permitted types of cable. (Note that surface nonmetallic raceways are not permitted where subject to severe physical damage and surface nonmetallic wireways and electrical nonmetallic tubing are not permitted where subject to physical damage under their respective articles.)
The references to cable wiring methods are rearranged to provide a more coherent sentence.
PANEL ACTION: Reject.
PANEL STATEMENT: The current text correctly expresses the intent of Code Making Panel 14.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1640)

14- 401 - (511-6(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
(b) Pendants. For pendants, flexible cord suitable for the type of service and ~~approved~~ (identified) for hard usage shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:
COOK: I agree with Panel Action, however I believe this action should be Accept in Principle since words were changed.

(Log #3584)

14- 402 - (511-6(b)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(b) Pendants. For pendants, flexible cord suitable for the type of service and ~~approved~~ (identified) for hard usage shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed extra-hard and hard usage cord is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
WECHSLER: See my Explanation of Negative Vote on Proposal 14-71.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1641)

14- 403 - (511-6(c)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second sentence to read as follows:
~~Approved~~ (identified) means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2402)

14- 404 - (511-6(c)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Delete item (c) in its entirity and change existing (d) to (c).
SUBSTANTIATION: This material, covering grounded and grounding conductors, is unnecessary as it is covered by Articles 200, 210, and 250. There appears to be no more reason to include it in this article than there would be in Article 501, 514, 516, or 517, where it does not appear (it does appear in Article 513).
PANEL ACTION: Reject.
PANEL STATEMENT: The text clearly defines this requirement as it applies to this occupancy.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3585)

14- 405 - (511-6(c)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"~~Approved~~ (Identified) means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1642)

14- 406 - (511-6(d)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
Attachment Plug Receptacles. Attachment plug receptacles in a fixed position shall be located above the level of any defined Class I location or shall be ~~approved~~ (identified) for the location.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2403)

14- 407 - (511-6(d)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Delete 511-6(d) in its entirity.
~~(d) Attachment Plug Receptacles. Attachment plug receptacles in a fixed position shall be located above the level of any defined Class I location, or shall be approved for the location.~~
SUBSTANTIATION: The subsection proposed for deletion addresses wiring and equipment above Class I locations, and should therefor not be included in this section on wiring within Class I locations. Receptacles are adequately covered in Section 511-4 and Article 501. This subsection might be useful if it addressed pendant receptacles that could be lowered into the classified location, not fixed receptacle outlets.
PANEL ACTION: Reject.
PANEL STATEMENT: This section addresses wiring above Class I locations not within Class I locations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3586)

14- 408 - (511-6(d)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
(d) Attachment Plug Receptacles. Attachment plug receptacles in a fixed position shall be located above the level of any defined Class I location or shall be ~~approved~~ (identified) for the location.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1643)

14- 409 - (511-9(a)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second sentence to read as follows:
Flexible cords shall be of a type ~~approved~~ (identified) for extra-hard usage.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3587)

14- 410 - (511-9(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"Flexible cords shall be of a type ~~approved~~ (identified) for extra-hard usage."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1892)

14- 411 - (511-9(b)): Reject
SUBMITTER: Frank J. Cihak, American Public Transit Assoc./Rep. Nat'l Electric Transportation Infrastructure Working Council
RECOMMENDATION: Revise to read as follows:
(b) Attachment Plug and Electric Vehicle Connector Location. No ~~connection to an electric vehicle~~ shall be ~~located~~ made within a Class I location as defined in Section 511-3.
SUBSTANTIATION: Currently, Section 511-9(c) includes a phrase referring to location, which is addressed in Section 511-9(b). The portion of (c) that talks about plug location has been moved to (b). The modified terminology in (b) and (c) is consistent with Article 625, Electric Vehicle Charging Systems.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposal does not enhance the text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1891)

14- 412 - (511-9(c)): Accept in Part
SUBMITTER: Frank J. Cihak, American Public Transit Assoc./Rep. Nat'l Electric Transportation Infrastructure Working Council
RECOMMENDATION: Revise to read as follows:
(c) Electric Vehicle Supply Equipment Cable Management. ~~Plug Connection to Vehicles. Where plugs are provided for direct connection to vehicles, the point of connection shall not be within a Class I location as defined in Section 511-3, and, w~~ Where the cord is suspended from overhead, it shall be arranged so that the lowest point of sag is at least 6 in. (152 mm) above the floor. Where an automatic arrangement is provided to pull both the cord and plug beyond the range of physical damage, no additional connector shall be required in the cable or at the outlet.
SUBSTANTIATION: The new title addresses in more generic terms the intent of this article. The first phrase was moved to 511-9(b) for editorial clarity. The portion of the article addressing location has been combined with Section 511-9(b). The modified terminology in (b) and (c) is consistent with Article 625, Electric Vehicle Charging Systems.
PANEL ACTION: Accept in Part.
Delete the first sentence only.
PANEL STATEMENT: Panel 14 agrees that the first sentence is redundant, but believes that the existing title is correct.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1795)

14- 413 - (511-10, Exception): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Add Exception as follows:
"A single receptacle or duplex receptacle for two appliances located within dedicated space for each appliance that, in normal use, is not easily moved from one place to another, and that is cord-and plug -connected in accordance with Section 400-7(a)(6), (a)(7), or (a)(8) shall not be required to be GFCI protected."
SUBSTANTIATION: The present requirement applies to areas without regard to actual use. Some appliances that may be used in garages are not appropriate for use with GFCIs. The proposed language is borrowed from the exceptions to Sections 210-8 (a)(2) and (a)(5), and the reasoning is identical to that provided for these exceptions.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "appliance" is too broad and the panel believes the safety risk is not acceptable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2339)

14- 414 - (511-11 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new section as follows:
511-11. Welding. Welding shall not be permitted in any classified area unless one of the following are provided.
1. Continuous exhaust ventilation at the rate of 4 air changes per hour is provided and the welding equipment is interlocked in such a way as to not permit the operation of the unit should the ventilation not be operational. OR 2. An exhaust ventilation system that provides a minimum of 4 air changes per hour that is interlocked with the welder in such a way as to not allow the welder to operate unless the ventilation system has been in operation for not less than 15 minutes prior to welding and, that will not permit the welding equipment to operate if the ventilation system is not operable. OR 3. The facility has no exterior walls on at least 3 sides for natural ventilation.
SUBSTANTIATION: It is believed by many that welding is permitted in a repair garage under any circumstance. This is due to model building codes classifying the occupancy as acceptable for welding or open flame and requiring a minimum amount of ventilation. (The ventilation required by the other codes, whether they are mechanical, building or fire, is for fresh air for human occupants.) What is confusing about this is that welding or cutting produces thousands of particles of hot molten metal that may radiate for up to a 35 ft radius from the point of work (the measurement given is from NFPA 51B), and NEC 511-7 will not permit arching or sparking equipment within 12 feet of floor level. This is to say the least, perplexing. How can we as owners, designers, installers, and enforcement professionals legitimately permit a welder in this occupancy when we would not permit a light switch or receptacle in the classified area?
Further in NFPA 51B Standard for Fire Prevention in use of Cutting and Welding, section 3-1.1 will not permit cutting or welding in the presence of explosive atmospheres. NFPA 51B in chapters 2 and 3 list a variety of other sections that address this issue.
The following is stated in NFPA 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.
Section 3-3.3 of NFPA 497 reads as follows:
Open flames and hot surfaces associated with the operation of certain equipment, such as boilers and fired heaters, provide inherent thermal ignition sources. Electrical classification is not appropriate in the immediate vicinity of these facilities. However, it is prudent to avoid installing electrical equipment that could be a primary ignition source for potential leak sources in pumps, valves, and so forth, or in waste product and fuel feed lines.
The electrical code should address this issue in some way, shape or form.
If this proposal is not accepted then how can we justify the enforcement of 511-7. Intellectually it would be a tough argument not only to make let alone to enforce the requirements of 511-7 when we would readily permit a welder in the same room.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes this proposal deals with hot work and believes this is beyond the scope of the code. This issue should be dealt with in NFPA 51B, NFPA 30A, and NFPA 88B.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

ARTICLE 513 — AIRCRAFT HANGARS

(Log #1265)

14- 415 - (513): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In 513-3(b), change “18 in. (457 mm)” to “450 mm (18 in.)”.
In 513-3(c), change “5 ft (1.52 m)” to “1.5 m (5 ft)” in two places in this section.
In 513-6(a), change “10 ft (3.05 m)” to “3.0 m (10 ft)”.
In 513-7(c), revise the Warning Sign to read “WARNING - KEEP 1.5 M (5 FT) CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS.”
In 513-11(a), change “18 in. (457 mm)” to “450 mm (18 in.)” in the title and the body of this section.
In 513-12(a), change “18 in. (457 mm)” to “450 mm (18 in.)”.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Reject.
PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.
OMEARA: The proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #2903)

14- 416 - (513): Accept in Principle
SUBMITTER: Technical Committee on Airport Facilities
RECOMMENDATION: Revise as follows:
513 Aircraft Hangars.
513-1. Scope. This article shall apply to buildings or structures inside any part of which aircraft containing Class I (flammable) liquids or Class II (combustible) liquids whose temperatures are above their flash points are housed or stored and in which aircraft might undergo service, repairs, or alterations. It shall not apply to locations used exclusively for aircraft that have never contained fuel or unfueled aircraft.
FPN No. 1: For definitions of aircraft hangar and unfueled aircraft, see Standard on Aircraft Hangars, NFPA 409-1995.
FPN No. 2: For further information on fuel classification, see Flammable and Combustible Liquids Code, NFPA 30-1996, and Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325-1994.
513-2. Definitions. For the purpose of this article, the following definitions shall apply. Mobile Equipment. Equipment with electric components suitable to be moved only with mechanical aids or which are provided with wheels for movements by Person(s) or powered devices.
Portable Equipment. Equipment with electric components suitable to be moved by a single person without mechanical aids.
513-3. Classification of Locations.
(a) Below Floor Level. Any pit or depression below the level of the hangar floor shall be classified as a Class I, Division 1 location that shall extend up to said floor level.
(b) Areas Not Cut Off or Ventilated. The entire area of the hangar, including any adjacent and communicating areas not suitably cut off from the hangar, shall be classified as a Class I, Division 2 location up to a level 18 in. (457 mm) above the floor.
(c) Vicinity of Aircraft. The area within 5 ft (1.52 m) horizontally from aircraft power plants or aircraft fuel tanks shall be classified as a Class I, Division 2 location that shall extend upward from the floor to a level 5 ft (1.52 m) above the upper surface of wings and of engine enclosures.
(d) Areas Suitably Cut Off and Ventilated. Adjacent areas in which flammable liquids or vapors are not likely to be released, such as stock rooms, electrical control rooms, and other similar locations, shall not be classified where adequately ventilated and where effectively cut off from the hangar itself by walls or partitions.
513-4. Wiring and Equipment in Class I Locations.
(a) All wiring and equipment that is or may be installed or operated within any of the Class I locations defined in Section 513-3 shall comply with the applicable provisions of Article 501.
Attachment plugs and receptacles in Class I locations shall be approved for Class I locations or shall be designed so that they cannot be energized while the connections are being made or broken.

(b) Electric wiring, outlets, and equipment (including lamps) on or attached to stanchions, rostrums, or docks that are located or likely to be located in a Class I location, as defined in Section 513-3(c), shall comply with the requirements for Class I, Division 2 locations.

513-5. Wiring and Equipment Embedded, Underslab, or Underground. All wiring installed in or under the hangar floor shall comply with the requirements for Class I, Division 1 locations. Where such wiring is located in vaults, pits, or ducts, adequate drainage shall be provided.

513-6. Sealing. Approved seals shall be provided in accordance with Section 501-5. Sealing requirements specified in Sections 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Raceways embedded in a concrete floor or buried beneath a floor shall be considered to be within the Class I location above the floor.

513-7. Wiring and Equipment Not Within Class I Locations.

(a) Fixed Wiring. All fixed wiring in a hangar, but not within a Class I location as defined in Section 513-3, shall be installed in metal raceways or shall be Type MI, TC, or MC cable.

Exception: Wiring in unclassified locations, as defined in Section 513-3(d), shall be of a type recognized in Chapter 3.

(b) Pendants. For pendants, flexible cord suitable for the type of service and approved for hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.

(c) Grounded and Grounding Conductors. Where a circuit supplies portables or pendants and includes a grounded conductor as provided in Article 200, receptacles, attachment plugs, connectors, and similar devices shall be of the grounding type, and the grounded conductor of the flexible cord shall be connected to the screw shell of any lampholder or to the grounded terminal of any utilization equipment supplied. Approved means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment.

(d) Arcing Equipment. In locations other than those described in Section 513-3, equipment that is less than 10 ft (3.05 m) above wings and engine enclosures of aircraft and that may produce arcs, sparks, or particles of hot metal, such as lamps and lampholders for fixed lighting, cutouts, switches, receptacles, charging panels, generators, motors, or other equipment having make-and-break or sliding contacts, shall be of the totally enclosed type or constructed so as to prevent the escape of sparks or hot metal particles.

Exception: Equipment in areas described in Section 513-3(d) shall be permitted to be of the general-purpose type.

(e) Lampholders, lampholders of metal-shell, fiber-lined types shall not be used for fixed incandescent lighting.

(f) Where stanchions, rostrums, or docks are not located or likely to be located in a Class I location, as defined in Section 513-3(c), wiring and equipment shall comply with Sections 513-4 and 513-7, except that such wiring and equipment not more than 18 in. (457 mm) above the floor in any position shall comply with 513-4(b). Receptacles and attachment plugs shall be of a locking type that will not readily disconnect.

(g) Mobile Type. Mobile stanchions with electric equipment complying with (f) above shall carry at least one permanently affixed warning sign to read:

WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS.

513-9. Special Equipment.

(a) Aircraft Electrical Systems.

(1) Aircraft electrical systems shall be deenergized when the aircraft is stored in a hangar and, whenever possible, while the aircraft is undergoing maintenance.

(2) Aircraft batteries shall not be charged where installed in an aircraft located inside or partially inside a hangar.

(b) Aircraft Battery Charging and Equipment. Battery chargers and their control equipment shall not be located or operated within any of the Class I locations defined in Section 513-3 and shall preferably be located in a separate building or in an area such as defined in Section 513-3(d).. Mobile chargers shall carry at least one permanently affixed warning sign to read "WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS." Tables, racks, trays, and wiring shall not be located within a Class I location and, in addition, shall comply with Article 480.

(c) External Power Sources for Energizing Aircraft.

(1) Not Less than 18 in. (457 mm) Above Floor. Aircraft energizers shall be designed and mounted so that all electrical equipment and fixed wiring will be at least 18 in. (457 mm) above floor level and shall not be operated in a Class I location as defined in Section 513-3(c).

(2) Marking for Mobile Units. Mobile energizers shall carry at least one permanently affixed warning sign to read:

WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS.

(3) Cords. Flexible cords for aircraft energizers and ground support equipment shall be approved for the type of service and extra-hard usage and shall include an equipment grounding conductor.

(d) Mobile Servicing Equipment With Electric Components.

(1) General. Mobile servicing equipment (such as vacuum cleaners, air compressors, air movers, etc.) having electric wiring and equipment not suitable for Class I, Division 2 locations shall be designed and mounted so that all such fixed wiring and equipment will be at least 18 in. (457 mm) above the floor. Such mobile equipment shall not be operated within the Class I location defined in Section 513-3(c) and shall carry at least one permanently affixed warning sign to read:

WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS.

(2) Cords and Connectors. Flexible cords for mobile equipment shall be suitable for the type of service and approved for extra-hard usage and shall include an equipment grounding conductor. Attachment plugs and rec receptacles shall be approved for the location in which they are installed and shall provide for connection of the equipment grounding conductor.

(3) Restricted Use. Equipment that is not identified as suitable for Class I, Division 2 locations shall not be operated in locations where maintenance operations likely to release flammable liquids or vapors are in progress.

(e) Portable Lighting Equipment. Portable lighting equipment that are used within a hangar shall be approved for the location in which they are used. For portable lamps, flexible cord suitable for the type of service and approved for extra-hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.

(f) Portable Equipment. Portable utilization equipment that is or may be used within a hangar shall be of a type suitable for use in Class I, Division 2 locations. For portable utilization equipment flexible cord suitable for the type of service and approved for extra-hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.

513-9 through 513-15 Reserved.

513-16. Grounding. All metal raceways, the metal armor or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding in Class I locations shall comply with Section 501-16.

SUBSTANTIATION: Editorial rewrite of section. This rewrite was developed by NEC CMP 14 and balloted through the Airport Facilities Committee.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: This is accomplished by the action on Proposal 14-417.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #3971)

14- 417 - (513): Accept in Principle

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. It is the understanding of the Technical Correlating Committee that this proposal is modified by Proposals 14-420, 14-421, 14-424, 14-426, 14-429, 14-430, 14-431, 14-432, 14-433, 14-437, 14-438, 14-439, 14-440, 14-441, 14-442, 14-443, 14-444, 14-445, 14-446, 14-447, 14-448, 14-449, 14-450, and 14-451. The Technical Correlating Committee directs that the references to "Reserved Sections" be deleted, since the NEC Style Manual does not have a provision for "Reserved Sections."

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Revise the entire Article 513 as follows:

Article 513 — Aircraft Hangars

513.1. Scope. This article shall apply to buildings or structures inside any part of which aircraft containing Class I (flammable) liquids or Class II (Combustible) liquids whose temperatures are above their flash points are housed or stored an in which aircraft might undergo service, repairs, or alterations. It shall not apply to locations used exclusively for aircraft that have never contained fuel or unfueled aircraft.

FPN No. 1: For definitions of aircraft hangar and unfueled aircraft, see NFPA 409, Standard on Aircraft Hangars, 1995 edition.
FPN No. 2: For further information on fuel classification see NFPA 30, Flammable and Combustible Liquids Code, 1996 edition, and NFPA 325, Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, 1994 edition.
513.2. Definitions. For the purpose of this article, the following definitions shall apply.
Mobile Equipment. Equipment with electric components suitable to be moved only with mechanical aids or which are provided with wheels for movements by person(s) or powered devices.
Portable Equipment. Equipment with electric components suitable to be moved by a single person without mechanical aids.
513.3. Classification of Locations.
(a) Below Floor Level. Any pit or depression below the level of the hangar floor shall be classified as a Class I, Division 1 location that shall extend up to said floor level.
(b) Areas Not Cut Off or Ventilated. The entire area of the hangar, including any adjacent and communicating areas not suitably cut off from the hangar, shall be classified as a Class I, Division 2 location up to a level 18 in. (457 mm) above the floor.
(c) Vicinity of Aircraft. The area within 5 ft (1.52 m) horizontally from aircraft power plants or aircraft fuel tanks shall be classified as a Class I, Division 2 location that shall extend upward from the floor to a level 5 ft (1.52 m) above the upper surface of wings and of engine enclosures.
(d) Areas Suitably Cut Off and Ventilated. Adjacent areas in which flammable liquids or vapors are not likely to be released, such as stock rooms, electrical control rooms, and other similar locations, shall not be classified where adequately ventilated and where effectively cut off from the hangar itself by walls or partitions.
513.4. Wiring and Equipment in Class I Locations.
(a) All wiring and equipment that is or may be installed or operated within any of the Class I locations defined in Section 513.3 shall comply with the applicable provisions of Article 501.
Attachment plugs and receptacles in Class I locations shall approved for Class I locations or shall be designed so that they cannot be energized while the connections are being made or broken.
(b) Electric wiring, outlets, and equipment (including lamps) on or attached to stanchions, rostrums, or docks that are located or likely to be located in a Class I location, as defined in Section 513.3(c), shall comply with the requirements for Class I, Division 2 locations.
513.6. Sealing. Approved seals shall be provided in accordance with Section 501-5. Sealing requirements specified in Sections 501.5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Raceways embedded in a concrete floor or buried beneath a floor shall be considered to be within the Class I location above the floor.
513.7. Wiring and Equipment Not Installed in Class I Locations.
(a) Fixed Wiring. All fixed wiring in a hangar, but not installed in a Class I location as classified in Section 513.3, shall be installed in metal raceways or shall be Type MI, TC, or MC cable.
Exception: Wiring in unclassified locations, as classified in Section 513.3(d), shall be of a type recognized in Chapter 3.
(b) Pendants. For pendants, flexible cord suitable for the type of service and approved for hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.
(c) Arcing Equipment. In locations other than those described in Section 513.3, equipment that is less than 10 ft (3.05 m) above wings and engine enclosures of aircraft and that may produce arcs, sparks, or particles of hot metal, such as lamps and lampholders for fixed lighting, cutouts, switches, receptacles, charging panels, generators, motors, or other equipment having make-and-break or sliding contacts, shall be of the totally enclosed type or constructed so as to prevent the escape of sparks or hot metal particles.
Exception: Equipment in areas described in Section 513.3(d) shall be permitted to be of the general-purpose type.
(d) Lampholders. Lampholders of metal-shell, fiber-lined types shall not be used for fixed incandescent lighting.
(e) Stanchions, Rostrums, or Docks. Where stanchions, rostrums, or docks are not located or likely to be located in a Class I location, as defined in Section 513.3(c), wiring and equipment shall com ply with Sections 513.4 and 513.7, except that such wiring and equipment not more than 18 in. (457 mm) above the floor in any position shall comply with 513.4(b). Receptacles and attachment plugs shall be of a locking type that will not readily disconnect.
(f) Mobile Stanchions. Mobile stanchions with electric equipment complying with (e) above shall carry at least one permanently affixed warning sign to read WARNING — KEEP 5 FT CLEAR OF ARICRAFT ENGINES AND FUEL TANK AREAS.
513.8. Wiring and Equipment Embedded, Underslab, or Underground. All wiring installed in or under the hangar floor shall comply with the requirements for Class I, Division 1 locations. Where such wiring is located in vaults, pits, or ducts, adequate drainage shall be provided.
513.9. Special Equipment.
(a) Aircraft Electrical Systems.
(1) Deenergizing Aircraft Electrical Systems. Aircraft electrical systems shall be deenergized when the aircraft is stored in a hangar and, whenever possible, while the aircraft is undergoing maintenance.
(2) Aircraft Batteries. Aircraft batteries shall not be charged where installed in an aircraft located inside or partially inside a hangar.
(b) Aircraft Battery Charging and Equipment. Battery chargers and their control equipment shall not be located or operated within any of the Class I locations defined in Section 513.3 and shall preferably be located in a separate building or in an area such as defined in Section 513.3(d). Mobile chargers shall carry at least one permanently affixed warning sign to read "WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS." Tables, racks, trays, and wiring shall not be located within a Class I location and, in addition, shall comply with Article 480.
(c) External Power Sources for Energizing Aircraft.
(1) Not Less than 18 in. (457 mm) Above Floor. Aircraft energizers shall be designed and mounted so that all electric equipment and fixed wiring will be at least 18 in. (457 mm) above floor level and shall not be operated in a Class I location as defined in Section 513.3(c).
(2). Marking for Mobile Units. Mobile energizers shall carry at least one permanently affixed warning sign to read: "WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS".
(3) Cords. Flexible cords for aircraft energizers and ground support equipment shall be approved for the type of service and extra-hard usage and shall include an equipment grounding conductor.
(d) Mobile Servicing Equipment with Electric Components.
(1) General. Mobile servicing equipment (such as vacuum cleaners, air compressors, air movers, etc.) having electric wiring and equipment not suitable for Class I, Division 2 locations shall be designed and mounted so that all such fixed wiring and equipment will be at least 18 in. (457 mm) above the floor. Such mobile equipment shall not be operated within the Class I location defined in Section 513.3(c) and shall carry at least one permanently affixed warning sign to read: "WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS".
(2) Cords and Connectors. Flexible cords for mobile equipment shall be suitable for the type of service and approved for extra-hard usage and shall include an equipment grounding conductor. Attachment plugs and receptacles shall be approved for the location in which they are installed and shall provide for connection of the equipment grounding conductor.
(3) Restricted Use. Equipment that is not identified as suitable for Class I, Division 2 locations shall not be operated in locations where maintenance operations likely to release flammable liquids or vapors are in progress.
(e) Portable Equipment.
(1) Portable Lighting Equipment. Portable lighting equipment that are used within a hangar shall be approved for the location in which they are used. For portable lamps, flexible cord suitable for the type of service and approved for extra-hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.
(2) Portable Utilization Equipment. Portable utilization equipment that is or may be used within a hangar shall be of a type suitable for use in Class I, Division 2 locations. For portable utilization equipment flexible cord suitable for the type of service and approved for extra-hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.
513-10 through 513-15 Reserved.
513.16. Grounded and Grounding Requirements.
(a) General Grounding Requirements. All metal raceways, the metal armor or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding in Class I locations shall comply with Section 501.16.
(b) Supplying Circuits with Grounded and Grounding Conductors in Class I Locations.
(1) Circuits Supplying Portable Equipment or Pendants. Where a circuit supplies portables or pendants and includes a grounded conductor as provided in Article 200, receptacles, attachment

plugs, connectors, and similar devices shall be of the grounding type, and the grounded conductor of the flexible cord shall be connected to the screw shell of any lampholder or to the grounded terminal of any utilization equipment supplied.

(2) Approved Means. Approved means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment.

SUBSTANTIATION: 1. Changed the Section and subsection numbering and lettering to new format to match the NEC Style Manual.

2. Moved old Section 513-5 to new Section 513.8 for "Wiring and Equipment Embedded, Underslab, or Underground" to standardize the section numbers and titles for all of the specific hazardous location.

3. In Section 513.7, removed the word "within" in both the title and the text and replaced it with the words "installed in" since the application deals with wiring and equipment installed in the hazardous location. Also changed the word "defined" "as classified" since Section 513.3 provides classification for these locations and not definitions.

4. Moved old Section 513-7(c) dealing with grounded and grounding conductors to Section 513.16(b) to be consistent with the other Haz Loc articles and since that information should be located within the Section dealing with grounding and bonding in a hazardous location. The other subsections have been re-lettered to indicate the deletion of (c).

5. New titles for subsections have been created to comply with the NEC Style Manual.

PANEL ACTION: Accept in Principle.

Accept the recommended text, but renumber as follows 513-6 to 513-9 and 513-9 to 513-10.

PANEL STATEMENT: The minor changes implement a standardized numbering format for Articles 511 through 516.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3974)

14- 418 - (513): Accept in Principle

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Revise the entire Article 513 as follows:

Article 513 — Aircraft Hangars

513.1. Scope. This article shall apply to buildings or structures inside any part of which aircraft containing Class I (flammable) liquids or Class II (Combustible) liquids whose temperatures are above their flash points are housed or stored an in which aircraft might undergo service, repairs, or alterations. It shall not apply to locations used exclusively for aircraft that have never contained fuel or unfueled aircraft.

FPN No. 1: For definitions of aircraft hangar and unfueled aircraft, see NFPA 409, Standard on Aircraft Hangars, 1995 edition.

FPN No. 2: For further information on fuel classification see NFPA 30, Flammable and Combustible Liquids Code, 1996 edition, and NFPA 325, Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, 1994 edition.

513.2. Definitions. For the purpose of this article, the following definitions shall apply.

Mobile Equipment. Equipment with electric components suitable to be moved only with mechanical aids or which are provided with wheels for movements by person(s) or powered devices.

Portable Equipment. Equipment with electric components suitable to be moved by a single person without mechanical aids.

513.3. Classification of Locations.

(a) Below Floor Level. Any pit or depression below the level of the hangar floor shall be classified as a Class I, Division 1 location that shall extend up to said floor level.

(b) Areas Not Cut Off or Ventilated. The entire area of the hangar, including any adjacent and communicating areas not suitably cut off from the hangar, shall be classified as a Class I, Division 2 location up to a level 18 in. (457 mm) above the floor.

(c) Vicinity of Aircraft. The area within 5 ft (1.52 m) horizontally from aircraft power plants or aircraft fuel tanks shall be classified as a Class I, Division 2 location that shall extend upward from the floor to a level 5 ft (1.52 m) above the upper surface of wings and of engine enclosures.

(d) Areas Suitably Cut Off and Ventilated. Adjacent areas in which flammable liquids or vapors are not likely to be released, such as stock rooms, electrical control rooms, and other similar locations, shall not be classified where adequately ventilated and where effectively cut off from the hangar itself by walls or partitions.

513.4. Wiring and Equipment in Class I Locations.

(a) All wiring and equipment that is or may be installed or operated within any of the Class I locations defined in Section 513.3 shall comply with the applicable provisions of Article 501.

All wiring installed in or under the hangar floor shall comply with the requirements for Class I, Division 1 locations. Where such wiring is located in vaults, pits, or ducts, adequate drainage shall be provided.

Attachment plugs and receptacles in Class I locations shall be approved for Class I locations or shall be designed so that they cannot be energized while the connections are being made or broken.

(b) Electric wiring, outlets, and equipment (including lamps) on or attached to stanchions, rostrums, or docks that are located or likely to be located in a Class I location, as defined in Section 513.3(c), shall comply with the requirements for Class I, Division 2 locations.

513.5 Wiring and Equipment Embedded, Underslab, or Underground. All wiring installed in or under the hangar floor shall comply with the requirements for Class I, Division 1 locations. Where such wiring is located in vaults, pits, or ducts, adequate drainage shall be provided.

513.6. Sealing. Approved seals shall be provided in accordance with Section 501.5. Sealing requirements specified in Sections 501.5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Raceways embedded in a concrete floor or buried beneath a floor shall be considered to be within the Class I location above the floor.

513.7. Wiring and Equipment Not Within Class I Locations.

(a) Fixed Wiring. All fixed wiring in a hangar, but not within a Class I location as defined in Section 513.3, shall be installed in metal raceways or shall be Type MI, TC, or MC cable.

Exception: Wiring in unclassified locations, as defined in Section 513.3(d), shall be of a type recognized in Chapter 3.

(b) Pendants. For pendants, flexible cord suitable for the type of service and approved for hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.

(c) Portable Equipment. For portable utilization equipment and lamps, flexible cord suitable for the type of service and approved for extra-hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.

(~~c~~d) Grounded and Grounding Conductors. Where a circuit supplies portables or pendants and includes a grounded conductor as provided in Article 200, receptacles, attachment plugs, connectors, and similar devices shall be of the grounding type, and the grounded conductor of the flexible cord shall be connected to the screw shell of any lampholder or to the grounded terminal of any utilization equipment supplied. Approved means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment.

513.6. Equipment Not Within Class I Locations.

(~~d~~a) Arcing Equipment. In locations other than those described in Section 513.3, equipment that is less than 10 ft (3.05 m) above wings and engine enclosures of aircraft and that may produce arcs, sparks, or particles of hot metal, such as lamps and lampholders for fixed lighting, cutouts, switches, receptacles, charging panels, generators, motors, or other equipment having make-and-break or sliding contacts, shall be of the totally enclosed type or constructed so as to prevent the escape of sparks or hot metal particles.

Exception: Equipment in areas described in Section 513.3(d) shall be permitted to be of the general-purpose type.

(~~a~~b) Lampholders. Lampholders of metal-shell, fiber-lined types shall not be used for fixed incandescent lighting.

(c) Portable Lighting Equipment. Portable lighting equipmetn that are used iwthin a hangar shall be approved for the location in which they are used.

(d) Portable Equipment. Portable utilization equipmetn that is or may be used within a hanger shall be of a type suitable for use in Class I, Division 2 locations.

513.7 Stanchions, Rostrums, and Docks.

(a) In Class I Location. Electric wiring, outlets, and equipment (includign lamps) on or attached totanchions, rostrums, or docks that are located or likely to be located in a Class I location, as defined in Section 513.3(c), shall comply with the requirements for Class I, Division 2 locations.

(~~f~~b) Not in Class I Location. Where stanchions, rostrums, or docks are not located or likely to be located in a Class I location, as defined in Section 513-3(c), wiring and equipment shall comply with Sections 513.5 and 513.6, except that such wiring and equipment not more than 18 in. (457 mm) above the floor in any position shall comply with 513.7(a). Receptacles and attachment plugs shall be of a locking type that will not readily disconnect.

(~~g~~c) Mobile Type. Mobile stanchions with electric equipment complying with (b) above shall carry at least one permanently affixed warning sign to read: WARNING — KEEP 5 FT CLEAR OF ARICRAFT ENGINES AND FUEL TANK AREAS.

513.8. Sealing. Approved seals shall be provided in accordance with Section 501.5. Sealing requirements specified in Sections 501.5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Raceways embedded in a concrete floor or buried beneath a floor shall be considered to be within the Class I location above the floor.

513.9. Special Equipment.

(a) Aircraft Electrical Systems.

(1) Aircraft electrical systems shall be deenergized when the aircraft is stored in a hangar and, whenever possible, while the aircraft is undergoing maintenance.

513.10. Aircraft Batteries — Charging and Equipment(2). Aircraft batteries shall not be charged where installed in an aircraft located inside or partially inside a hangar.

(b) Aircraft Battery Charging and Equipment. Battery chargers and their control equipment shall not be located or operated within any of the Class I locations defined in Section 513.3 and shall preferably be located in a separate building or in an area such as defined in Section 513.3(d). Mobile chargers shall carry at least one permanently affixed warning sign to read "WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS." Tables, racks, trays, and wiring shall not be located within a Class I location and, in addition, shall comply with Article 480.

513.11.(c) External Power Sources for Energizing Aircraft.

(1~~a~~) Not Less than 18 in. (457 mm) Above Floor. Aircraft energizers shall be designed and mounted so that all electric equipment and fixed wiring will be at least 18 in. (457 mm) above floor level and shall not operated in a Class I location as defined in Section 513.3(c).

(2~~b~~) Marking for Mobile Units. Mobile energizers shall carry at least one permanently affixed warning sign to read: "WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS."

(3~~c~~) Cords. Flexible cords for aircraft energizers and ground support equipment shall be approved for the type of service and extra-hard usage and shall include an equipment grounding conductor.

513.12.~~(d)~~ Mobile Servicing Equipment with Electric Components.

(1~~a~~) General. Mobile servicing equipment (such as vacuum cleaners, air compressors, air movers, etc.) having electric wiring and equipment not suitable for Class I, Division 2 locations shall be designed and mounted so that all such fixed wiring and equipment will be at least 18 in. (457 mm) above the floor. Such mobile equipment shall not be operated within the Class I location defined in Section 513.3(c) and shall carry at least one permanently affixed warning sign to read: "WARNING — KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS."

(2~~b~~) Cords and Connectors. Flexible cords for mobile equipment shall be suitable for the type of service and approved for extra-hard usage and shall include an equipment grounding conductor. Attachment plugs and receptacles shall be approved for the location in which they are installed and shall provide for connection of the equipment grounding conductor.

(3~~c~~) Restricted Use. Equipment that is not identified as suitable for Class I, Division 2 locations shall not be operated in locations where maintenance operations likely to release flammable liquids or vapors are in progress.

(e) Portable Lighting Equipment. Portable lighting equipment that are used within a hangar shall be approved for the location in which they are used. For portable lamps, flexible cord suitable for the type of service and approved for extra-hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.

(f) Portable Equipment. Portable utilization equipment that is or may be used within a hangar shall be of a type suitable for use in Class I, Division 2 locations. For portable utilization equipment flexible cord suitable for the type of service and approved for extra-hard usage shall be used. Each such cord shall include a separate equipment grounding conductor.

513.16. Grounding. All metal raceways, the metal armor or metallic sheath on cables and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding in Class I locations shall comply with Section 501-16.

SUBSTANTIATION: This proposal is the work of a Task Group including Donny Cook, Fred Walker, Gordon Johnson, Don Zipsi, Mark Goodman, Kevin Earley, Mark Ode, Bob Benedetti, and Richard Hild. The Task Group was not balloted. The purpose of this proposal is to provide parallel numbering from Article 511 through 516 to comply with Section 2.4.1 of the NEC Style Manual.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: This is accomplished by the action on Proposal 14-417.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3906)

14- 419 - (513-1): Reject

Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA 409, Technical Committee on Airport Facilities, for comment.
SUBMITTER: Ronald E. Gnotke, Rep. Minnesota Board of Electricity
RECOMMENDATION: Recommend a text change at the end of this section to read:

513-1. Scope. It shall not apply to locations used exclusively for aircraft that have never contained fuel, unfueled aircraft, or attached or detached structures on residential property at or near airstrips used to store two or less, single engine aircraft.

SUBSTANTIATION: There are numerous airstrips around where there is a housing development with residential lots on each side of an air strip where the residents own and store these small aircraft in attached or detached "garages" or "pole type" structures on their private property. The installations are similar to a three or four car attached garage, but a garage of this type isn't required to be wired in compliance with Article 511. This proposal is being submitted to obtain a clarification on this type of installation to assist installers and electrical inspectors in e proper compliance with accepted standards for protection of the property and safety of the residence in the dwelling. Some consideration might be given to the number, aircraft allowed in a nonclassified structure attached to a dwelling.
PANEL ACTION: Reject.
PANEL STATEMENT: Classification of the hangar is the responsibility of NFPA 409. The Correlating Committee is responsible for establishing scope statements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1489)

14- 420 - (513-2-Spray Area, Spray Booth, Spray Room (New)): Accept in Principle
SUBMITTER: Fred K. Walker, US Air Force
RECOMMENDATION: Add a new definitions to Article 513:

For the purpose of this article, the following definitions shall apply.

Spray Area. Normally locations outside of buildings or localized operations within a larger room or space. Such are normally provided with some local vapor extraction/ventilation system. In automated operations the area limits shall be the maximum area in the direct path of spray operations. In manual operations the area limits shall be the maximum area of spray when aimed at 180 degrees to the application surface.

Spray Booth. An enclosure or insert within a larger room used for spray/coating/dipping applications. A spray booth may be fully enclosed or have open front or face and may include separate conveyor entrance and exit openings. The spray booth is provided with a dedicated ventilation exhaust but may draw supply air from the larger room or have a dedicated air supply.

Spray Room. A purpose built fully enclosed room constructed for spray/coating/dipping applications provided with dedicated

ventilation supply and exhaust. Other operations may be conducted in the room however a primary purpose of the room is to provide a controlled environment for the application of spray/coating/dipping operations. Normally the room is configured to house the item to be painted providing access around the item/process. Depending on the size of the item being painted such rooms may actually be the entire building or the major portion thereof.

SUBSTANTIATION: The article is not clear as to what a spray area, spray booth, or spray room is. This results in wide variations in what is often defined as the classified area or the degree to which areas are classified. In one case an enclosed room with dedicated supply and exhaust ventilation, the spray area has been defined as the surface of the item being painted/coated resulting no classifed equipment being required - in an exact copy of the room painting the same item at another location the entire room was required to be Class I Division 1.

The proposal more clearly defines what each of these areas are and in the case of a spray area provided some guidance in measuring/determining the spray area.

PANEL ACTION: Accept in Principle.

Add to 516 the definitions of "spray area", "spray booth", "spray room" verbatim from the 1995 edition of NFPA 33 and mark as extracted text.

PANEL STATEMENT: The panel believes the definitions from NFPA 33 need to be added to 516-2.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #3026)

14- 421 - (513-3): Accept

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Revise text as follows:

513-3. Classification of Locations.

(a) Below Floor Level. Any pit or depression below the level of the hangar floor shall be classified as a Class I, Division 1 or Zone 1 location that shall extend up to said floor level.

(b) Areas Not Cut Off or Ventilated. The entire area of the hangar, including any adjacent and communicating areas not suitably cut off from the hangar, shall be classified as a Class I, Division 2 or Zone 2 location up to a level 18 in. (457 mm) above the floor.

(c) Vicinity of Aircraft. The area within 5 ft (1.52 m) horizontally from aircraft power plants or aircraft fuel tanks shall be classified as a Class I, Division 2 or Zone 2 location that shall extend upward from the floor to a level 5 ft (1.52 m) above the upper surface of wings and of engine enclosures.

SUBSTANTIATION: This proposal is to recognize the alternate method for classification that was introduced into the 1996 National Electrical Code. (See also proposal for Article 514-8.)

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

COOK: Since Article 505 was included in the 1996 NEC, I am only aware of one major project that utilized the Zone concept. This was a project that was provided significant financial and engineering backing and it proved to be a challenge to install. To permit this to happen in the Specific Occupancies, Articles 5-11-515, which will not have the financial and engineering support will be a mistake in my opinion. If Proposal 14-348 is accepted and the supervision of qualified registered professional engineering is removed, we would be allowing a segment of the electrical industry that has little or no experience with the zone concept to use a method that is still quite complex. These facilities are places where our families have access on a daily basis.

I also do not believe the concept has been adopted in the current editions of NFPA Standards for these occupancies.

(Log #2404)

14- 422 - (513-3(d)): Reject

SUBMITTER: William E. Bickner, Stillwater, MN

RECOMMENDATION: Add the following sentence after the existing text:

"Separating walls or partitions shall be permitted to have openings that are not within or partially within a Class I location, provided that the air pressure within such adjacent locations is maintained by mechanical ventilation and exceeds that within the hangar."

SUBSTANTIATION: The present provisions are silent on the matter of openings within separating walls or partitions, which strongly implies that no openings are permitted. This imposes seemingly unnecessary restrictions on areas such as classrooms or living quarters. The proposed change would permit openings under conditions that would assure no meaningful communication of flammable gases into the adjacent areas, keeping in mind that Division 2 locations are being addressed.

PANEL ACTION: Reject.

PANEL STATEMENT: Requirements for purging and pressurization are contained in NFPA 496 and these concepts can be applied to reduce the area classification of the space in question.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #2405)

14- 423 - (513-3(d)): Reject

SUBMITTER: William E. Bickner, Stillwater, MN

RECOMMENDATION: Add the following sentence following the existing text:

"Separating walls or partitions shall be permitted to have self-closing doors for personnel provided that the air pressure in such adjacent locations is maintained by mechanical ventilation and exceeds than that within the hangar, and the doors are prominently marked "Keep Closed"."

SUBSTANTIATION: The present provisions are silent on the matter of openings within separating walls or partitions, which strongly implies that no openings are permitted. This imposes seemingly unnecessary restrictions on areas such as classrooms or living quarters. The proposed change would permit openings under conditions that would assure no meaningful communication of flammable gases into the adjacent areas, keeping in mind that Division 2 locations are being addressed.

PANEL ACTION: Reject.

PANEL STATEMENT: Requirements for purging and pressurization are contained in NFPA 496 and these concepts can be applied to reduce the area classification of the space in question.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1644)

14- 424 - (513-4): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise second paragraph to read as follows:

Attachment plugs and receptacles in Class I locations shall be ~~approved~~ (identified) for Class I locations or shall be designed so that they cannot be energized while the connections are being made or broken.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2406)

14- 425 - (513-4): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise the second paragraph as shown below:
"Attachment plugs and receptacles in Class I locations shall be approved for Class I locations ~~or shall be designed so that they cannot be energized while the connections are being made or broken~~."
SUBSTANTIATION: The first paragraph of this section requires wiring and equipment in Class I locations to comply with the applicable provisions of Article 501. Section 501-12 requires receptacles and attachment plugs in Class I, Div. 1 or 2, to be approved for the location. Section 513-7(a) requires outlets in Class I locations in the vicinity of the aircraft to comply with the requirements for Class I, Division 2 locations. The material proposed for deletion conflicts with those requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed deleted text is an intentional modification of 501-12 to accomodate specialized aircraft power equipment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3591)

14- 426 - (513-4): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second paragraph to read as follows:
"Attachment plugs and receptacles in Class I locations shall be ~~approved~~ (identified) for Class I locations or shall be designed so that they cannot be energized while the connections are being made or broken."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3978)

14- 427 - (513-4): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
513-4. Wiring and Equipment in Class I Locations. All wiring and equipment that is or may be installed or operated within any of the Class I locations defined in Section 513-3 shall comply with the applicable provisions of Article 501. All wiring installed in or under the hangar floor shall comply with the requirements for Class I, Division 1 locations and shall be sealed with a listed seal when it emerges from below grade. When such wiring is located in vaults, pits, or ducts, adequate drainage shall be provided.
SUBSTANTIATION: To provide common wording for conduit systems installed below grade from Articles 511 through 516.
PANEL ACTION: Reject.
PANEL STATEMENT: The layout of raceway will dictate need and location of seals as covered in Article 501.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See statement on Proposal 14-394.

(Log #2407)

14- 428 - (513-4, Exception (New)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Add the following Exception following the existing text:
Exception: Wiring in a raceway within or directly under concrete floors of locations defined by Section 513-3(d) shall not be considered to be within a Class I location where the raceway does not enter or pass through a Class I location.
SUBSTANTIATION: The present wording requires Class I, Division 1 wiring methods for such locations, which seems unnecessary where no part of the raceway system is within an area that could reasonably be considered a Class I, Division 1 location.
PANEL ACTION: Reject.
PANEL STATEMENT: Migration of fluid below the floor would not be prevented by aboveground barriers.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1645)

14- 429 - (513-5(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
For pendants, flexible cord suitable for the type of service and ~~approved~~ (identified) for hard usage shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2408)

14- 430 - (513-5(b)): Accept
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
(b) Pendants. For pendants, flexible cord suitable for the type of service and approved for hard usage or extra-hard usage shall be used.
SUBSTANTIATION: To correct an apparent omission.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3592)

14- 431 - (513-5(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"For pendants, flexible cord suitable for the type of service and ~~approved~~ (identified) for hard usage shall be used."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1646)

14- 432 - (513-5(c)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
For portable utilization equipment and lamps, flexible cord suitable for the type of service and ~~approved~~ (identified) for extra-hard usage shall be used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3593)

14- 433 - (513-5(c)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"For portable utilization equipment and lamps, flexible cord suitable for the type of service and ~~approved~~ (identified) for extra-hard usage shall be used."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1647)

14- 434 - (513-5(d)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second sentence to read as follows:
~~Approved~~ (identified) means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2409)

14- 435 - (513-5(d)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Delete item (d) in its entirety.
SUBSTANTIATION: This material, covering grounded and grounding conductors, is unnecessary as it is covered by Articles 200, 210, and 250. There appears to be no more reason to include it in this article than there would be in Article 501, 514, 516, or 517, where it does not appear (it does appear in Article 511).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement to Proposal 14-404.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3594)

14- 436 - (513-5(d)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"~~Approved~~ (Identified) means shall be provided for maintaining continuity of the grounding conductor between the fixed wiring system and the noncurrent-carrying metal portions of pendant fixtures, portable lamps, and portable utilization equipment."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: "Approved" is the correct word to describe the "means", "manner", or "methods" employed to accomplish something.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2410)

14- 437 - (513-6(a)): Accept in Part
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise the first part of the paragraph as follows:
(a) Arcing Equipment. In locations ~~other than~~ above those described in Section 513-3 (b) and (c), equipment that is less than 10 ft (balance unchanged).
SUBSTANTIATION: 513-3(a) and (d) are not related to this requirement. The proposed changes make the exception unnecessary.

PANEL ACTION: Accept in Part.
Accept only the change to the words "other than".
PANEL STATEMENT: Equipment that releases sparks or hot metal would not be desireable over a pit or below-grade area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1648)

14- 438 - (513-6(c)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
Portable lighting equipment that are used within a hangar shall be ~~approved~~ (identified) for the location in which they are used.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3595)

14- 439 - (513-6(c)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"Portable lighting equipment that are used within a hanger shall be ~~approved~~ (identified) for the location in which they are used."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3275)

14- 440 - (513-7(c)): Accept
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise 513-7(c) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
(c) Mobile Type. Mobile stanchions with electric equipment complying with (b) above shall carry at least one permanently affixed warning sign ~~to read~~ with the following words or equivalent:
WARNING - KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS.
SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.
The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1649)

14- 441 - (513-8): Accept in Part
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
~~Approved~~ (identified) seals shall be provided in accordance with Section 501-5.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete "approved", but do not insert "identified".
PANEL STATEMENT: Seals are properly defined in 501-5(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3596)

14- 442 - (513-8): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"~~Approved~~ (Identified) seals shall be provided in accordance with Section 501-5."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete "approved", but do not insert "identified".
PANEL STATEMENT: Seals are properly defined in 501-5(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3272)

14- 443 - (513-10): Accept
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise the second paragraph of 513-10 with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
Battery chargers and their control equipment shall not be located or operated within any of the Class I locations defined in Section 513-3 and shall preferably be located in a separate building or in an

area such as defined in Section 513-3(d). Mobile chargers shall carry at least one permanently affixed warning sign ~~to read~~ with the following words or equivalent: "WARNING - KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS." Tables, racks, trays, and wiring shall not be located within a Class I location and, in addition, shall comply with Article 480.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #3273)

14- 444 - (513-11(b)): Accept

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise 513-11(b) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

(b) Marking for Mobile Units. Mobile energizers shall carry at least one permanently affixed warning sign ~~to read~~ with the following words or equivalent:

WARNING - KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1650)

14- 445 - (513-11(c)): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise to read as follows:

Flexible cords for aircraft energizers and ground support equipment shall be ~~approved~~ (identified) for the type of service and extra-hard usage and shall include an equipment grounding conductor.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3588)

14- 446 - (513-11(c)): Accept

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

"Flexible cords for aircraft energizers and ground support equipment shall be ~~approved~~ (identified) for the type of service and extra-hard usage and shall include an equipment grounding conductor."

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3274)

14- 447 - (513-12(a)): Accept

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise 513-12(a) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

513-12(a) General. Mobile servicing equipment (such as vacuum cleaners, air compressors, air movers, etc.) having electric wiring and equipment not suitable for Class I, Division 2 locations shall be designed and mounted so that all such fixed wiring and equipment will be at least 18 in. (457 mm) above the floor. Such mobile equipment shall not be operated within the Class I location defined in Section 513-3(c) and shall carry at least one permanently affixed warning sign ~~to read~~ with the following words or equivalent:

WARNING - KEEP 5 FT CLEAR OF AIRCRAFT ENGINES AND FUEL TANK AREAS.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1651)

14- 448 - (513-12(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
Flexible cords for mobile equipment shall be suitable for the type of service and ~~approved~~ (identified) for extra-hard usage and shall include an equipment grounding conductor.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1652)

14- 449 - (513-12(b)): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise second sentence to read as follows:
Attachment plugs and receptacles shall be ~~approved~~ (identified) for the location in which they are installed and shall provide for connection of the equipment grounding conductor.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3589)

14- 450 - (513-12(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"Flexible cords for mobile equipment shall be suitable for the type of service and ~~approved~~ (identified) for extra-hard usage and shall include an equipment grounding conductor."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3590)

14- 451 - (513-12(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"Attachment plugs and receptacles shall be ~~approved~~ (identified) for the location in which they are installed and shall provide for connection of the equipment grounding conductor."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

ARTICLE 514 — GASOLINE DISPENSING AND SERVICE STATIONS

(Log #1266)

14- 452 - (514): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In Table 514-2, change the text in the last column of the table as shown below: (Note: There are 38 places where SI dimensions are added.)
Any pit, box, or space below grade level, any part of which is within the Division 1 or 2 classified location.
Up to ~~18 in.~~ 450 mm (18 in.) above grade level within a horizontal radius of ~~10 ft~~ 3.0 m (10 ft) from a loose fill connection and within a horizontal radius of ~~5 ft~~ 1.5 m (5 ft) from a tight fill connection.
Within ~~3 ft~~ 900 mm (3 ft) of open end of vent, extending in all directions.
Space between ~~3 ft~~ 900 mm (3 ft) and ~~5 ft~~ 1.5 m (5 ft) of open end of vent, extending in all directions.
Any pit, box, or space below grade level, any part of which is within the Division 1 or 2 classified location.
FPN: Space classification inside the dispenser enclosure is covered in Power Operated Dispensing Devices for Petroleum Products, ANSI/UL 87-1995.
Within ~~18 in.~~ 450 mm (18 in.) horizontally in all directions extending to grade from the dispenser enclosure or that portion of the dispenser enclosure containing liquid handling components.
FPN: Space classification inside the dispenser enclosure is covered in Power Operated Dispensing Devices for Petroleum Products, ANSI/UL 87-1995.
Up to ~~18 in.~~ 450 mm (18 in.) above grade level within ~~20 ft~~ 6.0 m (20 ft) horizontally of any edge of enclosure.
Up to ~~18 in.~~ 450 mm (18 in.) above grade or floor level within ~~20 ft~~ 6.0 m (20 ft) horizontally of any edge of enclosure.

Up to ~~18 in.~~ 450 mm (18 in.) above grade or floor level within ~~25 ft~~ 7.5 m (25 ft) horizontally of any edge of enclosure.

The space within the dispenser enclosure, and all electrical equipment integral with the dispensing hose or nozzle.

A space extending ~~18 in.~~ 450 mm (18 in.) horizontally in all directions beyond the enclosure and extending to grade.

Up to ~~18 in.~~ 450 mm (18 in.) above grade level within ~~20 ft~~ 6.0 m (20 ft) horizontally measured from a point vertically below the edge of any dispenser enclosure.

Any pit, box, or space below grade level if any part is within a horizontal distance of ~~10 ft~~ 3.0 m (10 ft) from any edge of pump.

Within ~~3 ft~~ 900 mm (3 ft) of any edge of pump, extending in all directions. Also up to ~~18 in.~~ 450 mm 18 in. above grade level within ~~10 ft~~ 3.0 m (10 ft) horizontally from any edge of pump.

Entire space within any pit.

Within ~~5 ft~~ 1.5 m (5 ft) of any edge of pump, extending in all directions. Also up to ~~3 ft~~ 900 mm (3 ft) above grade level within ~~25 ft~~ 7.5 m (25 ft) horizontally from any edge of pump.

Any pit within any unventilated space.

Any pit within ventilation.

Space up to ~~18 in.~~ 450 mm (18 in.) above floor or grade level and ~~3 ft~~ 900 mm (3 ft) horizontally from a lubrication pit.

Within ~~3 ft~~ 900 mm (3 ft) of any fill or dispensing point, extending in all directions. Entire area within any pit used for lubrication or similar services where Class I liquids may be released.

Area up to ~~18 in.~~ 450 mm (18 in.) above any such pit, and extending a distance of ~~3 ft~~ 900 mm (3 ft) horizontally from any edge of the pit.

Entire unventilated area within any pit, below grade area, or subfloor area.

Area up to ~~18 in.~~ 450 mm (18 in.) above any such unventilated pit, below grade work area, or subfloor work area and extending a distance of ~~3 ft~~ 900 mm (3 ft) horizontally from the edge of any suchpit, below grade work area, or subfloor work area.

Any pit, below grade work area, or subfloor work area that is provided with exhaust ventilation at a rate of not less than ~~1 cfm/ft^2(0.3 m^3/minute/m^2)~~ 0.3 m^3/min/m^2(1 cfm/ft^2) of floor area at all times that the building is occupied or when vehicles are parked in or over this area and where exhaust air is taken from a point within ~~12 in. (0.3 m)~~ 300 mm (12 in.) of the floor of the pit, below grade work area, or subfloor work area.

Entire enclosure.

If there is any opening to these rooms within the extent of a Division 1 location, the entire room shall be classified as Division 1.

Any pit, box, or space below grade level, any part of which is within a Division 1 or 2 classified location or that houses any equipment used to transport or process vapors.

Within any protective enclosure housing vapor processing equipment.

The space within ~~18 in.~~ 450 mm (18 in.) in all directions of equipment containing flammable vapor or liquid extending to grade level. Up to ~~18 in.~~ 450 mm (18 in.) above grade level within ~~10 ft~~ 3.0 m (10 ft) horizontally of the vapor processing equipment.

Any space within the enclosure where vapor or liquid is present under normal operating conditions. The space within ~~18 in.~~ 450 mm (18 in.) in all directions extending to grade level. Up to ~~18 in.~~ 450 mm (18 in.) above grade level within ~~10 ft~~ 3.0 m (10 ft) horizontally.

In Table 514-2, delete "For SI units, 1 in. = 2.5 cm; 1 ft = 0.3048 m" at the bottom of the table.

In Figure 514-2, change "18 in." to "450 mm (18 in.)" in three places; "20 ft" to "6.0 m (20 ft)" in three places.

In Figure 514-2, delete "For SI units: 1 in. = 25.4 mm; 1 ft = 0.3048 m" at the bottom of the figure.

In 514-5(b), change "100 ft (30 m)" to "30 m (100 ft)".

In 514-5(c), change "20 ft (7 m)" to "6 m (20 ft)" and "100 ft (30 m)" to "30 m (100 ft)".

In 514-8, Exception No. 2, change "2 ft (610 mm)" to "600 mm (24 in.)" in two places.

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Reject.

PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.
OMEARA: The proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.
ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #1525)

14- 453 - (514): Accept

SUBMITTER: Marshall A. Klein, Marshall A. Klein & Assoc., Inc./Rep. Automotive Oil Change Assn. (AOCA)

RECOMMENDATION: Revise text as follows:

1. Article 514 – ~~Gasoline Dispensing and Service Stations~~ Motor Fuel Dispensing Facilities.

2. Section 514-1: Definition. A ~~gasoline dispensing and service station~~ motor fuel dispensing facility is a location where gasoline or other volatile flammable liquid or liquefied flammable gases are transferred to the fuel tanks (including auxiliary fuel tanks) of self-propelled vehicles or approved containers.

3. Section 514-2. Class I Locations. Table 514-2 shall be applied where Class I liquids are stored, handled, or dispensed and shall be used to delineate and classify ~~service stations~~ motor fuel dispensing facilities, and commercial garages as defined under Article 511.

4. ^{x}Table 514-2, Class I Locations – ~~Service Stations~~ Motor Fuel Dispensing Facilities and Commercial Garages.

5. Section 514-5^{x}(b) Attended Self-Service ~~Stations~~ Motor Fuel Dispensing Facilities.

6. Section 514-5^{x}(c) Unattended Self-Service ~~Stations~~ Motor Fuel Dispensing Facilities.

SUBSTANTIATION: NFPA 30A is in the process of an entire rewrite of NFPA 30A. The committee is also attempting to incorporate NFPA 88B into NFPA 30A. If this rewrite is approved by the NFPA 30A Committee at its meeting in November, 1999, then the NFPA 30A Committee will need to forward to the NEC code proposals to correlate Chapter 8 of NFPA 30A with Article 514 of the NEC. Since I am a member of the NFPA 30A Committee, and since our committee's work will not be completed by the 11/5/99 deadline for proposals to the NEC, I am respectfully submitting this code proposal to permit the NEC Panel 14 and the NFPA 30A Committee to be able to correlate the next edition of the NEC with the 2000 edition of NFPA 30A.

Changes to the NEC will be required to correlate with the next edition of NFPA 30A. Proposed new definitions for "motor fuel dispensing facility" and "major and minor repair garages" are used in place of "service station" in the next edition of NFPA 30A.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3975)

14- 454 - (514):

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action. The second paragraph contains requirements which are not permitted in a Scope Statement. The Technical Correlating Committee directs that the Scope be only the first paragraph of the Recommendation, and directs the panel to relocate the second paragraph elsewhere in the Article. Technical Correlating Committee understands that this proposal is modified by Proposals 14-453, 14-459, 14-460, 14-462, 14-467a and 14-470. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Revise the entire Article 514 as follows:

Article 514 — Gasoline Dispensing and Service Stations

514.1. Scope. These occupancies shall include locations where gasoline or other volatile flammable liquids or liquefied flammable gases are transferred to the fuel tanks (including auxiliary fuel tanks) of self-propelled vehicles or approved containers.

Other areas used as lubritoriums, service rooms, repair rooms, offices, salesrooms, compressor rooms, and similar locations shall

comply with Articles 510 and 511 with respect to electric wiring and equipment.

FPN: For further information regarding safeguards for gasoline dispensing and service stations, see NFPA 30A, Automotive and Marine Service Station Code, 1996 edition.

514.2. Definition. A gasoline dispensing and service station is a location where gasoline or other volatile flammable liquids or liquefied flammable gases are transferred to the fuel tanks (including auxiliary fuel tanks) of self-propelled vehicles or approved containers.

x514.3. Classification of Locations.

(a) Unclassified Locations. Where the authority having jurisdiction can satisfactorily determine that flammable liquids having a flash point below 38°C (100°F), such as gasoline, will not be handled, such location shall not be required to be classified.

(b) Classified Locations.

(1) Class I Locations. Table 514.3 shall be applied where Class I liquids are stored, handled, or dispensed and shall be used to delineate and classify service stations. A Class I location shall not extend beyond an unpierced wall, roof, or other solid partition.

FPN No. 1: For information on area classification where liquefied petroleum gases are dispensed, see NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases, 1995 edition.

FPN No. 2: For information on classified areas pertaining to LP-Gas systems other than residential or commercial, see NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases, 1995 edition, and NFPA 59, Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, 1995 edition.

FPN No. 3: See Section 555.10 for gasoline dispensing stations in marinas and boatyards.

xFigure 514.3. Classified locations adjacent to dispensers as detailed in Table 514.3.

514.4. Wiring and Equipment Installed in Class I Locations. All electrical equipment and wiring installed in Class I locations as classified in Section 514.3 shall comply with the applicable provisions of Article 501.

Exception: As permitted in Section 514.8.

FPN: For special requirements for conductor insulation, see Section 501.13.

514.7. Wiring and Equipment Above Class I Locations. Wiring and equipment above the Class I locations as classified in Section 514.3 shall comply with Section 511.7.

514.8. Underground Wiring. Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit. Any portion of electrical wiring or equipment that is below the surface of a Class I, Division 1 or Division 2 location (as classified in Table 514.3) shall be considered to be in a Class I, Division 1 location, which shall extend at least to the point of emergence above grade. Refer to Table 300.5.

Exception No. 1: Type MI cable shall be permitted where it is installed in accordance with Article 330.

Exception No. 2: Rigid nonmetallic conduit complying with Article 347 shall be permitted where buried under not less than 2 ft (610 mm) of cover. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 2 ft (610 mm) of the underground run to emergence or to the point of connection to the aboveground raceway, and an equipment grounding conductor shall be included to provide electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

514.10. Sealing.

(a) At Dispenser. An approved seal shall be provided in each conduit run entering or leaving a dispenser or any cavities or enclosures in direct communication therewith. The sealing fitting shall be the first fitting after the conduit emerges from the earth or concrete.

(b) At Boundary. Additional seals shall be provided in accordance with Section 501.5. Sections 501.5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations.

514.11. Circuit Disconnects.

(a) General. Each circuit leading to or through dispensing equipment, including equipment for remote pumping systems, shall be provided with a clearly identified and readily accessible switch or other acceptable means, located remote from e dispensing devices, to disconnect simultaneously from the source of supply, all conductors of the circuits, including the grounded conductor, if any.

Single-pole breakers utilizing handle ties shall not be permitted.

x(b) Attended Self-Service Stations. Emergency controls as specified in 514.11(a) shall be installed at a location acceptable to the authority having jurisdiction, but controls shall not be more than 100 ft (30 m) from dispensers.

x(c) Unattended Self-Service Stations. Emergency controls as specified in 514.11(a) shall be installed at a location acceptable to the authority having jurisdiction, but the control shall be more than 20 ft (7 m) but less than 100 ft (30 m) from the dispensers. Additional emergency controls shall be installed on each group of dispensers or the outdoor equipment used to control the dispensers. Emergency controls shall shut off all power to all dispensing equipment at the station. Controls shall be manually reset only in a manner approved by the authority having jurisdiction.

FPN: For additional information, see 9-4.5 and 9-5.3 of NFPA 30A, Automotive and Marine Service Station Code, 1996 edition.

514.12. Provisions for Maintenance and Service of Dispensing Equipment. Each dispensing device shall be provided with a means to remove all external voltage sources, including feedback, during periods of maintenance and service of the dispensing equipment.

514.16. Grounding. All metal raceways, the metal armor or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding in Class I locations shall comply with Section 501.16.

SUBSTANTIATION: 1. Section 514-1 that provided definitions for Article 514 has been moved to 514.2 to conform to the NEC Style Manual.

2. Section 514-1 is a new section providing a scope for Article 514.

3. The three FPNs that were located in Section 514-1 for definitions have been relocated. The FPN providing information on NFPA 30A has been left in the Scope since it provides information on the basis for the text in Article 514. The other two FPNs have been moved to Section 514.3(b)(1) since they deal with information on documents providing area classification.

4. Section 514.2, Table 514.2, and Figure 514.2 have been changed to Section 514.3, Table 514.3, and Figure 514.3 to provide consistency with the other specific hazardous location occupancies.

5. A new subsection 514.3(a) has been established for unclassified locations and the paragraph dealing with areas where the flammable liquids have a flashpoint greater than 100°F has been moved from the definition section to this new location.

6. Section 514.3 was changed to Section 514.4 to provide consistency between the various articles dealing with specific hazardous location occupancies. The word "within" was changed to "installed in" in both the title and in the text since the equipment and wiring is actually installed in this location and not just simply located within the area. The word "defined" was changed to "as classified" since old Section 514-2 (new Section 514.3) does not define the hazardous area; it provides the area classification requirements.

7. Old Section 514-4 for Wiring and Equipment Above Class I Locations has been moved to new Section 514.7 for consistency between the articles.

8. Section 514.5 covering circuit disconnecting means for dispensers and dispenser islands and Section 514.6 covering the provisions for maintenance and servicing of dispensing equipment have been moved to new Sections 514.11 and 514.12, respectively.

9. Old Section 514-7 for sealing of raceways at dispensers has been moved to new Section 514.10 for consistency between articles.

This proposal is the work of a Task Group including Donny Cook, Fred Walker, Gordon Johnson, Don Zipsi, Mark Goodman, Kevin Earley, Mark Ode, Bob Benedetti, and Richard Hild. The Task Group was not balloted. The purpose of the proposal is to provide parallel numbering from Article 511 through 516 to comply with Section 2.4.1 of the NEC Style Manual.

PANEL ACTION: Accept in Principle.

Accept the submitter's text, but renumber 514-10 to 514-9 and 514-12 to 514-13. Also, change the word "nonclassified" to "unclassified" wherever the term appears.

PANEL STATEMENT: The minor changes implement a standardized numbering format for Articles 511 through 516.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

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xTable 514.3. Class I Locations — Service Stations

Location	Class I, Group D Division	Extent of Classified Location1
Underground Tank		
Fill Opening	1	Any pit, box, or space below grade level, any part of which is within the Division 1 or 2 classified location.
	2	Up to 18 in. above grade level within a horizontal radius of 10 ft from a loose fill connection and within a horizontal radius of 5 ft from a tight fill connection.
Vent — Discharging Upward	1	Within 3 ft of open end of vent, extending in all directions.
	2	Space between 3 ft and 5 ft of open end of vent, extending in all directions.
Dispensing Device[1,4] (except overhead type)[2]		
Pits	1	Any pit, box, or space below grade level, any part of which is within the Division 1 or 2 classified location.
Dispenser		FPN: Space classification inside the dispenser enclosure is covered in Power Operated Dispensing Devices for Petroleum Products, ANSI/UL 87-1995.
	2	Within 18 in. horizontally in all directions extending to grade from the dispenser enclosure or that portion of the dispenser enclosure containing liquid handling components. FPN: Space classification inside the dispenser enclosure is covered in Power Operated Dispensing Devices for Petroleum Products, ANSI/UL 87-1995.
Outdoor	2	Up to 18 in. above grade level within 20 ft horizontally of any edge of enclosure.
Indoor		
with Mechanical Ventilation	2	Up to 18 in. above grade or floor level within 20 ft horizontally of any edge of enclosure.
with Gravity Ventilation	2	Up to 18 in. above grade or floor level within 25 ft horizontally of any edge of enclosure.
Dispensing Device[4]		
Overhead Type[2]	1	The space within the dispenser enclosure, and all electrical equipment integral with the dispensing hose or nozzle.
	2	A space extending 18 in. horizontally in all directions beyond the enclosure and extending to grade.
	2	Up to 18 in. above grade level within 20 ft horizontally measured from a point vertically below the edge of any dispenser enclosure.
Remote Pump — Outdoor	1	Any pit, box, or space below grade level if any part is within a horizontal distance of 10 ft from any edge of pump.
	2	Within 3 ft of any edge of pump, extending in all directions. Also up to 18 in. above grade level within `10 ft horizontally from any edge of pump.
Remote Pump — Indoor	1	Entire space within any pit.
	2	Within 5 ft of any edge of pump, extending in all directions. Also up to 3 ft above grade level within 25 ft horizontally from any edge of pump.
Lubrication or Service Room — with Dispensing	1	Any pit within any unventilated space.
	2	Any pit with ventilation.
	2	Space up to 18 in. above floor or grade level and 3 ft horizontally from a lubrication pit.
Dispenser for Class I Liquids	2	Within 3 ft of any fill or dispensing point, extending in all directions.
Lubrication or Service Room — Without Dispensing	2	Entire area within any pit used for lubrication or similar services where Class I liquids may be released.
	2	Area up to 18 in. above any such pit, and extending a distance of 3 ft horizontally from any edge of the pit.
	2	Entire unventilated area within any pit, below grade area, or subfloor area.
	2	Area up to 18 in. above any such unventilated pit, below grade work area, or subfloor work area and extending a distance of 3 ft horizontally from the edge of any such pit, below grade work area, or subfloor work area.
	Nonclassified	Any pit, below grade work area, or subfloor work area that is provided with exhaust ventilation at a rate of not less than 1 cfm/ft^2 (0.3 m^3/minute/m^2) of floor area at all times that the building is occupied or when vehicles are parked in or over this area and where exhaust air is taken from a point within 12 in. (0.3 m) of the floor of the pit, below grade work area, or subfloor work area.
Special Enclosure Inside Building[3]	1	Entire enclosure.
Sales, Storage, and Rest Rooms	Nonclassified	If there is any opening to these rooms within the extent of a Division 1 location, the entire room shall be classified as Division 1.

Vapor Processing Systems Pits	1	Any pit, box, or space below grade level, any part of which is within a Division 1 or 2 classified location or that houses nay equipment used to transport or process vapors.
Vapor Processing Equipment Located Within Protective Enclosures FPN: See NFPA 30A, Automotive and Marine Service Station Code, 1996 edition, Section 4-5.7	2	Within any protective enclosure housing vapor processing equipment.
Vapor Processing Equipment Not Within Protective Enclosures (excluding piping and combustion devices)	2	The space within 18 in. in all directions of equipment containing flammable vapor or liquid extending to grade level. Up to 18 in. above grade level within 10 ft horizontally of the vapor processing equipment.
Equipment Enclosures	1	Any space within the enclosure where vapor or liquid is present under normal operating conditions.
Vacuum-Assist Blowers [1,2,3,4]	2	The space within 18 in. in all directions extending to grade level. Up to 18 in. above grade level within 10 ft horizontally.

Note: For SI units, 1 in. = 2.5 cm; 1 ft -= 0.3048 m.
[1]Refer to Figure 514.2 for an illustration of classified location around dispensing devices.
[2]Ceiling mounted hose reel.
[3]FPN: See NFPA 30A, Automotive and Marine Service Station Code, 1996 edition, Section 2-2.
[4]FPN: Area classification inside the dispenser enclosure is covered in ANSI/UL 87-1995, Power-Operated Dispensing Devices for Petroleum Products.

(Log #3992)

14- 455 - (514): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Change to read:
Article 514 — ~~Gasoline Dispensing and Service Stations~~ Motor Fuel Dispensing Facility
514-1. This article shall apply to the electrical systems at Motor Fuel Dispensing Facilities as defined in Section 514-2.
514-2. Definitions. That portion of a property where motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles, self-propelled marine craft, or approved containers.
Other areas used as lubritoriums, service rooms, repair rooms, offices, salesrooms, compressor rooms, and similar locations shall comply with Articles 510 and 511 with respect to electric wiring and equipment.
Where the authority having jurisdiction can satisfactorily determine that flammable liquids having a flash point below 38°C (100°F), such as gasoline, will not be handled, such locations shall be required to be classified.
FPN No. 1: For further information regarding safeguards or gasoline dispensing and service stations, see NFPA 30A, Automotive and Marine Service Station Code, 1996, edition.
FPN No. 2: For information on classified areas pertaining to LP-Gas systems other than residential or commercial, see NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases, 1995 edition and NFPA 59, Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, 1995 edition.
FPN No. 3: See Section 555-10 for gasoline dispensing stations in marinas and boatyards.
SUBSTANTIATION: Changing the name of the Article and the definition will allow those using NFPA 30A to use common terms, see NFPA 30A-May 2000 ROP, Proposal 30A-8. Providing a scope will make Article 514 comply with Section 2.2.1 of NEC Style Manual.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The action on Proposal 14-453 addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3994)

14- 456 - (514): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise the entire Article 514 as follows:
Article 514 — Gasoline Dispensing and Service Stations
514.2. Definitions. A gasoline dispensing and service station is a location where gasoline or other volatile flammable liquids or liquefied flammable gases are transferred to the fuel tanks (including auxiliary fuel tanks) of self-propelled vehicles or approved containers.
Other areas used as lubritoriums, service rooms, repair rooms, offices, salesrooms, compressor rooms, and similar locations shall comply with Articles 510 and 511 with respect to electric wiring and equipment.
Where the authority having jurisdiction can satisfactorily determine that flammable liquids having a flash point below 38°C (100°F), such as gasoline, will not be handled, such locations shall be required to be classified.
FPN No. 1: For further information regarding safeguards for gasoline dispensing and service stations, see NFPA 30A, Automotive and Marine Service Station Code, 1996 edition.
FPN No. 2: For information on classified areas pertaining to LP-Gas systems other than residential or commercial, see NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases, 1995 edition and NFPA 59, Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, 1995 edition.
FPN No. 3: See Section 555.10 for gasoline dispensing stations in marinas and boatyards.
514.3. Classification of Locations.
x(a) Class I Locations. Table 514.2 shall be applied where Class I liquids are stored, handled, or dispensed and shall be used to delineate and classify service stations. A Class I location shall not extend beyond an unpierced wall, roof, or other solid partition.
FPN: For information on area classification where liquefied petroleum gases are dispensed, see NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases, 1995 edition.
Insert Existing Figure 514.2 Here
514.4. Wiring and Equipment in Class I Locations. All electrical equipment and wiring within Class I locations defined in Section 514.2 shall comply with the applicable provisions of Article 501.
Exception: As permitted in Section 514.8.
FPN: For special requirements for conductor insulation, see Section 501.13.
514.5. Wiring and Equipment Embedded, Underslab, or Underground. Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit. Any portion of electrical wiring or equipment that is below the surface of a Class I, Division 1 or Division 2 location (as defined in Table 514.2) shall be considered to be in a Class I, Division 1

location, which shall extend at least to the point of emergence above grade. Refer to Table 300.5.

Exception No. 1: Type MI cable shall be permitted where it is installed in accordance with Article 330.

Exception No. 2: Rigid nonmetallic conduit complying with Article 347 shall be permitted where buried under not less than 2 ft (610 mm) of cover. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 2 ft (610 mm) of the underground run to emergence or to the point connection to the aboveground raceway, and an equipment grounding conductor shall be included to provide electrical continuity of the raceways system and for grounding on noncurrent-carrying metal parts.

514.6. Sealing.

(a) At Dispenser. An approved seal shall be provided in each conduit run entering or leaving a dispenser or any cavities of enclosures in direct communication therewith. The sealing fitting shall be the first fitting after the conduit emerges from the earth or concrete.

(b) At Boundary. Additional seals shall be provided in accordance with Section 501.5.

Sections 501.5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations.

514.7. Wiring and Equipment Not Within Class I Locations.

(a) Wiring and Equipment Above Class I Locations. Wiring and equipment above the Class I locations defined in Section 514.3 shall comply with Section 511.7.

514.8. Special Equipment.

(a) Circuit Disconnects.

(1) General. Each circuit leading to or through dispensing equipment, including equipment for remote pumping systems, shall be provided with a clearly identified and readily accessible switch or other acceptable means, located remote from the dispensing devices, to disconnect simultaneously from the source of supply, all conductors of the circuit, including the grounded conductor, if any.

Single-pole breakers utilizing handle ties shall not be permitted.

x(2) Attended Self-Service Stations. Emergency controls as specified in Section 514.5(a) shall be installed at a location acceptable to the authority having jurisdiction, but controls shall not be more than 100 ft (30 m) from dispensers.

x(3) Unattended Self-Service Stations. Emergency controls as specified in Section 514.5(a) shall be installed at a location acceptable to the authority having jurisdiction, but the controls shall be more than 20 ft (7 m) but less than 100 ft (30 m) from the dispensers. Additional emergency controls shall be installed on each group of dispensers or the outdoor equipment used to control the dispensers. Emergency controls shall shut off all power to all dispensing equipment at the station. Controls shall be manually reset only in a manner approved by the authority having jurisdiction.

FPN: For additional information, see 9-4.5 and 9-5.3 of NFPA 30A, Automotive and Marine Service Station Code, 1996 edition.

(b) Provisions for Maintenance and Service of Dispensing Equipment. Each dispensing device shall be provided with a means to remove all external voltage sources, including feedback, during periods of maintenance and service of the dispensing equipment.

514.16 Grounding. All metal raceways, the metal armor or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding in Class I locations shall comply with Section 501.16.

SUBSTANTIATION: This proposal is the work of a Task Group including Donny Cook, Fred Walker, Gordon Johnson, Don Zipsi, Mark Goodman, Kevin Earley, Mark Ode, Bob Benedetti, and Richard Hild. The Task Group was not balloted. The purpose of this proposal is to provide parallel numbering from Article 511 through 516 to comply with Section 2.4.1 of the NEC Style Manual.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The action on Proposal 14-454 addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1653)

14- 457 - (514-1): Reject

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise first paragraph to read as follows:

A gasoline dispensing and service station is a location where gasoline or other volatile flammable liquids or liquefied flammable gases are transferred to the fuel tanks (including auxiliary fuel tanks) of self-propelled vehicles or ~~approved~~ (identified) containers.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Reject.

PANEL STATEMENT: The proper term is approved, as defined in both NFPA 30 and NFPA 30A.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #3597)

14- 458 - (514-1): Reject

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise the first paragraph to read as follows:

"A gasoline dispensing and service station is a location where gasoline or other volatile flammable liquids or liquefied flammable gases are transferred to the fuel tanks (including auxiliary fuel tanks) of self-propelled vehicles or ~~approved~~ (identified) containers."

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Reject.

PANEL STATEMENT: The proper term is approved, as defined in both NFPA 30 and NFPA 30A.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #2910)

14- 459 - (514-2): Accept

SUBMITTER: Mark R. Hilbert, Wolfeboro, NH

RECOMMENDATION: Add a new sentence after the current first sentence. The new sentence would read: "Table 515-2 shall be used for the purpose of delineating and classifying aboveground tanks."

SUBSTANTIATION: With the ever growing popularity of aboveground tanks at state, municipal, and commercial fueling sites, I find myself with locations that meet the definition of "gasoline dispensing" and are subject to the rules of Article 514. However, there is no reference in Table 514-2 for aboveground tanks. This information is contained in Table 515-2 but is only relative, at this time, to bulk storage sites. In the 1999 NEC proposal cycle I submitted this proposal in the form of an asterisk note to be added to Table 514-2. The panel agreed that the proposal had merit but was unable to change the extracted material of Table 514-2. This new second sentence would serve the same purpose and would not be affected by the extract policy. The acceptance of this proposal would allow for proper classification of aboveground tanks without having to resort to NFPA 30. Use of NFPA 30 can be difficult in areas where it has not been legally adopted by the state or municipality.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #3981)

14- 460 - (514-2, Table 514-3): Accept

Note: The Technical Correlating Committee directs the Panel to add a Heading to 514-2(b) in accordance with the Style Manual. Staff was directed to add SI Units to the Table. This action will be considered by the Panel as Public Comment.

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Add new text to read as follows:

x514-2(a). Class I Locations. Table 514-2 shall be applied where Class I liquids are stored, handled, or dispensed and shall be used to delineate and classify service stations. A Class I location shall not extend beyond an unpierced wall, roof, or other solid partition.

x(b) Table 514.3 shall be used to delineate and classify areas where Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), or Liquefied Petroleum Gas (LPG) are stored, handled, or dispensed. Where compressed natural gas or liquefied natural gas dispensers are installed beneath a canopy or enclosure, either the canopy or enclosure shall be deigned to prevent accumulation or entrapment of ignitable vapors or all electrical equipment installed beneath the canopy or enclosure shall be suitable for Class I, Division 2 hazardous (classified) locations. Dispensing devices for liquefied petroleum gas shall be located not less than 5 ft from any dispensing device for Class I liquids.

FPN: For information on area classification where liquefied petroleum gases are dispensed, see NFPA 58, Standard for the Storage and Handling of Liquefied petroleum Gases, 1995 edition.

xTable 514.3. Electrical Equipment Classified Areas for Dispensing Devices

	Extent of Classified Area	
Dispensing Device	**Class I, Division 1**	**Class I, Division 2**
Compressed Natural Gas	Entire space within the dispenser enclosure	5 ft in all directions from dispenser enclosure
Liquefied Natural Gas	Entire space within the dispenser enclosure and 5 ft in all directions from the dispenser enclosure	From 5 ft to 10 ft in all directions from the dispenser enclosure
Liquefied Petroleum Gas	Entire space within the dispenser enclosure; 18 in. from the exterior surface of the dispenser enclosure to an elevation of 4 ft above the base of the dispenser; the entire pit or open space beneath the dispenser and within 20 ft horizontally from any edge of the dispenser when the pit or trench is not mechanically ventilated.	Up to 18 in. aboveground and within 20 ft horizontally from any edge of the dispenser enclosure, including pits or trenches within this area when provided with adequate mechanical ventilation.

SUBSTANTIATION: Providing the proposed information from NFPA 30A will provide NEC users guidelines for fuels other than gasoline that are used in vehicles.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #2411)

14- 461 - (514-2 Note): Reject

SUBMITTER: William E. Bickner, Stillwater, MN

RECOMMENDATION: Revise the note to Table 514-2, as shown below:

Note: For SI units, 1 in. = 2.5 cm; 1 ft = 0.3~~048~~ m.

SUBSTANTIATION: For consistency. These values are both rounded to one decimal place in NFPA 30A, Table 7. Neither are rounded in Figure 514-2. Results are inconsistently and sometimes erroneously rounded in NFPA 30A (Sections 4-5.7, 9-5.3). Use of units (meters, centimeters, etc.) seems inconsistent in both standards. Rounding of results to a single decimal place is certainly reasonable, but conversion factors should not be rounded.

PANEL ACTION: Reject.

PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #2137)

14- 462 - (Table 514-2): Accept

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Revise Table 514-2 by adding an additional column to the immediate right of the center column titled "Group D Division". Title the new column "NEC Class I, Group IIA, Zone". The value to be placed in this column shall be as follows:

"All areas designated as "Unclassified" for Divisions would also be "Unclassified" for Zones. All areas designated as "2" for Divisions would also be "2" for Zones. "Undeground Tank Fill Opening", "Dispensing Device Pits", and "Vapor Processing Systems Pits" would be designated as Zone "0". All other locations designated as Division "1" shall be designated as Zone "1"."

The text in the "Extent of Classified Area" column should be revised as follows:

Replace each occurrence of "Division 1 or 2" with the words "Division 1, Division 2, Zone 1, or Zone 2".

The text in the "Extent of Classified Area" column should be revised as follows:

Replace each occurrence of "Division" with the words "Division 1, or Zone 1".

SUBSTANTIATION: This proposal is to recognize the alternate method for classification that was introduced into the 1996 National Electrical Code. NEC Article 505 Group IIA group designation is equivalent to NEC Article 500 Group D designation. The primary intent for proposing this change was to maintain correlation between the recommendations of NFPA 30A and other industry standards related to electrical area classification. While the fuel dispensing segment of the industry may not foresee immediate applications of zone classification, it is important that the various standards developing groups maintain consistent and coordinated recommendations. During the proposal and approval process for the 1996 National Electrical Code, extensive substantiation was provided to demonstrate that the zone method of classification provided equal if not higher levels of safety as compared to the division method, we were historically more familiar with. Following the approval of Article 505 in the NEC, NFPA, API, ISA, and UL began extensive efforts to develop new standards and revise existing standards to provide consistency and correlation between the recommendations and requirements of the various standards developing organizations. At the same time there was also an extensive effort to provide consistency and correlation with other world standards such as the IEC 79 series of standards and the International Petroleum Code 15.

This proposal is needed to maintain this consistency and correlation between NFPA 30A and other standards such as the NEC, API RP 500, API RP 505, and ISA SP 12.24. As the various North American standards related to zone classification were developed, there was a deliberate effort to maintain consistency in definitions. Therefore, the zone classification definitions used in all the NFPA, API, ISA, and UL zone related standards are the same as those of the NEC. While the exact wording describing a Class I, Division 2 location in NEC Article 501 is not word for word exactly the same as the description of a Class I, Zone 2 as described in NEC Article 505, the two areas are the same. This was the logic

used in this proposal for recommending that all existing Class I Division 2 locations also be identified as Class I Zone 2 locations. The logic for the proposed correlation between the NFPA 30A Class I Division 1 locations and Class I Zone 0 or zone 1 locations is not quite as straight forward, but are also based on the NEC Articles 501 and 505 description of these areas. While an argument could be made that by dividing existing Division 1 locations into the two categories of either Zone 0 where volatile materials are present continuously or Zone 1 where volatile materials could be present under normal situations affords a higher level of safety for fuel dispensing locations, it must also be recognized that for the most part fuel dispensing equipment like most other petroleum facility equipment does not have volatile materials present continuously. Therefore, in general the strict correlation between the existing Division 1 locations would be that they are equivalent to Zone 1 locations. However, this proposal recommends a slightly more conservative approach than a straight correlation of Division 1 to Zone 1. For "Underground Tank Fill Opening", "Dispensing Device Pits", and "Vapor Processing Systems Pits" where there is possibly a higher than normal risk that volatile materials could be present under normal operation, a more conservative recommendation that these Division 1 locations be classified as Zone 0. For all other Division 1 locations where the risk of volatile materials being present under normal operation is much lower, the less conservative correlation of Division 1 to Zone 1 was proposed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-376a.

(Log #2416)

14- 463 - (Table 514-2, FPN): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise the FPN referred to by footnote 3 as shown below:
3FPN: Enclosures for liquid storage tanks. See Automotive and Marine Service Station Code, NFPA 30A-1996, Section 2-2.
SUBSTANTIATION: NEC users generally would not know what constitutes "special enclosures." This minor change provides information from NFPA 30A and will enable users to quickly dismiss this requirement where no storage tank enclosures are present.
PANEL ACTION: Reject.
PANEL STATEMENT: This is extracted material from NFPA 30A.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #1160)

14- 464 - (514-4, Exception (New)): Reject
SUBMITTER: Charles K. Eldridge, Indianapolis, IN
RECOMMENDATION: Add a new Exception to read:
Wiring and equipment above the Class I locations defined in Section 514-2 shall comply with Sections 511-6 and 511-7.
Exception: Overhead outdoor wiring over 12 ft above the limits of the Class I location.
SUBSTANTIATION: Outdoor wiring installed in accordance with Article 225 may be installed next to a gasoline-dispensing unit where the Class I, Division 2 area extends under the overhead cable. This should not be a violation; however, the wiring is above a Class I area and the requirements of Sections 511-6 and 511-7 are required to be followed. Those references are for indoor wiring so they should not apply. Additionally, the overhead cable is nonsparking as opposed to the spark producing equipment and lighting referenced in 511-7 where the required is 12 ft.
PANEL ACTION: Reject.
PANEL STATEMENT: Wiring over a Class I area needs to be mechanically protected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
OMEARA: This proposal should be accepted. I agree with the submitter's substantiation and feel the overhead cable is not a source of ignition. Also, I feel the panel did not offer sufficient technical substantiation for their rejection.

(Log #409)

14- 465 - (514-5(a)): Reject
SUBMITTER: Kevin O'Connell, Primex Technologies
RECOMMENDATION: Revise 514-5(a) to read as follows:
(a) General. Each circuit leading to or through dispensing equipment, including equipment for remote pumping systems, shall be provided with a clearly identified means, located remote from the dispensing devices, to disconnect simultaneously from the source of supply, all conductors of the circuit, ~~including the grounded conductor, if any~~
Single-pole breakers utilizing handle ties shall not be permitted.
SUBSTANTIATION: Since the tanks and pumps at a service station are grounded at their location, once the ground from the supplied service is disconnected, the effect would cause a separately derived ground scenario. Maintenance personnel using any electrically run equipment could run the risk of developing a static discharge next to Class 1 rated material/fumes. Submergible pumps would be the biggest hazard, but above ground tanks should also be considered.
Experience is the result of handling explosives, and DOD regulations requiring personnel to be grounded whenever handling or working around explosive dusts or fumes, to eliminate static discharge.
DOD Contractors Safety Manual Chapter 12 — Safety Requirements for Explosives Facilities -
DOD document #4145.26-M.
PANEL ACTION: Reject.
PANEL STATEMENT: This information should be retained. The grounded conductor referred to here is not the equipment grounding conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2756)

14- 466 - (514-5(a)): Reject
SUBMITTER: John Vinciguerra, Aron Electric, Inc.
RECOMMENDATION: There needs to be a shunt trip involved and a maintained push button, the source to activate the shunt trip needs to be in the same panel as the shunt trip breaker.
SUBSTANTIATION: Most inspectors require a shunt trip, whether or not a relay is used to shut down power. This reasoning is so the emergency stop is not reactivated by accident. This shunt trip has to be reset making it two (2) steps to regain power.
1. Turn on or pull out stop button.
2. Reset shunt trip.

Also this needs to be in the same panel as the petroleum equipment. This is the most important matter. For some reason the power going to the shunt trip portion of the breaker is getting turned off. No matter how it is labeled there are some people who don't understand the significance of this breaker and turn it off. To give you an example, Florida Department of Transportation in Orlando called me to fix the E-stop, their electricians could not figure out why their shunt trip would not work. I found that in one of the large main panels a breaker that fed the shunt trip portion of the breaker to the gas equipment had been turned off. We are also noticing from time to time this is happening at service stations.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter does not suggest any proposed text, which fails to meet the requirements for submitting a proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #308)

14- 467 - (514-6): Reject
SUBMITTER: Ronald Fuller, Washington State Labor and Industries
RECOMMENDATION: Revise 514-6 to read as follows:
...Each dispensing device shall be provided with a separate and individual means to remove all external voltage sources, including feedback, during periods of maintenance and service of ~~the~~ each dispensing equipment.
SUBSTANTIATION: The new language as written in the 1999 National Electrical code addresses the circuit disconnecting means of dispensing equipment for servicing. As currently written, there are no additional requirements to those already required by NEC 514-5(a), (b), (c). To allow for safe conditions when servicing, a "separate and individual" means must be provided to disconnect "each" individual dispensing equipment.
As currently written, a multi-pole switching device is allowed to be installed between the branch circuit panel and the installation of multiple dispensers provided that all circuit conductors (grounded and ungrounded) to those dispensers as required by NEC 514-6 are disconnected.
In order to not interrupt service to dispensers not being serviced, a service person would likely disconnect only the dispensing device to be serviced at the branch circuit panel (possibly a device that interrupts only the ungrounded conductor as allowable by NEC 514-5, 6) rather than utilizing the multi-pole switching device. To use the multi-switch in this situation would disconnect all dispensers controlled by that multi-pole device and possibly shutdown an entire facility.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing language provides for more than one method to satisfy this requirement. Accepting this proposal would eliminate this flexibility.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #CP1404)

14- 467a - (514-6): Accept
SUBMITTER: CMP 14
RECOMMENDATION: Add at the end of 514-6 the following text: "The location of this means shall be permitted to be other than inside or adjacent to the dispensing device."
SUBSTANTIATION: This clarifies the intent of the code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
JAGUNICH: See ballot for David Wechsler.

(Log #1654)

14- 468 - (514-7(a)): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise to read as follows:
An ~~approved~~ (identified) seal shall be provided in each conduit run entering or leaving a dispenser or any cavities or enclosures in direct communication therewith.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: An approved seal is required, as there is no reference to 501-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: I disagree with the Panel Action and Statement. It does not seem consistent with actions on similiar porposals.

(Log #3598)

14- 469 - (514-7(a)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"An ~~approved~~ (identified) seal shall be provided in each conduit run entering or leaving a dispenser or any cavities or enclosures in direct communication therewith."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 14-468
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-468.

(Log #2138)

14- 470 - (514-8): Accept
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise text to read as follows:
"Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit. Any portion of electrical wiring or equipment that is below the surface of a Class I, Division 1, ~~or~~ Division 2, Zone 1, or Zone 2 locations (as defined in Table 514-2) shall be considered to be in a Class I, Division 1 or Zone 1 location, which shall extend at least to the point of emergence above grade. Refer to Table 300-5.
SUBSTANTIATION: This proposal is to recognize the alternate method for classification that was introduced into the 1996 National Electrical Code. NEC Article 505 Group IIA group designation is equivalent to NEC Article 500 Group D designation. The primary intent for proposing this change was to maintain correlation between the recommendations of NFPA 30A and other industry standards related to electrical area classification. While the fuel dispensing segment of the industry may not foresee immediate applications of zone classification, it is important that the various standards developing groups maintain consistent and coordinated recommendations. During the proposal and approval process for the 1996 National Electrical Code, extensive substantiation was provided to demonstrate that the zone method of classification provided equal if not higher levels of safety as compared to the division method, we were historically more familiar with. Following the approval of Article 505 in the NEC, NFPA, API, ISA, and UL began extensive efforts to develop new standards and revise existing standards to provide consistency and correlation between the recommendations and requirements of the various standards developing organizations. At the same time there was also an extensive effort to provide consistency and correlation with other world standards such as the IEC 79 series of standards and the International Petroleum Code 15.
This proposal is needed to maintain this consistency and correlation between NFPA 30A and other standards such as the NEC, API RP 500, API RP 505, and ISA SP 12.24. As the various North American standards related to zone classification were developed, there was a deliberate effort to maintain consistency in definitions. Therefore, the zone classification definitions used in all the NFPA, API, ISA, and UL zone related standards are the same as those of the NEC. While the exact wording describing a Class I, Division 2 location in NEC Article 501 is not word for word exactly the same as the description of a Class I, Zone 2 as described in NEC Article 505, the two areas are the same. This was the logic used in this proposal for recommending that all existing Class I Division 2 locations also be identified as Class I Zone 2 locations. The logic for the proposed correlation between the NFPA 30A Class I Division 1 locations and Class I Zone 0 or zone 1 locations is not quite as straight forward, but are also based on the NEC Articles 501 and 505 description of these areas. While an argument

could be made that by dividing existing Division 1 locations into the two categories of either Zone 0 where volatile materials are present continuously or Zone 1 where volatile materials could be present under normal situations affords a higher level of safety for fuel dispensing locations, it must also be recognized that for the most part fuel dispensing equipment like most other petroleum facility equipment does not have volatile materials present continuously. Therefore, in general the strict correlation between the existing Division 1 locations would be that they are equivalent to Zone 1 locations. However, this proposal recommends a slightly more conservative approach than a straight correlation of Division 1 to Zone 1. For "Underground Tank Fill Opening", "Dispensing Device Pits", and "Vapor Processing Systems Pits" where there is possibly a higher than normal risk that volatile materials could be present under normal operation, a more conservative recommendation that these Division 1 locations be classified as Zone 0. For all other Division 1 locations where the risk of volatile materials being present under normal operation is much lower, the less conservative correlation of Division 1 to Zone 1 was proposed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-376a.

(Log #3979)

14- 471 - (514-8): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
514-8. Underground Wiring. Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit. Any ~~portion of electrical wiring or equipment~~ conduit that is below the surface of a Class I, Division 1 or Division 2 location (as defined in Table 514-2) shall be ~~considered to be in a Class I, Division 1 location, which shall extend at least to the point of emergence above grade~~. sealed with a listed seal when it emerges from below grade. Refer to Table 300-5.
SUBSTANTIATION: To provide common wording for conduit systems installed below grade from Articles 511 through 516.
PANEL ACTION: Reject.
PANEL STATEMENT: The suggested wording would conflict with the intent of the original language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-394.

(Log #4241)

14- 472 - (514-8): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Delete the ending phrase "which shall extend at least to the point of emergence above grade."
SUBSTANTIATION: The only reason this is in the Code is to prevent a necessity for handholes out in the pavement in the event a classification boundary falls more than one conduit length from the point of emergence from grade, since Section 501-5(c)(1) requires seals to be accessible. The better solution is to put generic language in the sealing rules in Article 501 allowing for seals to be placed at the point of emergence. This proposal is a companion proposal to another that does just that.
PANEL ACTION: Reject.
PANEL STATEMENT: See Proposal 14-471.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: The proposal, like Proposal 14-471, indicates that there may be a different way of covering underground wiring and the seals associated with that wiring for the special occupancies. I do not agree that the Panel Action should be to do nothing.

ARTICLE 515 — BULK STORAGE PLANTS

(Log #1267)

14- 473 - (515): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In **Table 515-2**, change the text in the last column of the table as shown below: (Note: There are 53 places where SI dimensions are added.)
Space within ~~5 ft~~ 1.5 m (5 ft) of any edge of such equipment, extending in all directions.
Space between ~~5 ft~~ 1.5 m (5 ft) and ~~8 ft~~ 2.5 m (8 ft) of any edge of such equipment, extending in all directions. Also, space up to ~~3 ft~~ 900 mm (3 ft) above floor or grade level within ~~5 ft~~ 1.5 m (5 ft) to ~~25 ft~~ 7.5 m (25 ft) horizontally from any edge of such equipment. 1
Space within ~~3 ft~~ 900 mm (3 ft) of any edge of such equipment, extending in all directions.
Space between ~~3 ft~~ 900 mm (3 ft) and ~~8 ft~~ 2.5 m (8 ft) of any edge of such equipment, extending in all directions. Also, space up to ~~3 ft~~ 900 mm (3 ft) above floor or grade level within ~~3 ft~~ 900 mm (3 ft) to ~~10 ft~~ 3.0 m (10 ft) horizontally from any edge of such equipment.
Space inside dike where dike height is greater than the distance from the tank to the dike for more than 50 percent of the tank circumference.
Within ~~10 ft~~ 3.0 m (10 ft) from shell, ends, or roof of tank. Space inside dikes to level of top of dike.
Within ~~5 ft~~ 1.5 m (5 ft) of open end of vent, extending in all directions.
Space between ~~5 ft~~ 1.5 m (5 ft) and ~~10 ft~~ 3.0 m (10 ft) from open end of vent, extending in all directions.
Space above the roof and within the shell.
Any pit, box, or space below grade level, if any part is within a Division 1 or 2 classified location.
Up to ~~18 in.~~ 450 mm (18 in.) above grade level within a horizontal radius of ~~10 ft~~ 3.0 m (10 ft) from a loose fill connection, and within a horizontal radius of ~~5 ft~~ 1.5 m (5 ft) from a tight fill connection.

Within ~~3 ft~~ 900 mm (3 ft) of open end of vent, extending in all directions.
Space between ~~3 ft~~ 900 mm (3 ft) and ~~5 ft~~ 1.5 m (5 ft) of open end of vent, extending in all directions.
Within ~~3 ft~~ 900 mm (3 ft) of vent and fill openings, extending in all directions.
Space between ~~3 ft~~ 900 mm (3 ft) and ~~5 ft~~ 1.5 m (5 ft) from vent or fill opening, extending in all directions. Also, up to ~~18 in.~~ 450 mm (18 in.) above floor or grade level within a horizontal radius of ~~10 ft~~ 3.0 m (10 ft) from vent or fill openings.
Within ~~5 ft~~ 1.5 m (5 ft) of any edge of such devices, extending in all directions. Also up to ~~3 ft~~ 900 mm (3 ft) above floor or grade level within ~~25 ft~~ 7.5 m (25 ft) horizontally from any edge of such devices.
Within ~~3 ft~~ 900 mm (3 ft) of any edge of such devices, extending in all directions. Also up to ~~18 in.~~ 450 mm (18 in.) above grade level within ~~10 ft~~ 3.0 m (10 ft) horizontally from any edge of such devices.
Entire space within pit if any part is within a Division 1 or 2 classified location.
Entire space within pit if any part is within a Division 1 or 2 classified location.
Entire pit.
Space up to ~~18 in.~~ 450 mm (18 in.) above ditch, separator, or basin. Also up to ~~18 in.~~ 450 mm (18 in.) above grade within ~~15 ft~~ 4.5 m (15 ft) horizontally from any edge.
Same as pits.
Within ~~3 ft~~ 900 mm (3 ft) of edge of dome, extending in all directions.
Space between ~~3 ft~~ 900 mm (3 ft) and ~~15 ft~~ 4.5 m (15 ft) from edge of dome, extending in all directions.
Within ~~3 ft~~ 900 mm (3 ft) of point of venting to atmosphere, extending in all directions.

Space between ~~3 ft~~ 900 mm (3 ft) and ~~15 ft~~ 4.5 m (15 ft) from point of venting to atmosphere, extending in all directions. Also up to ~~18 in.~~ 450 mm (18 in.) above grade within a horizontal radius of ~~10 ft~~ 3.0 m (10 ft) from point of loading connection.

If there is any opening to these rooms within the extent of an indoor classified location, the room shall be classified the same as if the wall, curb, or partition did not exist.

Within ~~3 ft~~ 900 mm (3 ft) of open end of vent, extending in all directions.

Space between ~~3 ft~~ 900 mm (3 ft) and ~~15 ft~~ 4.5 m (15 ft) from open end of vent, extending in all directions. Also within ~~3 ft~~ 900 mm (3 ft) of edge of dome, extending in all directions.

Within ~~3 ft~~ 900 mm (3 ft) of point of connection of both fill and vapor lines, extending in all directions.

Within ~~3 ft~~ 900 mm (3 ft) of point of connections, extending in all directions. Also up to ~~18 in.~~ 450 mm (18 in.) above grade within a horizontal radius of ~~10 ft~~ 3.0 m (10 ft) from point of connections.

All pits or spaces below floor level.

Space up to ~~18 in.~~ 450 mm (18 in.) above floor or grade level for entire storage or repair garage.

If there is any opening to these rooms within the extent of an outdoor classified location, the entire room shall be classified the same as the space classification at the point of the opening.

If there is any opening to these rooms within the extent of an indoor classified location, the room shall be classified the same as if the wall, curb, or partition did not exist.

See Figure 515-2.

In **Table 515-2**, delete "For SI units, 1 in. = 2.5 cm; 1 ft = 0.3048 m." at the bottom of the table.

In **Figure 515-2**, change "2 ft" to "600 mm (2 ft)" in one place; "25 ft" to "7.6 m (25 ft)" in four places; and "50 ft" to "15 m (50 ft)" in three places.

In **Figure 515-2 Note 2**, change "25 ft (7.6 m)" to "7.6 m (25 ft)" in two places, sub-notes "a" and "b".

In **Figure 515-2**, delete "For SI units: 1 ft = 0.3048 m." at the bottom of the figure.

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Reject.

PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 3

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.

OMEARA: This proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.

ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #3976)

14- 474 - (515): Accept in Principle

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 14-477, 14-478, 14-480, 14-481, 14-482, and 14-484. The Technical Correlating Committee directs NFPA staff to add the SI units to Table 515-2. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Revise the entire Article 515 as follows:

Article 515 — Bulk Storage Plants

515.1. Scope. This article covers a property or portion of a property where flammable liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipeline, tank car, tank vehicle, portable tank, or container.

515.2. Definition. Bulk Storage Plant. That portion of a property where flammable liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipelines, tank car, tank vehicle, portable tank, or container.

FPN: For further information, see NFPA 30, Flammable and Combustible Liquids Code, 1996 edition.

x515.3. Class I Locations. Table 515.2 shall be applied where Class I liquids are stored, handled, or dispensed and shall be used to delineate and classify bulk storage plants. The Class location shall not extend beyond a floor, wall, roof, or other solid partition that has no communicating openings.

FPN: The area classifications listed in Table 515.2 are based on the premise that the installation meets the applicable requirements of NFPA 30, Flammable and Combustible Liquids Code, 1996, Chapter 5, in all respects. Should this not be the case, the authority having jurisdiction has the authority to classify the extent of the classified space.

FPN No. 3: See Section 555.10 for gasoline dispensing stations in marinas and boatyards.

xFigure 515.3. Marine terminal handling flammable liquids.

515.4. Wiring and Equipment Located in Class I Locations. All electrical wiring and equipment within the Class I locations defined in Section 515.2 shall comply with the applicable provisions of Article 501.

Exception: As permitted in Section 515.5.

515.7. Wiring and Equipment Above Class I Locations.

(a) Fixed Wiring. All fixed wiring above Class I locations shall be in metal raceways or PVC Schedule 80 rigid nonmetallic conduit, or equivalent, or be Type MI, TC, or MC cable.

(b) Fixed Equipment. Fixed equipment that may produce arcs, sparks, or particles of hot metal, such as lamps and lampholders for fixed lighting, cutouts, switches, receptacles, motors, or other equipment having make-and-break or sliding contacts, shall be of the totally enclosed type or be constructed so as to prevent the escape of sparks or hot metal particles.

(c) Portable Lamps or Other Utilization Equipment. Portable lamps or other utilization equipment and their flexible cords shall comply with the provisions of Article 501 for the class of location above which they are connected or used.

515.8. Underground Wiring.

(a) Wiring Method. Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit or, where buried under not less than 2 ft (610 mm) of cover, shall be permitted in rigid nonmetallic conduit or an approved cable. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 2 ft (610 mm) of the conduit run to emergence or to the point of connection to the aboveground raceway. Where cable is used, it shall be enclosed in threaded rigid metal conduit or threaded steel intermediate metal conduit from the point of lowest buried cable level to the point of connection to the aboveground raceway.

(b) Insulation. Conductor insulation shall comply with Section 501.13.

(c) Nonmetallic Wiring. Where rigid nonmetallic conduit or cable with a nonmetallic sheath is used, an equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.

515.9. Special Equipment — Gasoline Dispensers. Where gasoline or other volatile flammable liquids or liquefied flammable gases are dispensed at bulk stations, the applicable provisions of Article 514 shall apply.

515.10. Sealing. Sealing requirements in Sections 501.5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Buried raceways under defined Class I locations shall be considered to be within a Class I, Division 1 location.

515.16. Grounding. All metal raceways, the metal armor or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding in Class I locations shall comply with Section 501.16.

FPN: For information on grounding for static protection, see 5-6.3.4 and 5-6.3.5 of NFPA 30, Flammable and Combustible Code, 1996 edition.

xTable 515.2. Class I Locations — Bulk Plants

Location	Class I, Division	Extent of Classified Location [1]
Indoor equipment installed in accordance with NFPA 30, Flammable Combustible Liquids Code, 1996, Section 5-3.4.5, where flammable vapor-air mixtures may exist under normal operation	1	Space within 5 ft of any edge of such equipment, extending in all directions.
	2	Space between 5 ft and 8 ft of any edge of such equipment, extending in all directions. Also, space up to 3 ft above floor or grade level within 5 ft to 25 ft horizontally from any edge of such equipment.[1]
Outdoor equipment of the type covered in NFPA 30, Flammable and Combustible Liquids Code, Section 5-3.4.5, where flammable vapor-air mixtures may exist under normal operation	1	Space within 3 ft of any edge of such equipment, extending in all directions.
	2	Space between 3 ft and 8 ft of any edge of such equipment, extending in all directions. Also, space up to 3 ft above floor or grade level within 3 ft to 10 ft horizontally from any edge of such equipment.
Tank — Aboveground[2]	1	Space inside dike where dike height is greater than the distance from the tank to the dike for more than 50 percent of the tank circumference.
Shell, Ends, or Roof and Dike Space Vent	2	Within 10 ft from shell, ends, or roof of tank. Space inside dikes to level of top of dike.
Vent	1	Within 5 ft of open end of vent, extending in all directions.
	2	Space between 5 ft and 10 ft from open end of vent, extending in all directions.
Floating Roof	1	Space above the roof and within the shell.
Underground Tank Fill Opening	1	Any pit, box, or space below grade level, if any part is within a Division 1 or 2 classified location.
	2	Up to 18 in. above grade level within a horizontal radius of 10 ft for loose fill connection, and within a horizontal radius of 5 ft from a tight fill connection.
Vent — Discharging Upward	1	Within 3 ft of open end of vent, extending in all directions.
	2	Space between 3 ft and 5 ft of open end of vent, extending in all directions.
Drum and Container Filling		
Outdoors, or Indoors with Adequate Ventilation	1	Within 3 ft of vent and fill openings, extending in all directions.
	2	Space between 3 ft and 5 ft from vent or fill opening, extending in all directions. Also, up to 18 in. above floor or grade level within a horizontal radius of 10 ft from vent or fill openings.
Pumps, Bleeders, Withdrawal Fittings, Meters, and Similar Devices		
Indoors	2	Within 5 ft of any edge of such devices, extending in all directions. Also up to 3 ft above floor or grade level within 25 ft horizontally from any edge of such devices.
Outdoors	2	Within 3 ft of any edge of such devices, extending in all directions. Also up to 18 in. above grade level within 10 ft horizon from any edge of such devices
Pits		
Without Mechanical Ventilation	1	Entire space within pit if any part is within a Division 1 or 2 classified location.
With Adequate Mechanical Ventilation	2	Entire space within pit if any part is within a Division 1 or 2 classified location.
Containing Valves, Fittings, or Piping, and Not Within A division 1 or 2 Classified Location	2	Entire pit.
Drainage Ditches, Separators, Impounding Basins		
Outdoor	2	Space up to 18 in. above ditch, separator, or basin. Also up to 18 in. above grade within 15 ft horizontally from any edge.
Indoor		Same as pits.
Tank Vehicle and Tank Car[3]		
Loading Through Open Dome	1	Within 3 ft of edge of dome, extending in all directions.
	2	Space between 3 ft and 15 ft from edge of dome, extending in all directions.
Loading through Bottom Connections with Atmospheric Venting	1	Within 3 ft of point of venting to atmosphere, extending in all directions.
	2	Space between 3 ft and 15 ft from point of venting to atmosphere, extending in all directions. Also up to 18 in. above grade within a horizontal radius of 10 ft from point of loading connection.
Office and Rest Rooms	Unclassified	If there is any opening to these rooms within the extent of an indoor classified location, the room shall be classified the same as if the wall, curb, or partition did not exist.

xTable 515.2. Class I Locations — Bulk Plants (continued)

Location	Class I, Division	Extent of Classified Location [1]
Loading through Closed Dome with Atmospheric Venting	1	Within 3 ft of open end of vent, extending in all directions.
	2	Space between 3 ft and 15 ft from open end of vent, extending in all directions. Also within 3 ft of edge of dome, extending in all directions.
Loading through Closed Dome with Vapor Control	2	Within 3 ft of point of connection of both fill and vapor lines, extending in all directions.
Bottom Loading with Vapor Control Any Bottom Unloading	2	Within 3 ft of point of connections, extending in all directions. Also up to 18 in. above grade within a horizontal radius of 10 ft from point of connections.
Storage and Repair Garage for Tank Vehicles	1	All pits or spaces below floor level.
	2	Space up to 18 in. above floor or grade level for entire storage or repair garage.
Garages for other than Tank Vehicles	Unclassified	If there is any opening to these rooms within the extent of an outdoor classified location, the entire room shall be classified the same as the space classification at the point of the opening.
Indoor Warehousing Where There is No Flammable Liquid Transfer	Unclassified	If there is any opening to these rooms within the extent of an indoor classified location, the room shall be classified the same as if the wall, curb, or partition did not exist.
Piers and Wharves		See Figure 515.2

Note: For SI units, 1 in. = 25.4 mm; 1 ft -= 0.3048 m.
[1]The release of Class I liquids may generate vapors to the extent that the entire building, and possible a zone surrounding it, should be considered a Class I, Division 2 location.
[2]For Tanks — Underground, see Section 514.2.
[3]When classifying extent of space, consideration shall be given to the fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

SUBSTANTIATION: 1. Created a new Section 515-1 Scope for the article to be consistent with the NEC Style Manual.
2. Changed old Section 515-1 on definitions to new Section 515.2 for definitions to be consistent with the NEC Style Manual.
3. Changed old Section 515-2, Table 515-2, and Figure 515-2 for area classifications to new Section 515.3, Table 515.3, and Figure 515.3 for consistency with the other specific hazardous locations articles.
4. Changed old Section 515-3 covering Wiring and Equipment Within Class I Locations to new Section 515.4, covering Wiring and Equipment Located in Class I Locations. Changed the word "Within" in the title and the text to "located in" to be consistent throughout the Articles.
5. Old Section 515.5 for underground wiring has been changed to new Section 515.8 for underground wiring for consistency with the other specific hazardous location articles.
6. Old Section 515-7 for dispensing equipment has been renumbered to new Section 515.9 and the title has been changed to "Special Equipment — Gasoline Dispensers" to provide consistency.
7. Old Section 515-6 covering sealing has been changed to new Section 515.10 for consistency between articles.
PANEL ACTION: Accept in Principle.
Accept the proposed text, but renumber 515-9 to 515-10 and renumber 515-10 to 515-9.
PANEL STATEMENT: The minor changes implement a standardized numbering format for Articles 511 through 516.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3995)

14- 475 - (515): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise the entire Article 515 as follows:
Article 515 — Bulk Storage Plant.
515.2. Definition. A bulk storage plant is that portion of a property where flammable liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipeline, tank car, tank vehicle, portable tank, or container.

FPN: For further information, see NFPA 30, Flammable and Combustible Liquids Code, 1996 edition.
x515.3. Classification I Locations. Table 515.2 shall be applied where Class I liquids are stored, handled, or dispensed and shall be used to delineate and classify bulk storage plants. The Class I location shall not extend beyond a floor, wall, roof, or other solid partition that has no communicating openings.
Insert Existing Table 515.2 Here
515.4. Wiring and Equipment in Class I Locations. All electric wiring and equipment within Class I locations defined in Section 515.3 shall comply with the applicable provisions of Article 501.
Exception: As permitted in Section 515.5.
FPN: Fr special requirements for conductor insulation, see Section 501.13.
515.5. Wiring and Equipment Embedded, Underslab, or Underground.
(a) Wiring Method. Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit, or where buried under not less than 2 ft (610 mm) of cover, shall be permitted in rigid nonmetallic conduit or an approved cable. Where rigid nonmetallic conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 2 ft (610 mm) of the conduit run to emergence or the point of connection to the aboveground raceway. Where cable is used, it shall be enclosed in threaded rigid metal conduit or threaded steel intermediate metal from the point of lowest buried cable level to the point of connection to the aboveground raceway.
(b) Insulation. Conductor insulation shall comply with Section 501.13.
(c) Nonmetallic Wiring. Where rigid nonmetallic conduit or cable with a nonmetallic sheath is used, an equipment grounding conductor shall be included to provide for electrical continuity of the raceway system and for grounding of noncurrent-carrying metal parts.
515.6. Sealing. Sealing requirements in Sections 501.5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Buried raceways under defined Class I locations shall be considered to be within a Class I, Division 1 location.
515.7. Wiring and Equipment Not Within Class I Locations.
Wiring and Equipment Above Class I Locations. All fixed wiring above Class I locations shall be in metal raceways or PVC Schedule 80 rigid nonmetallic conduit, or equivalent, or be Type MI, TC, or MC cable. Fixed equipment that may produce arc, sparks, or particles of hot metal, such as lamps and lampholders for fixed lighting, cutouts, switches, receptacles, motors, or other equipment

having make-and-break or sliding contacts, shall be of the totally enclosed type or be constructed so as to prevent the escape of sparks or hot metal particles. Portable lamps or other utilization equipment and their flexible cords shall comply with the provisions of Article 501 for the class of location above which they are connected or used.

515-6. Sealing. Sealing requirements in Section 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Buried raceways under defined Class 1 locations shall be considered to be within a Class I, Division 1 location.

515.8. Special Equipment.

(a) Gasoline Dispensing. Where gasoline or other volatile flammable liquids or liquefied flammable gases are dispensed at bulk stations, the applicable provisions of Article 514 shall apply.

515.16. Grounding. All metal raceways, the metal armor or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding in Class I locations shall comply with Section 501.16.

FPN: For information on grounding for static protection, see 5-6.3.4 and 5-6.3.5 of NFPA 30, Flammable and Combustible Code, 1996 edition.

SUBSTANTIATION: This proposal is the work of a Task Group including Donny Cook, Fred Walker, Gordon Johnson, Don Zipsi, Mark Goodman, Kevin Earley, Mark Ode, Bob Benedetti, and Richard Hild. The Task Group was not balloted. The purpose of this proposal is to provide parallel numbering from Article 511 through 516 to comply with Section 2.4.1 of the NEC Style Manual.

PANEL ACTION: Accept in Principle.
See Proposal 14-474.

PANEL STATEMENT: This proposal is identical to Proposal 14-474.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #923)

14- 476 - (515-2): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise last sentence to read as follows:

The Class 1 location shall not extend beyond a floor, wall, roof, or other ~~solid~~ partition that has no communicating openings, except as provided in Section 515-6 for underground wiring.

SUBSTANTIATION: Editorial. Deletion of "solid" does not change intent but removes any inference that stud walls, joist-type ceilings, and floors, and concrete and tile block walls which are not "solid" are not permitted. The reference to Section 515-6 removes any perceived conflict.

PANEL ACTION: Reject.

PANEL STATEMENT: The Panel does not see a conflict.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2139)

14- 477 - (Table 515-2): Accept in Principle

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Revise Table 515-2 by adding an additional column to the immediate right of the center column titled "Group D Division". Title the new column "NEC Class I, Group IIA, Zone". The value to be placed in this column shall be as follows:

"All areas designated as "Unclassified" for Divisions would also be "Unclassified" for Zones. All areas designated as "2" for Divisions would also be "2" for Zones. The Division 1 areas related to "Underground Tank Fill Opening", and "Pits would be designated as Zone "0". All other locations designated as Division "1" shall be designated as Zone "1"."

The text in the "Extent of Classified Area" column should be revised as follows:

Replace each occurrence of "Division 1 or 2" with the words "Division 1, Division 2, Zone 1, or Zone 2"."

The text in the "Extent of Classified Area" column should be revised as follows:

Replace each occurrence of "Division" with the words "Division 1, or Zone 1".

SUBSTANTIATION: This proposal is to recognize the alternate method for classification that was introduced into the 1996 National Electrical Code. NEC Article 505 Group IIA group designation is equivalent to NEC Article 500 Group D designation. The primary intent for proposing this change was to maintain correlation between the recommendations of NFPA 30A and other industry standards related to electrical area classification. While the fuel dispensing segment of the industry may not foresee immediate applications of zone classification, it is important that the various standards developing groups maintain consistent and coordinated recommendations. During the proposal and approval process for the 1996 National Electrical Code, extensive substantiation was provided to demonstrate that the zone method of classification provided equal if not higher levels of safety as compared to the division method, we were historically more familiar with. Following the approval of Article 505 in the NEC, NFPA, API, ISA, and UL began extensive efforts to develop new standards and revise existing standards to provide consistency and correlation between the recommendations and requirements of the various standards developing organizations. At the same time there was also an extensive effort to provide consistency and correlation with other world standards such as the IEC 79 series of standards and the International Petroleum Code 15.

This proposal is needed to maintain this consistency and correlation between NFPA 30A and other standards such as the NEC, API RP 500, API RP 505, and ISA SP 12.24. As the various North American standards related to zone classification were developed, there was a deliberate effort to maintain consistency in definitions. Therefore, the zone classification definitions used in all the NFPA, API, ISA, and UL zone related standards are the same as those of the NEC. While the exact wording describing a Class I, Division 2 location in NEC Article 501 is not word for word exactly the same as the description of a Class I, Zone 2 as described in NEC Article 505, the two areas are the same. This was the logic used in this proposal for recommending that all existing Class I Division 2 locations also be identified as Class I Zone 2 locations. The logic for the proposed correlation between the NFPA 30A Class I Division 1 locations and Class I Zone 0 or zone 1 locations is not quite as straight forward, but are also based on the NEC Articles 501 and 505 description of these areas. While an argument could be made that by dividing existing Division 1 locations into the two categories of either Zone 0 where volatile materials are present continuously or Zone 1 where volatile materials could be present under normal situations affords a higher level of safety for fuel dispensing locations, it must also be recognized that for the most part fuel dispensing equipment like most other petroleum facility equipment does not have volatile materials present continuously. Therefore, in general the strict correlation between the existing Division 1 locations would be that they are equivalent to Zone 1 locations. However, this proposal recommends a slightly more conservative approach than a straight correlation of Division 1 to Zone 1. For "Underground Tank Fill Opening", "Dispensing Device Pits", and "Vapor Processing Systems Pits" where there is possibly a higher than normal risk that volatile materials could be present under normal operation, a more conservative recommendation that these Division 1 locations be classified as Zone 0. For all other Division 1 locations where the risk of volatile materials being present under normal operation is much lower, the less conservative correlation of Division 1 to Zone 1 was proposed.

PANEL ACTION: Accept in Principle.
See Proposal 14-478

PANEL STATEMENT: Proposal 14-478 addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-376a.

(Log #3996)

14- 478 - (Table 515-2): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Delete existing NEC Table 515-2 and insert proposed Table 6-2.2 from NFPA 30-May 2000 ROP (page 579-581) as new NEC Table 515-2.

Table 515-2 Electrical Area Classifications

Location	NEC Class I Division	NEC Class I Zone	Extent of Classified Area
Indoor equipment installed in accordance with 5-3 where flammable vapor-air mixtures can exist under normal operation	1	0	The entire area associated with such equipment where flammable gases or vapors are present continuously or for long periods of time.
	1	1	Area within 5 ft of any edge of such equipment, extending in all directions.
	2	2	Area between 5 ft and 8 ft of any edge of such equipment, extending in all directions; also, space up to 3 ft above floor or grade level within 5 ft to 25 ft horizontally from any edge of such equipment.[1]
Outdoor equipment of the type covered flammable in 5-3 where flammable vapor-air mixtures may exist under normal operation	1	0	The entire area associated with such equipment where gases or vapors are present continuously or for long periods of time.
	1	1	Area within 3 ft of any edge of such equipment, extending in all directions.
	2	2	Area between 3 ft and 8 ft of any edge of such equipment, extending in all directions; also, space up to 3 ft above floor or grade level within 3 ft to 10 ft horizontally from any edge of such equipment.
Tank storage installations inside buildings	1	1	All equipment located below grade level
	2	2	Any equipment located at or above grade level
Tank — aboveground	1	0	Inside fixed roof tank
	1	1	Area inside dike where dike height is greater than the distance from the tank to the dike for more than 50 percent of the tank circumference.
Shell, ends, or roof and dike area	2	2	Within 10 ft from shell, ends, or roof of tank. Also, area inside dikes to level of top of tank.
Vent	1	0	Area inside of vent piping or opening.
	1	1	Within 5 ft of open end of vent, extending in all directions.
	2	2	Area between 5 ft and 10 ft from open end of vent, extending in all directions.
Floating roof with fixed outer roof	1	0	Area ~~above the~~ between the floating and fixed roof sections and within the shell.
with no fixed outer roof	1	1	Area above the floating roof and within the shell.
Underground tank fill opening	1	1	Any pit, box, or space below grade level, if any part is within a Division 1 or 2, or Zone 1 or 2, classified location.
	2	2	Up to 18 in. above grade level within a horizontal radius of 10 ft from a loose fill connection, and within a horizontal radius of 5 ft from a tight fill connection.
Vent — discharging upward	1	0	Area inside of vent piping or opening
	1	1	Within 3 ft of open end of vent, extending in all directions.
	2	2	Area between 3 ft and 5 ft of open end of vent, extending in all directions.

Table 515-2 Electrical Area Classifications (continued)

Location	NEC Class I Division	Zone	Extent of Classified Area
Drum and container filling -- outdoors or indoors,	1	0	Area inside the drum or container.
	1	1	Within 3 ft of vent and fill openings, extending in all directions.
	2	2	Area between 3 ft and 5 ft from vent or fill opening, extending in all directions. Also, up to 18 in. above floor or grade level within a horizontal radius of 10 ft from vent or fill opening.
Pumps, bleeders, withdrawal fittings,			
Indoors	2	2	Within 5 ft of any edge of such devices, extending in all directions. Also up to 3 ft above floor or grade level within 25 ft Horizontally from any edge of such devices.
Outdoors	2	2	Within 3 ft of any edge of such devices, extending in all directions. Also up to 18 in. above grade level within 10 ft horizontally from any edge of such devices.
Pits and sumps			
without mechanical ventilation	1	1	Entire area within a pit or sump if any part is within a Division 1 or 2, or Zone 1 or 2, classified location.
with adequate mechanical ventilation	2	2	Entire area within a pit or sump if any part is within a Division 1 or 2, or Zone 1 or 2, classified location.
Containing valves, fittings, or piping, and not within a Division 1 or 2 , or Zone 1 or 2, classified location	2	2	Entire pit or sump.
Drainage ditches, separators, impounding basins			
Outdoor	2	2	Area up to 18 in. above ditch, separator, or basin. Also, area up to 18 in. above grade within 15 ft. horizontally from any edge.
Indoor			Same classified area as pits.
Tank vehicle and tank car[2] loading through open dome	1	0	Area inside of the tank.
	1	1	Within 3 ft of edge of dome, extending in all directions.
	2	2	Area between 3 ft and 15 ft from edge of dome, extending in all directions.
Loading through bottom connections with	1	0	Area inside of the tank.
atmospheric venting	1	1	Within 3 ft of point of venting to atmosphere, extending in all directions
	2	2	Area between 3 ft and 15 ft from point of venting to atmosphere, extending in all directions. Also, up to 18 in above grade within a horizontal radius of 10 ft from point of loading connection.
Office and rest rooms	Ordinary		If there is any opening to these rooms within the extent of an indoor classified location, the room shall be classified the same as if the wall, curb, or partition did not exist.

Table 515-2 Electrical Area Classifications (continued)

Location	NEC Class I Division	Zone	Extent of Classified Area
Loading through closed dome with atmospheric venting	1	1	Within 3 ft of open end of vent, extending in all directions.
	2	2	Area between 3 ft and 15 ft from open end of vent, extending in all directions. Also within 3 ft of edge of dome, extending in all directions.
Loading through closed dome with vapor control	2	2	Within 3 ft of point of connection of both fill and vapor lines extending in all directions.
Bottom loading with vapor control or any bottom	2	2	Within 3 ft of point of connections, extending in all directions. unloading Also up to 18 in. above grade within a horizontal radius of 10 ft from point of connections.
Storage and repair garage for tank vehicles	1	1	All pits or spaces below floor level.
	2	2	Area up to 18 in. above floor or grade level for entire storage or repair garage.
Garages for other than tank vehicles	Ordinary		If there is any opening to these rooms within the extent of an outdoor classified location, the entire room shall be classified the same as the area classification at the point of the opening.
Outdoor drum storage	Ordinary		
Inside rooms or storage lockers used for the storage of Class I liquids	2	2	Entire room.
Indoor warehousing where there is no flammable liquid transfer	Ordinary		If there is any opening to these rooms within the extent of an indoor classified location, the room shall be classified the same as the wall, curb, or partition did not exist.
Piers and wharves			See Figure 5-7.16

For SI units: 1 in. = 25.4 mm; 1 ft = 0.3048 m.
[1]The release of Class I liquids may generate vapors to the extent that the entire building, and possibly ~~a zones~~ an area surrounding it, should be considered a Class I, Division 2, or Zone 2 location.
[2]When classifying extent of area, consideration shall be given to fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

SUBSTANTIATION: Based on the NFPA 30 Committee accepting Proposal 30-167 to change this extracted material, this proposal was developed as part of the work done by a Task Group including Donny Cook, Fred Walker, Gordon Johnson, Don Zipsi, Mark Goodman, Kevin Earley, Mark Ode, Bob Benedetti, and Richard Hild to correlate the two documents. The Task Group was not balloted on this proposal.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-376a.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #924)

14- 479 - (515-3, Exception): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete:
~~Exception: As permitted in Section 515-5.~~
SUBSTANTIATION: Section 515-5 deals with underground wiring. Section and Table 515-1 Class 1 defined locations do not appear to extend underground. Section 515-6 covers underground wiring under Class 1 locations, which would not permit all the wiring methods of Section 515-5. This exception is somewhat confusing.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not support the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2140)

14- 480 - (515-4): Accept
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise text to read as follows:
"All fixed wiring above Class I locations shall be in metal raceways or PVC Schedule 80 rigid nonmetallic conduit, or equivalent, or be Type MI, TC or MC cable. Fixed equipment that may produce arcs, sparks, or particles of hot metal, such as lamps and lampholders for fixed lighting, cutouts, switches, receptacles, motors, or other equipment having make-and-break or sliding contacts, shall be of the totally enclosed type or be constructed so as to prevent the escape of sparks or hot metal particles. Portable lamps or other utilization equipment and their flexible cords shall comply with the provisions of Article 501 or Article 505 for the class of location above which they are connected or used."
SUBSTANTIATION: This proposal is to recognize the alternate method for classification that was introduced into the 1996 National Electrical Code. (See also proposal for 514-8).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-376a.

(Log #1655)

14- 481 - (515-5(a)): Accept in Principle
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise first sentence to read as follows:
Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit or, where buried under not less than 2 ft (610 mm) of cover, shall be permitted in rigid nonmetallic conduit or an ~~approved~~ (identified) cable.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed cable is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3599)

14- 482 - (515-5(a)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit or, where buried under not less than 2 ft (610 mm) of cover, shall be permitted in rigid nonmetallic conduit or an ~~approved~~ (identified) cable."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed cable is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #4304)

14- 483 - (515-5(a)): Reject
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise the last sentence of this section as shown below:
"Where cable is used, it shall be enclosed in threaded rigid metal conduit or threaded steel intermediate metal conduit from 18 in. below finished grade ~~the point of lowest buried cable~~ level to ~~the point of connection to the aboveground raceway~~ at least 8 ft above finished grade level."
SUBSTANTIATION: The provisions of this section remain essentially the same as they were in the 1953 NEC, predating cables that are recognized for either direct-burial or aboveground stand-alone wiring. Such cables may not be connected to an aboveground raceway, but comprise an entire circuit that extends for some distance above ground as a stand-alone wiring method, which is not generally prohibited by Article 515. Because this section does not specifically address classified locations, the intent appears to be only to require physical protection. The revised text accommodates installations where cable wiring is extended aboveground and makes the requirements consistent with Section 300-5(d).
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has failed to provide adequate technical justification to support this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #925)

14- 484 - (515-6): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Buried raceways and cables under defined Class 1 locations which extend to floor or grade level shall be considered to be within a Class 1 Division 1 location.
SUBSTANTIATION: Editorial. Section 330-3 permits Type MI cable in hazardous (classified) locations and underground. Section 334-3 permits Type MC cable direct-buried and in hazardous locations per Section 501-4(a)(1) Exception No. 2 where listed for such applications. Section 300-5 permits direct-burial cable splices.
Where boxes covered by the exception for Section 370-29 are used for such splices they may be considered not required to be explosion-proof since the cables are not presently included in the rule. Cable seals for Type MC cable per Section 501-5(d)(1) are not required if the cable is not considered to be within a Class 1 Division 1 location.
Underground wiring may pass under vent locations which are Class 1 Division 1 locations which do not normally extend to the ground level. The proposal would exempt such wiring from the classified location requirement.
PANEL ACTION: Accept in Principle in Part.
Insert only the words "and cables" as shown and change the reference in the first sentence of current 515-6 to state "section 501-5", instead of "sections 501-5(a)4 and (b)2".
PANEL STATEMENT: All raceways and cables that pass under a Class I location are considered to be within a Class I location, regardless of where they emerge. The changes to the reference are to include all sealing requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #3980)

14- 485 - (515-6): Reject
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL
RECOMMENDATION: Revise text to read as follows:
515-6. Sealing. Sealing requirements in Sections 501-5(a)(4) and (b)(2) shall apply to horizontal as well as to vertical boundaries of the defined Class I locations. Buried raceways under defined Class I locations shall be considered to be within a Class I, Division 1 location and sealed with a listed seals when it emerges from below grade.
SUBSTANTIATION: To provide common wording for conduit systems installed below grade from Articles 511 through 516.
PANEL ACTION: Reject.
PANEL STATEMENT: Sealing requirements are already established in 501-5. The additional wording is not required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
COOK: See my Explanation of Negative Vote on Proposal 14-394.

ARTICLE 516 — SPRAY APPLICATION, DIPPING, AND COATING PROCESSES

(Log #1268)

14- 486 - (516): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered by the Panel. The issues of raceway trade size, extracts, and use of soft versus hard metrication were all studied in detail and resolutions were communicated to the Panel prior to the Panel Meeting. It should be noted that all of the other Code-Making Panels accepted the metrication directive. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: In 516-2(a)(4), change "5-ft (1.52-m)" to "1.52-m (5-ft)" and "1 ft (305 mm)" to "305 mm (1 ft)". (Note: As is extracted material).

In 516-2(a)(5), change "25 ft (7.62 m)" to "7.62 m (25 ft)" in two places. (Note: As is extracted material).

In 516-2(b)(1), change "20 ft (6.10 m)" to "6.10 m (20 ft)" and "10 ft (3.05 m)" to "3.05 m (10 ft)". (Note: As is extracted material).

In Figure 516-2(b)(1), change "20 ft (6100 mm)" to "6100 mm (20 ft)" and "10 ft (3050 mm)" to "3050 mm (10 ft)". (Note: As is extracted material).

In 516-2(b)(2)(a), change "5 ft (1525 mm)" to "1525 mm (5 ft)" and "3 ft (915 mm)" to "915 mm (3 ft)". (Note: As is extracted material).

In Figure 516-2(b)(2), change "3-ft R (915 mm)" to "915 mm R (3 ft)" in twelve places; "5-ft R (1525 mm)" to "1525 mm R (5-ft)" in two places; and "10-ft R (3050 mm)" to "3050 mm R (10-ft)"two places. (Note: As is extracted material).

In 516-2(b)(2)(b), change "10 ft (3050 mm)" to "3050 mm (10 ft)" and "3 ft (915 mm)" to "915 mm (3 ft)". (Note: As is extracted material).

In 516-2(b)(3), change "3 ft (914 mm)" to "914 mm (3 ft)" in two places. (Note: As is extracted material).

In 516-2(b)(4), change "3 ft (914 mm)" to "914 mm (3 ft)". (Note: As is extracted material).

In Figure 516-2(b)(4), change "3 ft R" to "914 mm R (3-ft)" in seven places. (Note: SI Units are added and correspond to the text in the Section 516-2(b)(4), which is extracted material).

In Figure 516-2(b)(4), delete "For SI units: 1 ft = 0.3048 m." at the bottom of the figure.

In 516-2(b)(5), change "3 ft (914 mm)" to "914 mm (3 ft)". (Note: As is extracted material).

In Figure 516-2(b)(5), change "3 ft (1 m)" to "1 m (3 ft)" in six places; change "5 ft (1.5 m)" to "1.5 m (5 ft)" in six places; change "20 ft (6.1 m)" to "6.1 m (20 ft)" in two places. (Note: As is extracted material).

In Figure 516-2(b)(5), delete "Note: SI (metric) units shown in parenthesis are approximate. A more accurate conversion is 1.0 ft = 305 mm."

In 516-2(b)(6), change "20 ft (6.1 m)" to "6.1 m (20 ft)". (Note: As is extracted material).

In 516-2(b)(6) Ex, change "5 ft2 (0.46 m2)" to "0.46 m2 (5 ft2)" and "5 gal (18.9 L)" to "18.9 L (5 gal)". (Note: As is extracted material).

In 516-2(c) Ex, change "3 ft (914 mm)" to "914 mm (3 ft)". (Note: As is extracted material).

In 516-3(d) Ex. No. 2 (b), change "18 in. (45.7 cm)" to "450 mm (18 in.)".

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Reject.

PANEL STATEMENT: Panel 14 believes the following issues need further evaluation before changes are made to the code: trade sizes of conduit; extract policies; consistency from article to article within the code. For example, trade size of conduit is not a true dimension and cannot be converted to a true metric number.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 3

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

KUCZKA: See my Explanation of Negative Vote on Proposal 14-10.

OMEARA: The proposal should be accepted, to be in conformance with Chapter 4 of the NFPA MOS-1 Manual of Style.

ZIPSE: See my Explanation of Negative Vote on Proposal 14-10.

(Log #3973)

14- 487 - (516): Accept in Principle

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposals 14-420,14-488, 14-489, 14-490, 14-491, 14-492, 14-493, 14-494, 14-495, 14-496, 14-497, 14-498, 14-499, 14-500, 14-501, 14-502, 14-503, 14-504, 14-505, 14-506, 14-507, 14-508, 14-509, 14-510, and 14-511. The Technical Correlating Committee directs the Panel to reconsider and clarify the Panel Action on this Proposal. Note references in 516-10(a), 516-10(a)(10)c, and others to sections 516-5, which is deleted in accordance with the Panel Action. The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual specifically with respect to 516-10. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL

RECOMMENDATION: Revise the entire Article 516 as follows:

Article 516 — Spray Application, Dipping, and Coating Processes

516.1. Scope. This article covers the regular or frequent application of flammable liquids, combustible liquids, and combustible powders by spray operations and the application of flammable liquids, or combustible liquids at temperatures above their flashpoint, by dipping, coating, or other means.

FPN: For further information regarding safeguards for these processes, such as fire protection, posting of warning signs, and maintenance, see NFPA 33, Standard for Spray Application Using Flammable and Combustible Materials, 1995 edition, and NFPA 34, Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids, 1995 edition. For additional information regarding ventilation, see NFPA 91, Standard for Exhaust Systems for Air Conveying of Materials, 1995 edition.

516.2. Definitions. For the purpose of this article, the following definitions shall apply:

Spray Area. Normally locations outside of buildings or localized operations within a larger room or space. Such are normally provided with some local vapor extraction/ventilation system. In automated operations the area limits shall be the maximum area in the direct path of spray operations. In manual operations the area limits shall be the maximum area of spray when aimed at 180 degrees to the application surface.

Spray Booth. An enclosure or insert within a larger room used for spray/coating/dipping applications. A spray booth may be fully enclosed or have open front or face and may include separate conveyor entrance and exit. The spray booth is provided with a dedicated ventilation exhaust but may draw supply air from the larger room or have a dedicated air supply.

Spray Room. A purpose fully enclosed room built for spray/coating/dipping applications provided with dedicated ventilation supply and exhaust. Normally the room is configured to house the item to be painted providing reasonable access around the intem/process. Depending on the size of the item being painted such rooms may actually be the entire building or the major portion thereof.

516.3. Classification of Locations. Classification is based on dangerous quantities of flammable vapors, combustible mists, residues, dusts, or deposits.

(a) Class I or Class II, Division 1 Locations. The following spaces shall be considered Class I or Class II, Division 1 locations, as applicable.

x1. The interior of spray booths and rooms except as specifically provided in Section 516.3(d).

x2. The interior of exhaust ducts.

x3. Any area in the direct path of spray operations.

x4. For dipping and coating operations, all space within a 5-ft (1.52-m) radial distance from the vapor sources extending from these surfaces to the floor. The vapor source shall be the liquid exposed in the process and the drainboard, and any dipped or coated object from which it is possible to measure vapor concentrations exceeding 25 percent of the lower flammable limit at a distance of 1 ft (305 mm), in any direction, from the object.

x5. Sumps, pits or below-grade channels within 25 ft (7.625 m) horizontally of a vapor source. If the sump, pit, or channel extends beyond 25 ft (7.625 m) from the vapor source, it shall be provided

with a vapor stop or it shall be classified as Class I, Division 1 for its entire length.

x6. The interior of any enclosed dipping or coating process or apparatus.

(b) Class I or Class II, Division 2 Locations. The following spaces shall be considered Class I or Class II, Division 2 as applicable.

x1. For open spraying, all space outside of but within 20 ft (6.10 m) horizontally and 10 ft (3.05 m) vertically of the Class I, Division 1 location as defined in Section 516.2(a), and not separated from it by partitions. See Figure 516.2(b)(1).

x2. If spray application operations are conducted within a closed-top, open-face, or open-front booth or room, any electrical wiring or utilization equipment located outside of the booth or room but within the boundaries designated as Division 2 in Figure 516-2(b)(2) shall be suitable for Class I, Division 2 or Class II, Division 2 locations, whichever is applicable. The Class I, Division 2 or Class II, Division 2 locations shown in Figure 516-2(b)(2) shall extend from the edges of the open face or open front of the booth or room in accordance with the following:

a. If the exhaust ventilation system is interlocked with the spray application equipment, then the Division 2 location shall extend 5 ft (1525 mm) horizontally and 3 ft (915 mm) vertically from the open face or open front of the booth or room, as shown in Figure 516.2(b)(2) top.

b. If the exhaust ventilation system is not interlocked with the spray application equipment, then the Division 2 location shall extend 10 ft (3.05 mm) horizontally and 3 ft (914 mm) vertically from the open face or open front of the booth or room, as shown in Figure 516.2(b)(2) bottom.

For the purposes of this subsection, interlocked shall mean that the spray application equipment cannot be operated unless the exhaust ventilation system is operating and functioning properly and spray application is automatically stopped if the exhaust ventilation system fails.

x3. For spraying operations conducted within an open top spray booth, the space 3 ft (914 mm) vertically above the booth and within 3 ft (914 mm) of other booth openings shall be considered Class I or Class II, Division 2.

x4. For spraying operations confined to an enclosed spray booth or room, the space within 3 ft (914 mm) in all directions from any openings shall be considered Class I or Class II, Division 2 as shown in Figure 516.2(b)(4).

x5. For dip tanks and drain boards, the 3 ft (914 mm) space surrounding the Class I, Division 1 location as defined in Section 516.2(a)(4) and as shown in Figure 516.2(b)(5).

x6. For dip tanks and drain boards, the space 3 ft (914 mm) above the floor and extending 20 ft (6.1 m) horizontally in all directions from the Class I, Division 1 location.

Exception: This space shall not be required to be considered a hazardous (classified) location where the vapor source area is 5 ft^2 (0.46 m^2) or less, and where the contents of the open tank trough, or container do not exceed 5 gal (18.9 L). In addition, the vapor concentration during operation and shutdown periods shall not exceed 25 percent of the lower flammable limit outside the Class I location specified in Section 516.2(a)(4).

x(c) Enclosed Coating and Dipping Operations. The space adjacent to an enclosed dipping or coating process or apparatus shall be considered unclassified.

Exception: The space within 3 ft (914 mm) in all directions from any opening in the enclosures shall be classified as Class I, Division 2.

(d) Adjacent Locations. Adjacent locations that are cut off from the defined Class I or Class II locations by tight partitions without communicating openings, and within which flammable vapors or combustible powders are not likely to be released, shall be unclassified.

(e) Unclassified Locations. Locations using drying, curing, or fusion apparatus and provided with positive mechanical ventilation adequate to prevent accumulation of flammable concentrations of vapors, and provided with effective interlocks to deenergize all electrical equipment (other than equipment approved for Class I locations) in case the ventilating equipment is inoperative, shall be permitted to be unclassified where the authority having jurisdiction so judges.

FPN: For further information regarding safeguards, see NFPA 86, Standard for Ovens and Furnaces, 1995 edition.

xFigure 516.2(b)(1) Class I or Class II, Division 2 location adjacent to an unenclosed spray operation.

Figure 516.2(b)(2) Class I or Class II, Division 2 locations adjacent to a closed top, open face, or open front spray booth or room.

xFigure 516.2(b)(4) Class I (or Class II), Division 2 locations adjacent to an enclosed spray booth or spray room.

xFigure 516.2(b)(5) Electrical area classification for open processes without vapor containment or ventilation.

516.4. Wiring and Equipment in Class I Locations.

(a) Wiring and Equipment — Vapors. All electric wiring and equipment within the Class I location (containing vapor only – not residues) defined in Section 516.2 shall comply with the applicable provisions of Article 501.

x(b) Wiring and Equipment — Vapors and Residues. Unless specifically listed for locations containing deposits of dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits (as applicable), there shall be no electrical equipment in any spray area as herein defined whereon deposits of combustible residue may readily accumulate, except wiring in rigid metal conduit, intermediate metal conduit, Type MI cable, or in metal boxes or fittings containing no taps, splices, or terminal connections.

(c) Illumination. Illumination of readily ignitable areas through panels of glass or other transparent or translucent material shall be permitted only if it complies with the following:

1. Fixed lighting units are used as the source of illumination;
2. The panel effectively isolates the Class I location from the area in which the lighting unit is located;
3. The lighting unit is approved for its specific location;
4. The panel is of a material or is protected so that breakage will be unlikely; and
5. The arrangement is such that normal accumulations of hazardous residue on the surface of the panel will not be raised to a dangerous temperature by radiation or conduction from the source of illumination.

x(d) Portable Equipment. Portable electric lamps or other utilization equipment shall not be used in a spray area during spray operations.

Exception No. 1: Where portable electric lamps are required for operations in spaces not readily illuminated by fixed lighting within the spraying area, they shall be of the type approved for Class I, Division 1 locations where readily ignitable residues may be present.

Exception No. 2: Where portable electric drying apparatus are used in automobile refinishing spray booths and the following requirements are met.

a. The apparatus and its electrical connections are not located within the spray enclosure during spray operations.

b. Electrical equipment within 18 in. (45.7 cm) of the floor is approved for Class I, Division 2 locations.

c. All metallic parts of the drying apparatus are electrically bonded and grounded.

d. Interlocks are provided to prevent the operation of spray equipment while drying apparatus is within the spray enclosure, to allow for a 3-minute purge of the enclosure before energizing the drying apparatus, and to shut off drying apparatus on failure of ventilation system.

(e) Electrostatic Equipment. Electrostatic spraying or detearing equipment shall be installed and used only as provided in Section 516.8.

FPN: For further information, see NFPA 33, Standard for Spray Application Using Flammable and Combustible Materials, 1995 edition.

516.5. Wiring and Equipment Embedded, Underslab, or Underground. (RESERVED)

516.6. Sealing (RESERVED)

516.7. Wiring and Equipment Not Within Class I and II Locations.

(a) Wiring. All fixed wiring above the Class I and II locations shall be in metal raceways, rigid nonmetallic conduit, or electrical nonmetallic tubing, or shall be Type MI, TC, or MC cable. Cellular metal floor raceways shall be permitted only for supplying ceiling outlets or extensions to the area below the floor of a Class I or II location, but such raceways shall have no connections leading into or through the Class I or II location above the floor unless suitable seals are provided.

(b) Equipment. Equipment that may produce arcs, sparks, or particles of hot metal, such as lamps and lampholders for fixed lighting, cutouts, switches, receptacles, motors, or other equipment having make-and-break or sliding contacts, where installed above a Class I or II location or above a location where freshly finished goods are handled, shall be of the totally enclosed type or be constructed so as to prevent the escape of sparks or hot metal particles.

x516-9. Special Equipment.

(a) Fixed Electrostatic Equipment. This section shall apply to any equipment using electrostatically charged elements for the atomization, charging, and/or precipitation of hazardous materials

for coatings on articles or for other similar purposes in which the charging or atomizing device is attached to a mechanical support or manipulator. This shall include robotic devices. This section shall not apply to devices that are held or manipulated by hand. Where robot or programming procedures involve manual manipulation of the robot arm while spraying with the high voltage on, the provisions of Section 516.5 shall apply. The installation of electrostatic spraying equipment shall comply with Sections 516.4(a) through (j). Spray equipment shall be listed or approved. All automatic electrostatic equipment systems shall comply with Section 516.4(a) through (i).

(1) Power and Control Equipment. Transformers, high-voltage supplies, control apparatus, and all other electric portions of the equipment shall be installed outside of the Class I location as defined in Section 516.2 or be of a type approved for the location.

Exception: High-voltage grids, electrodes, electrostatic atomizing heads, and their connections shall be permitted within the Class I location.

(2) Electrostatic Equipment. Electrodes and electrostatic atomizing heads shall be adequately supported in permanent locations and shall be effectively insulated from ground. Electrodes and electrostatic atomizing heads that are permanently attached to their bases, supports, reciprocators, or robots shall be deemed to comply with this section.

(3) High-Voltage Leads. High-voltage leads shall be properly insulated and protected from mechanical damage or exposure to destructive chemicals. Any exposed element at high voltage shall be effectively and permanently supported on suitable insulators and shall be effectively guarded against accidental contact or grounding.

(4) Support of Goods. Goods being coated using this process shall be supported on conveyors or hangers. The conveyors or hangers shall be arranged to (1) ensure that the parts being coated are electrically connected to ground with a resistance of 1 megohm or less and (2) to prevent parts form swinging.

(5) Automatic Controls. Electrostatic apparatus shall be equipped with automatic means that will rapidly deenergize the high-voltage elements under any of the following conditions:

a. Stoppage of ventilating fans or failure of ventilating equipment from any cause.

b. Stoppage of the conveyor carrying goods through the high-voltage field unless stoppage is required by the spray process.

c. Occurrence of excessive current leakage at any point in the high-voltage system.

d. Deenergizing the primary voltage input to the power supply.

(6) Grounding. All electrically conductive objects in the spray area, except those objects required by the process to be at high voltage, shall be adequately grounded. This requirement shall apply to paint containers, wash cans, guards, hose connectors, brackets, and any other electrically conductive objects or devices in the area.

(7) Isolation. Safeguards such as adequate booths, fencing, railings, interlocks, or other means shall be placed about the equipment or incorporated therein so that they, either by their location or character, or both, ensure that a safe separation of the process is maintained.

(8) Signs. Signs shall be conspicuously posted to.

a. Designate the process zone as dangerous with regard to fire and accident,

b. Identify the grounding requirements for all electrically conductive objects in the spray area, and

c. Restrict access to qualified personnel only.

(9) Insulators. All insulators shall be kept clean and dry.

(10) Other Than Nonincendive Equipment. Spray equipment that cannot be classified as nonincendive shall comply with (1) and (2).

a. Conveyors or hangers shall be arranged so to maintain a safe distance of at least twice the sparking distance between goods being painted and electrodes, electrostatic atomizing heads, or charged conductors. Warnings defining this safe distance shall be posted.

b. The equipment shall provide an automatic means of rapidly deenergizing the high-voltage elements in the event the distance between the goods being painted and the electrodes or electrostatic atomizing heads falls below that specified in (1).

c. Electrostatic Hand-Spraying Equipment. This section shall apply to any equipment using electrostatically charged elements for the atomization, charging, and/or precipitation of materials for coatings on articles, or for other similar purposes in which the atomizing device is hand held or manipulated during the spraying operation. Electrostatic hand-spraying equipment and devices used in connection with paint-spraying operations shall be of approved types and shall comply with Sections 516.5(a) through (e).

(1) General. The high-voltage circuits shall be designed so as not to produce a spark of sufficient intensity to ignite the most readily ignitable of those vapor-air mixtures likely to be encountered, no result in appreciable shock hazard upon coming in contact with a grounded object under all normal operating conditions. The electrostatically charged exposed elements of the hand gun shall be capable of being energized only by an actuator that also controls the coating material supply.

(2) Power Equipment. Transformers, power packs, control apparatus, and all other electric portions of the equipment shall be located outside of the Class I location or be approved for the location.

Exception: The hand gun itself and its connections to the power supply shall be permitted within the Class I location.

(3) Handle. The handle of the spraying gun shall be electrically connected to ground by a metallic connection and be constructed so that the operator in normal operating position is in intimate electrical contact with the grounded handle to prevent buildup of a static charge on the operator's body. Signs indicating the necessity for grounding other persons entering the spray area shall be conspicuously posted.

(4) Electrostatic Equipment. All electrically conductive objects in the spraying area shall be adequately grounded. This requirement shall apply to paint containers, wash cans, and any other electrical conductive objects or devices in the area. The equipment shall carry a prominent, permanently installed warning regarding the necessity for this grounding feature.

(5) Support of Objects. Objects being painted shall be maintained in metallic contact with the conveyor or other grounded support. Hooks shall be regularly cleaned to ensure adequate grounding of 1 megohm or less. Areas of contact shall be sharp points or knife edges where possible. Points of support of the object shall be concealed from random spray where feasible; and, where the objects being sprayed are supported from a conveyor, the point of attachment to the conveyor shall be located so as to not collect spray material during normal operation.

c. Powder Coating. This section shall apply to processes in which combustible dry powders are applied. The hazards associated with combustible dusts are present in such a process to a degree, depending on the chemical composition of the material, particle size, shape, and distribution.

FPN: The hazards associated with combustible dusts are inherent in this process. Generally speaking, the hazard rating of the powders employed depends on the chemical composition of the material, particle size, shape, and distribution.

(1) Electric Equipment and Sources of Ignition. Electric equipment and other sources of ignition shall comply with the requirements of Article 502. Portable electric lamps and other utilization equipment shall not be used within a Class II location during operation of the finishing processes. Where such lamps or utilization equipment are used during cleaning or repairing operations, they shall be of a type approved for Class II, Division 1 locations, and all exposed metal parts shall be effectively grounded.

Exception: Where portable electric lamps are required for operations in spaces not readily illuminated by fixed lighting within the spraying area, they shall be of the type approved for Class II, Division 1 locations where readily ignitable residues may be present.

(2) Fixed Electrostatic Spraying Equipment. The provisions of Sections 516.4 and 516.6(a) shall apply to fixed electrostatic spraying equipment.

(3) Electrostatic Hand-Spraying Equipment. The provisions of Section 516.5 and Section 516.6(a) shall apply to electrostatic hand-spraying equipment.

(4) Electrostatic Fluidized Beds. Electrostatic fluidized beds and associated equipment shall be of approved types. The high-voltage circuits shall be designed so that any discharge produced when the charging electrodes of the bed are approached or contacted by a grounded object shall not be of sufficient intensity to ignite any powder-air mixture likely to be encountered nor to result in an appreciable shock hazard.

a. Transformers, power packs, control apparatus, and all other electric portions of the equipment shall be located outside the powder-coating area or shall otherwise comply with the requirements of Section 516.6(a).

Exception: The charging electrodes and their connections to the power supply shall be permitted within the powder-coating area.

b. All electrically conductive objects within the powder-coating area shall be adequately grounded. The powder-coating equipment shall carry a prominent, permanently installed warning regarding the necessity for grounding these objects.

c. Objects being coated shall be maintained in electrical contact (less than 1 megohm) with the conveyor or other support in order

to ensure proper grounding. Hangers shall be regularly cleaned to ensure effective electrical contact. Areas of electrical contact shall be sharp points or knife edges where possible.

d. The electric equipment and compressed air supplies shall be interlocked with a ventilation system so that the equipment cannot be operated unless the ventilating fans are in operation.

516.9. through 516.15. (RESERVED)

516.16. Grounding. All metal raceways, the metal armors or metallic sheath on cables, and all noncurrent-carrying metal parts of fixed or portable electrical equipment, regardless of voltage, shall be grounded as provided in Article 250. Grounding in Class I locations shall comply with Section 501.16.

SUBSTANTIATION: This proposal is the work of a Task Group including Donny Cook, Fred Walker, Gordon Johnson, Don Zipsi, Mark Goodman, Kevin Earley, Mark Ode, Bob Benedetti, and Richard Hild. The Task Group was not balloted. The purpose of this proposal is to provide parallel numbering from Article 511 through 516 to comply with Section 2.4.1 of the NEC Style Manual.

PANEL ACTION: Accept in Principle.

Renumber 516-9 to 516-10. Delete 516-5, 516-6, and 516-9 through 516-15 (RESERVED).

PANEL STATEMENT: Proposal 14-420 addresses this issue. The minor changes implement a standardized numbering format for Articles 511 through 516.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1656)

14- 488 - (516-2(e)): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise first paragraph to read as follows:

Locations using drying, curing, or fusion apparatus and provided with positive mechanical ventilation adequate to prevent accumulation of flammable concentrations of vapors, and provided with effective interlocks to deenergize all electrical equipment (other than equipment ~~approved~~ (identified) for Class I locations) in case the ventilating equipment is inoperative, shall be permitted to be unclassified where the authority having jurisdiction so judges.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3600)

14- 489 - (516-2(e)): Accept

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise the first paragraph to read as follows:

"Locations using drying, curing, or fusion apparatus and provided with positive mechanical ventilation adequate to prevent accumulation of flammable concentrations of vapors, and provided with effective interlocks to de-energize all electrical equipment (other than equipment ~~approved~~ (identified) for Class I locations) in case the ventilating equipment is inoperative, shall be permitted to be unclassified where the authority having jurisdiction so judges."

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Earley, Saban

(Log #1937)

14- 490 - (516-3(b) Exception No. 2 (b)): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise to read as follows:

Electrical equipment within 18 in. (45.7 cm) of the floor is ~~approved~~ identified for Class I, Division 2 locations.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #1657)

14- 491 - (516-3(c)): Accept

SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI

RECOMMENDATION: Revise to read as follows:

The lighting unit is ~~approved~~ (identified) for its specific location;.

SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.

PANEL ACTION: Accept.

PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:

ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

COMMENT ON AFFIRMATIVE:

WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3601)

14- 492 - (516-3(c)(3)): Accept

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

"The lighting unit is ~~approved~~ (identified) for its specific location;"

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1938)

14- 493 - (516-3(d) Exception No. 1): Accept
SUBMITTER: Donald R. Cook, Shelby County Building Insp., AL/Rep. Southern Section, IAEI
RECOMMENDATION: Revise as follows:
Exception No. 1: Where portable electric lamps are required for operations in spaces not readily illuminated by fixed lighting within the spraying area, they shall be of the type ~~approved~~ (identified) for Class I, Division 1 locations where readily ignitable residues may be present.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval o the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3602)

14- 494 - (516-3(d) Exception No. 1): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
Exception No. 1: Where portable electric lamps are required for operations in spaces not readily illuminated by fixed lighting within the spraying area, they shall be of the type ~~approved~~ (identified) for Class I, Division 1 locations where readily ignitable residues may be present.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #3603)

14- 495 - (516-3(d) Exception No. 2 (b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the Exception to read as follows:
"Electrical equipment within 18 in. (45.7 cm) of the floor is ~~approved~~ (identified) for Class I, Division 2 locations."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2735)

14- 496 - (516-4): Accept in Part
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise the sixth sentence to read:
"Spray equipment shall be listed or ~~approved~~ (identified).
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete the word "approved"
PANEL STATEMENT: There is no need to use the word "approved", because NFPA 33 requires this spray equipment to be listed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3605)

14- 497 - (516-4): Accept in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the sixth sentence to read as follows:
"Spray equipment shall be listed or ~~approved~~ (identified)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Part.
Delete the word "approved"
PANEL STATEMENT: There is no need to use the word "approved", because NFPA 33 requires this spray equipment to be listed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban

EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2734)

14- 498 - (516-4(a)): Accept
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise text to read as follows:
"Transformers, high-voltage supplies, control apparatus, and all other electric portions of the equipment shall be installed outside of the Class I location as defined in Section 516-2 or be of a type ~~approved~~ (identified) for the location."
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3604)

14- 499 - (516-4(a)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"Transformers, high-voltage supplies, control apparatus, and all other electric portions of the equipment shall be installed outside of the Class I location as defined in Section 516-2 or be or a type ~~approved~~ (identified) for the location."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2737)

14- 500 - (516-5): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise the second sentence to read:
"Electrostatic hand-spraying equipment and devices used in connection with paint-spraying operations shall be of ~~approved~~ (identified) types and shall comply with Sections 516-5(a) through (e)."
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed hand-held spray equipment is available and required by NFPA 33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3607)

14- 501 - (516-5): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the second sentence to read as follows:
"Electrostatic hand-spraying equipment and devices used in connection with paint-spraying operations shall be of ~~approved~~ (identified) types and shall comply with Sections 516-5(a) through (e)."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed hand-held spray equipment is available and required by NFPA 33.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2736)

14- 502 - (516-5(b)): Accept
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise text to read as follows:
"Transformers, power packs, control apparatus, and all other electric portions of the equipment shall be located outside of the Class I location or be ~~approved~~ (identified) for the location."
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3606)

14- 503 - (516-5(b)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
"Transformers, power packs, control apparatus, and all other electric portions of the equipment shall be located outside of the Class I location or be ~~approved~~ (identified) for the location."

SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #1796)

14- 504 - (516-6, FPN): Accept
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Delete the FPN.
SUBSTANTIATION: The FPN is redundant as most of the language in the FPN is also in the main text of the Section. FPN's are supposed to be explanatory, but no explanation is provided here other than repeating the code text.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

(Log #2740)

14- 505 - (516-6, Exception): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise the fifth paragraph to read:
Exception: Where portable electric lamps are required for operations in spaces not readily illuminated by fixed lighting within the spraying area, they shall be of the type ~~approved~~ (identified) for Class II, Division 1 locations where readily ignitable residues may be present.
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed electrical lamps are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3610)

14- 506 - (516-6, Exception): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the fifth paragraph to read as follows:
Exception: Where portable electric lamps are required for operations in spaces not readily illuminated by fixed lighting within the spraying area, they shall be of the type ~~approved~~ (identified) for Class II, Division 1 locations where readily ignitable residues may be present.
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed electrical lamps are readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2738)

14- 507 - (516-6(a)): Accept in Principle
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise the third sentence to read:
"Where such lamps or utilization equipment are used during cleaning or repairing operations, they shall be of a type ~~approved~~ (identified) for Class II, Division 1 locations, and all exposed metal parts shall be effectively grounded."
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed utilization equipment is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3608)

14- 508 - (516-6(a)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the third sentence to read as follows:
"Where such lamps or utilization equipment are used during cleaning or repairing operations, they shall be of a type ~~approved~~ (identified) for Class II, Division 1 locations, and all exposed metal parts shall be effectively grounded."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept in Principle.
Change "approved" to "listed".
PANEL STATEMENT: Listed utilization equipment is readily available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #2739)

14- 509 - (516-6(d)): Accept
SUBMITTER: Donald R. Cook, Southern Section, IAEI
RECOMMENDATION: Revise the first sentence to read:
"Electrostatic fluidized beds and associated equipment shall be of ~~approved~~ (identified) types."
SUBSTANTIATION: If approved is the desired requirement of CMP 14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.
COMMENT ON AFFIRMATIVE:
WECHSLER: See my Comment on Affirmative Vote on Proposal 14-13.

(Log #3609)

14- 510 - (516-6(d)): Accept
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise the first sentence to read as follows:
"Electrostatic fluidized beds and associated equipment shall be of ~~approved~~ (identified) types."
SUBSTANTIATION: If approved is the desired requirement of CMP-14, it is already required by Section 110-2. If the panel desires that this equipment, or technique be suitable for some specific purpose, then "identified" would be a more accurate term, based on Article 100, NEC definitions. The authority having jurisdiction would have no basis for approval of the equipment or technique unless it was suitable for the specific purpose.
PANEL ACTION: Accept.
PANEL STATEMENT: Acceptance of this proposal is contingent upon acceptance of the Fine Print Note to the definition of "Identified" in Proposal 14-4a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Earley, Saban
EXPLANATION OF NEGATIVE:
ZIPSE: See my Explanation of Negative Vote on Proposal 14-13.

(Log #926)

14- 511 - (516-16): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Grounding. All metal raceways, the metal armor or metallic sheath on cables, and all exposed noncurrent-carrying metal parts of fixed or portable electrical equipment likely to become energized, regardless of voltage, shall be grounded. ~~As provided in Article 250.~~ Grounding in Class 1 and Class 2 locations shall comply with Sections 501-16 and 502-16, respectively.
SUBSTANTIATION: If a metal part is not subject to contact such as internal isolated parts, grounding of such parts does not seem necessary. "Exposed" and "likely to be" are conditions of other sections. It has been interpreted by some that "as provided in Article 250" includes provisions in that article which permit nongrounding and I believe that is technically correct. However, the tenor of this section seems to require grounding. If that is the intent, the proposal provides clarification.
If it is felt necessary to note Section 501-16, Section 502-16 should also be noted.
PANEL ACTION: Accept in Part.
Add "and Class II" where indicated and add "and 502-16, respectively" where indicated.
PANEL STATEMENT: Non-current carrying metal parts are required to be grounded to facilitate opening of the protective device. In addition, there is the concern of static electricity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Earley, Saban

ARTICLE 517 — HEALTH CARE FACILITIES

(Log #1082)

17- 3 - (517): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 517 as follows:
517-14 - change "No. 10" to "10 AWG"
517-19(c) - change "No. 10" to "10 AWG"
517-74(b) - change "No. 18 or No. 16" to "18 or 16 AWG".
SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1275)

17- 4 - (517): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 517-3 definition of Patient Vicinity replace "6 ft (1.83 m)" with "1.8 m (6 ft)"
2. In Section 517-3 definition of Patient Vicinity replace "7 1/2 ft (2.29 m)" with "2.3 m (7 1/2 ft)"
3. In Section 517-13(a) Ex. No. 3 replace "7 1/2 ft (2.2 m)" with "2.3 m (7 1/2 ft)"
4. In Section 517-30(c)(3) Ex. No. 4 replace "2 in. (50.8 mm)" with "50 mm (2 in.)"
5. In Section 517-34(b)(1) Ex. (a) replace "+20°F (-6.7°C)" with "-6.7°C (20°F)"
6. In Section 517-34(b)(1) Ex. (b) replace "+20°F (-6.7°C)" with "-6.7°C (20°F)"
7. In Section 517-43(b)(1) Ex. (a) replace "+20°F (-6.7°C)" with "-6.7°C (20°F)"
8. In Section 517-43(b)(1) Ex. (b) replace "+20°F (-6.7°C)" with "-6.7°C (20°F)"
9. In Section 517-60(a)(1) replace "5 ft (1.52 m)" with "1.52 m (5 ft)"
10. In Section 517-61(a)(7) replace "3 in. (76 mm)" with "75 mm (3 in.)"
11. In Section 517-61(c)(1) Ex. replace "6 ft (1.83 m)" with "1.8 m (6 ft)"
12. In Section 517-63(b)(3) replace "8 ft (2.44 m)" with "2.5 m (8 ft)"
13. In Section 517-63(c)(1) replace "8 ft (2.44 m)" with "2.5 m (8 ft)"
SUBSTANTIATION: The proposed revisions are intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units. For those conversions involving extracted materials, the numeric values were not rounded and only the order in which the units appear was changed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2158)

17- 5 - (517-1): Accept in Principle

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

The provisions of this article shall apply to electrical construction and installation criteria in human health care facilities.

~~FPN No. 1: This article is not intended to apply to veterinary facilities.~~

FPN ~~No. 2:~~ For information concerning performance...

SUBSTANTIATION: This change will allow for the elimination of FPN No. 1.

The Foreward to the NEC Style Manual states, "It is vitally important that the text be as explicit as possible...". The Style Manual also states in 3.1.3 Fine Print Notes, "Fine Print Notes contain explanatory information."

If a FPN is needed to ensure that veterinary facilities are not intended, then it would be more explicit to so state in the basic rule by adding the word "human."

PANEL ACTION: Accept in Principle.

Revise the submitter's recommedation to read as follows:

Revise as follows:

The provisions of this article shall apply to electrical construction and installation criteria in health care facilities providing services to human beings.

~~FPN No. 1: This article is not intended to apply to veterinary facilities.~~

FPN ~~No. 2:~~ For information concerning performance...

PANEL STATEMENT: The revised text is consistent with the scope of NFPA 99 and meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2804)

17- 6 - (517-1): Reject

SUBMITTER: Bud Swathwood, Bud Swathwood Consulting

RECOMMENDATION: Add to the sentence, after the word facilities to read:

including chiropractic clinics.

SUBSTANTIATION: It has been a long time argument that chiropractic methods are not medical treatments. The examining rooms in these clinics should follow the same rules as all medical clinics for the redundant grounding wiring method. The argument is a fact that the "patients" are examined and treated in examining rooms and many times with equipment meeting NEC 517-2 and 517-13; and also the definition in 517-3 "Health Care Facilities and patient care areas."

PANEL ACTION: Reject.

PANEL STATEMENT: The term "chiropractic" is not defined in the NEC or in NFPA 99 and the need for compliance with Article 517 depends on the type of service being provided.

The definition of "health care facilities" is the responsibility of NFPA 99 not the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1701)

17- 6a - (517-2, 517-3): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.The Technical Correlating Committee understands the actions in Proposal 17-5 further modify the recommendation.

SUBMITTER: CMP 17

RECOMMENDATION: Modify 517-2 as follows:

Delete the section number a section title, "517-2 General," and insert the section text after the first sentence of 517-1.

Renumber existing 517-3 as 517-2.

517-1, 2 and 3 will read as follows:

"517-1. Scope

The provisions of this article shall apply to electrical construction and installation criteria in health care facilities. The requirements in Parts B and C apply not only to single-function buildings, but are also intended to be individually applied to their respective forms of occupancy within a multifunction building (e.g., a doctor's examining room located within a limited care facility would be required to meet the provisions of Section 517-10).

FPN No. 1: This article is not intended to apply to veterinary facilities.

FPN No. 2: For information concerning performance, maintenance, and testing criteria, refer to the appropriate health care facilities documents.

517-2. Definitions

[The definitions are unchanged by this proposal.]

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Definitions are required to be in 517-2.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

COMMENT ON AFFIRMATIVE:

STEPLOWSKI: The panel's recommendation in this proposal should incorporate the revisions as accepted in Proposal 17-5. It should read as follows:

Modify 517-2 as follows:

Delete the section number and section title, "517-2 General," and insert the section text after the first sentence of 517-1.

Renumber existing 517-3 as 517-2.

517-1 and 517-2 will read as follows:

517-1 Scope. The provisions of this article shall apply to electrical construction and installation criteria in health care facilities providing services to human beings. The requirements in Parts B and C apply not only to single-function buildings, but are also intended to be individually applied to their respective forms of occupancy within a multifunction building (e.g., a doctor's examining room located within a limited care facility would be required to meet the provisions of Section 517-10).

FPN: For information concerning performance, maintenance, and testing criteria, refer to the appropriate health care facilities documents.

517-2. Definitions

(The definitions are unchanged by this proposal).

(Log #1527)

17- 7 - (517-3): Accept in Principle

SUBMITTER: Victor V. Timpanaro, Old Bridge , NJ

RECOMMENDATION: Add wording "psychiatric" to list of items identified in a building or portion of a building. Should be "TIA."

SUBSTANTIATION: NFPA 99 on page 99-18 of the standard includes "psychiatric" as a health care facility. To keep consistency between NFPA 70 and NFPA 99. This wording should be included.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action on Proposal 17-11 which now includes the term "psychiatric" accomplishing the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2148)

17- 8 - (517-3): Reject

SUBMITTER: Behzad Eghtesady, City of Los Angeles, CA

RECOMMENDATION: Revise the text to read:

Patient Bed Location: The location of an inpatient sleeping bed; or the bed or procedure table used in a crtical or general patient care area.

SUBSTANTIATION: The current definition does not include "general" patient care areas. This causes a problem in section 517-18 which makes numerous referances to such an area. This revision will clarify that the definition of "Patient Bed Location" includes "general" patient care areas and eliminates any confusion that may arise from the current code definition.

PANEL ACTION: Reject.

PANEL STATEMENT: The current text is clear as written and is consistent with NFPA 99. The procedure tables intended to be included are only those in critical care areas.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1734)
17- 8a - (517-3 Ambulatory Health Care Center): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise the title of the defined term "Ambulatory Health Care Center" to "Ambulatory Health Care Facility"
SUBSTANTIATION: The revision is made to correlate with the term in NFPA 99-1999.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1392)
17- 9 - (517-3-Anesthetizing Location): Accept in Part
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise to read as follows:
Anesthetizing Location. Any area of a ~~health care~~ facility that has been designated to be used for the administration of ~~flammable or~~ nonflammable inhalation anesthetic agents in the course of examination or treatment, including the use of such agents for relative analgesia.
SUBSTANTIATION: NFPA has developed a glossary of standard terms that are used in all of its codes and standards. One of the goals of the glossary project is to provide a single consistent definition for each term that can be used in each code or standard in which the term is used. In this instance, the preferred definition can be found in NFPA 99. This proposal recommends using that definition.
PANEL ACTION: Accept in Part.
Revise the submitter's recommendation to read as follows:
Revise to read as follows:
Anesthetizing Location. Any area of a ~~health care~~ facility that has been designated to be used for the administration of any flammable or nonflammable inhalation anesthetic agent in the course of examination or treatment, including the use of such agents for relative analgesia.
PANEL STATEMENT: The panel rejects the elimination of "flammable." While the panel understands the desire to correlate with NFPA 99, the definition in the NEC needs to be different. Flammable agents are still used in many parts of the world where the NEC is used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1393)
17- 10 - (517-3-Emergency System): Accept in Principle
Note: The Technical Correlating Committee directs the Panel to reconsider the Proposal and clarify if emergency systems in this Article are intended to modify Article 700. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise to read:
Emergency System. A system of ~~feeders and branch~~ circuits and equipment meeting the requirements of Article 700, except as amended by Article 517, intended to supply alternate power to a limited number of prescribed functions vital to the protection of life and ~~patient~~ safety ~~with automatic restoration of electrical power within 10 seconds of power interruption.~~
SUBSTANTIATION: NFPA has developed a glossary of standard terms that are used in all of its codes and standards. One of the goals of the glossary project is to provide a single consistent definition for each term that can be used in each code or standard in which the term is used. In this instance, the preferred definition can be found in NFPA 99. This proposal recommends using that definition. In addition, it should be noted that the existing definition contains a requirement (within 10 seconds). If this requirement is not covered elsewhere and it is needed, CMP 17 should add it to the body of Article 517.
PANEL ACTION: Accept in Principle.
Replace the definition of emergency system with that in NFPA 99 to read as follows:
"Emergency System. A system of circuits and equipment intended to supply alternate power to a limited number of prescribed functions vital to the protection of life and safety."
PANEL STATEMENT: This correlates the definition exactly with that in NFPA 99. Reference to requirements in other articles is not appropriate in a definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1729)
17- 10a - (517-3 Equipment System): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise the definition of equipment system to read as follows:
"Equipment System. A system of circuits and equipment arranged for delayed, automatic, or manual connection to the alternate power source and that serves primarily 3-phase power equipment."
SUBSTANTIATION: The text has been revised to correlate with NFPA 99-1999, Chapter 2 definitions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1394)
17- 11 - (517-3-Health Care Facilities): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise to read as follows:
Health Care Facilities. Buildings or portions of buildings in which medical, dental, psychiatric, nursing, obstetrical, or surgical care are provided. Health care facilities include, but are not limited to, hospitals, nursing homes, limited care facilities, clinics, medical and dental offices, and ambulatory care centers, whether permanent or movable.
SUBSTANTIATION: NFPA has developed a glossary of standard terms that are used in all of its codes and standards. One of the goals of the glossary project is to provide a single consistent definition for each term that can be used in each code or standard in which the term is used. In this instance, the preferred definition can be found in NFPA 99.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #927)
17- 12 - (517-3-Isolated Power Systems): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Isolated Power Systems. ~~A~~ An ungrounded system comprising an isolating transformer or its equivalent, a line isolation monitor, and its ungrounded circuit conductors.
Isolation Transformer. A transformer of the multiple winding type, with the primary and secondary windings physically separated, with an ungrounded secondary, which inductively couples its secondary winding to the grounded feeder systems that energize its primary winding.
SUBSTANTIATION: An ungrounded system and secondary must be assumed by perceived intent of other sections. However, this is not specified in the definitions. An isolated power system could have ungrounded circuit conductors with system grounding (no grounded circuit conductor). The definition of isolation transformer could apply to any transformer with separated primary

and secondary windings even where the secondary is grounded, such as required in Section 250-30.

The proposal for isolated power systems would encompass those served by battery or generator power sources permitted by Section 517-160.

Acceptance of this proposal would clarify the word "isolated" used in other sections.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed change in the first definition is redundant. As written, the system includes the ungrounded circuit conductors.

These are the same definitions as in NFPA 99. The panel does not want to deviate from NFPA 99 unless there is a compelling reason.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1395)

17- 13 - (517-3-Reference Grounding Point): Reject

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise to read as follows:

Reference Grounding Point. A terminal bus that is the equipment grounding bus, or an extension of the equipment grounding bus, and is a convenient collection point for installed grounding wires or other bonding wires where used.

SUBSTANTIATION: NFPA has developed a glossary of standard terms that are used in all of its codes and standards. One of the goals of the glossary project is to provide a single consistent definition for each term that can be used in each code or standard in which the term is used. In this instance, the preferred definition can be found in NFPA 99.

PANEL ACTION: Reject.

PANEL STATEMENT: The reference grounding point is a construction requirement and, therefore, should be defined by the NEC. It is suggested that NFPA 99 extract its definition from the NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2492)

17- 14 - (517-13 Exception No. 3): Reject

SUBMITTER: Lynn Adams, Escambia County, FL

RECOMMENDATION: Revise as follows:

Exception No. 3: Light fixtures more than 7 1/2 ft above the floor and switches located outside of the patient vicinity shall ~~not~~ be required to be grounded by an insulated grounding conductor, or a metal raceway, or listed Types MI, MC, or AC cables; provided the outer metal armor sheath of the cable is identified as an acceptable grounding return path.

SUBSTANTIATION: As written the exception requires metal raceway as the only approved means of grounding fixtures or switches outside the patient care area. The intent may be to allow 517-13(a) Exception No. 1 or 517-13(b) to apply and allow this type of grounding; however the rule as written does not. If this is the intent it would be more clearly stated in the paragraph dealing with light fixtures in that area.

PANEL ACTION: Reject.

PANEL STATEMENT: As written 517-13(a) requires metal raceways and an insulated grounding conductor. The intent of Exception No. 3 is to allow the redundancy of the insulated ground conductor to be optional. For light fixtures more than 71/2 ft above the floor and switches located outside of the patient vicinity 517-13(a) and 517-13(a) Exception No. 1 can be applied to have either metal raceways or listed Types MI, MC, or AC cables used. The proposed revision would allow non-metallic raceways or non-metallic cables to be used which is not intended.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3878)

17- 15 - (517-13(a) and (b)): Accept in Principle

SUBMITTER: J. Philip Simmons, Olympia, WA

RECOMMENDATION: Revise text to read as follows:

(a) Patient Care Area. Wiring in patient care areas shall comply with (1) and (2) below.

(1) Wiring Methods. All branch circuits serving patient care areas shall be provided with a ground path for fault current by installation in a metal raceway system, or a cable armor or sheath assembly that qualifies as an equipment grounding return path in accordance with Section 250-118. Type AC, Type MC, Type MI cables shall have an outer metal armor or sheath that is identified as an acceptable grounding return path in accordance with Section 250-118.

(2) Insulated Equipment Grounding Conductor. In areas used for patient care, the grounding terminals of all receptacles and all noncurrent-carrying conductive surfaces of fixed electric equipment likely to become energized that are subject to personal contact, operating at over 100 volts, shall be grounded by an insulated copper conductor. The grounding conductor shall be sized in accordance with Table 250-122 and installed in the metal raceways or metal-clad cables with the branch-circuit conductors supplying these receptacles or fixed equipment.

Exception No. 1: ~~Metal raceways shall not be required where listed Types MI, MC, or AC cables are used, provided the outer metal armor or sheath of the cable is identified as an acceptable grounding return path.~~

~~Exception No. 2:~~ Metal faceplates shall be permitted to be grounded by means of a metal mounting screw(s) securing the faceplate to a grounded outlet box or grounded wiring device.

Exception No. 2~~3~~: Light fixtures more than 7 1/2 ft (2.2 m) above the floor and switches located outside of the patient vicinity shall not be required to be grounded by an insulated equipment grounding conductor.

~~(b) Methods. In addition to the requirements of Section 517-13(a), all branch circuits serving patient care areas shall be provided with a ground path for fault current by installation in a metal raceway system or cable assembly. The metal raceway system, or cable armor or sheath assembly, shall itself qualify as an equipment grounding return path in accordance with Section 250-118. Type MC cable and Type MI cable shall have an outer metal armor or sheath that is identified as an acceptable grounding return path.~~

SUBSTANTIATION: Editorial revisions to organize this section to emphasize the wiring method is intended to provide the primary equipment ground-fault path and the insulated equipment grounding conductor provides the secondary path. This concept has been repeatedly emphasized by CMP-17 over several Code cycles. With this organization of this section, Exception No. 1 is not needed as the requirement for the construction of metal-clad cables is in the basic rule.

PANEL ACTION: Accept in Principle.

Revise the submitter's recommendation to read as follows:

Revise text to read as follows:

517-13 Grounding of Receptacles and Fixed Electric Equipment in Patient Care Areas.

(a) Patient Care Area. Wiring in patient care areas shall comply with (1) and (2) below.

(1) Wiring Methods. All branch circuits serving patient care areas shall be provided with a ground path for fault current by installation in a metal raceway system, or a cable armor or sheath assembly that itself qualifies as an equipment grounding return path in accordance with Section 250-118. Type AC, Type MC, Type MI cables shall have an outer metal armor or sheath that is identified as an acceptable grounding return path. in accordance with Section 250-118.

(2) Insulated Equipment Grounding Conductor. In areas used for patient care, the grounding terminals of all receptacles and all noncurrent-carrying conductive surfaces of fixed electric equipment likely to become energized that are subject to personal contact, operating at over 100 volts, shall be grounded by an insulated copper conductor. The grounding conductor shall be sized in accordance with Table 250-122 and installed in the metal raceways or metal-clad cables with the branch-circuit conductors supplying these receptacles or fixed equipment.

Exception No. 1: ~~Metal raceways shall not be required where listed Types MI, MC, or AC cables are used, provided the outer metal armor or sheath of the cable is identified as an acceptable grounding return path.~~

~~Exception No. 2:~~ Metal faceplates shall be permitted to be grounded by means of a metal mounting screw(s) securing the faceplate to a grounded outlet box or grounded wiring device.

Exception No. 2~~3~~: Light fixtures more than 7 1/2 ft (2.2 m) above the floor and switches located outside of the patient vicinity shall not be required to be grounded by an insulated equipment grounding conductor.

~~(b) Methods. In addition to the requirements of Section 517-13(a), all branch circuits serving patient care areas shall be provided with a ground path for fault current by installation in a metal raceway system or cable assembly. The metal raceway system, or cable armor or sheath assembly, shall itself qualify as an equipment grounding return path in accordance with Section 250-118. Type MC cable and Type MI cable shall have an outer metal armor or sheath that is identified as an acceptable grounding return path.~~

PANEL STATEMENT: The text has been revised to comply with the NEC Style Manual and to delete redundant wording.

The panel disagrees with the submitter's substantiation in that it does not view the two paths as "primary"and "secondary". Rather it views them as two independent means of grounding.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3301)

17- 16 - (517-13(a) Exception No. 1): Reject

SUBMITTER: George A. Straniero, AFC Cable Systems

RECOMMENDATION: Revise Exception No. 1 as follows:

Exception No. 1: Metal raceways shall not be required where listed Types MI, MC, or AC cables are used, provided the outer metal armor or sheath of the cable is identified as an acceptable grounding return path, or where the combined metal sheath and grounding conductor of listed No. 14, 12 or 10 AWG interlocked Armor Type MC cable is used in lengths not exceeding 100 feet.

SUBSTANTIATION: The intent of 517-13(a), Exception No. 1, as stated by the panel in 98 ROC 17-6, is that the metal sheath or armor of these cables (interlocked armor Type MC cable) of itself shall provide a suitable mechanical grounding means. The metal sheath of interlocked armored Type MC cables, of it self, does provide a suitable mechanical grounding means in lengths not exceeding 100 feet.

A worst case condition for this construction is when a conductor to armor fault occurs at the midpoint of a cable circuit length. This condition would require the armor alone to serve the ground fault path. Where limited to a conservative circuit length of 100 feet the interlocked armor, of itself, provides a suitable mechanical grounding means.

The following schematic diagram of a worst case fault condition demonstrates that the fault current will split according to Kirchoff's Current Law. The fault current will split proportionally at the point of the fault based on the fault path resistance of each path. The two fault paths are as follows:

Fault path #1: Through the armor to the load side termination where the armor and the ground wire are bonded to form the combination armor and grounding conductor recognized in Section 250-118(11). The path continues through the ground conductor to the supply side termination.

Fault path #2: Through the armor to the supply side termination where the armor and the ground wire are bonded to form the combination armor and grounding conductor recognized in Section 250-118(11).

The maximum length of the fault path in order to clear a ground fault is given by the IAEI Soares Book on Grounding. Soares recommends a minimum desired fault current of 5 times the overcurrent device rating. Also recommended is a 50 volt drop to account for an arcing type of fault.

For a #12 AWG, 120 Volts, 20 ampere circuit; the maximum length of the fault path is determined by the impedance necessary to allow a fault current of 5 times the overcurrent device rating to flow through the fault path.

$$Z_T = \frac{\text{Circuit Voltage} \ — \ \text{Arc Voltage}}{5 \text{ X overcurrent device rating}}$$

$$Z_T = \frac{120 - 50}{5 \text{ x } 20} \quad Z = \ 0.7 \text{ Ohms}$$

For a 100 ft branch circuit the worst case impedance of fault path orginates at the midpoint of the cable. The impedance of the fault path is the parallel paths in each direction from the point of the fault.

For path #1 the impedance is that of 50 feet of the armor and 100 ft of the ground conductor.

$$Z\#1 = (L_{Armor} \text{ X } Z_{Armor}) + (L_{Conductor} \text{ X } Z_{Conductor})$$

$$Z\#1 = (50 \text{ ft x } 0.00617\Omega/\text{ft.}) + (100 \text{ ft X } .00162\Omega/\text{ft.}) = .471\Omega$$

For path #2 the impedance is that of 50 feet of the armor.

$$Z\#2 = (L_{Armor} \text{ X } Z_{Armor})$$

$$Z\#2 = (50 \text{ ft x } 0.00617\Omega/\text{ft.}) = 0.309\Omega$$

The total impedance of the parallel paths from the point of the fault at the midpoint of the cable is:

$$Z_{\text{Fault Path total}} = 1/(1/Z\#1 + 1/Z\#2) = 1/(1/.471 + 1/.309) = 0.187\ \Omega$$

The impedance of the cable fault path for the 100 ft cable with a fault at its midpoint is 01.87 Ω which is well within the maximum 0.7 Ω recommended by the IAEI Soare's Book on Grounding.

The worst case impedance of the mechanical grounding means for the 100 ft cable for #14, 12, and 10 AWG cables is as shown below and on the next page:

PANEL ACTION: Reject.

PANEL STATEMENT: The outer sheath of interlocked armor Type MC cable is not itself identified as an acceptable grounding path and therefore does not meet the conditions of Exception No. 1.

The intent is to have 2 independent grounding means; one being the outer metal armor or sheath itself, and the other being the insulated copper conductor.

The submitters substitution is in conflict with the UL guide information for interlocked metal tape sheath MC cable. The listing information for that type of MC cable requires a grounding conductor for all lengths.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

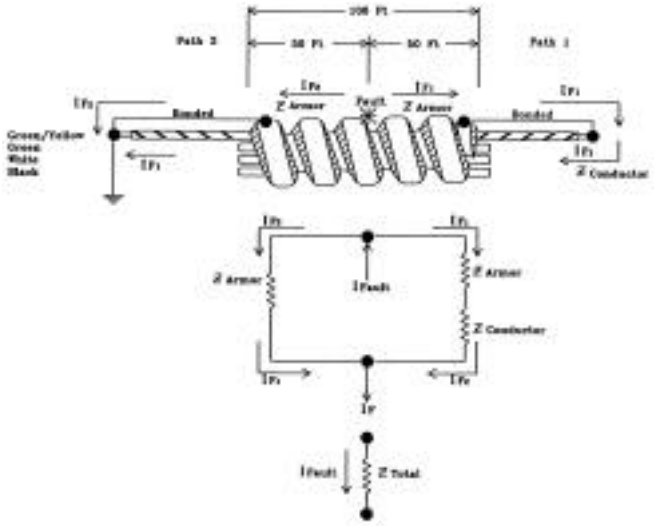
AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

Conductor Size	Conductor Impedance per Ft	Armor Impedance per Ft*	Impedance of 100 Ft Mechanical Fault Path	Soare's Maximum Recommended Fault Path Impedance
14	.00257Ω	.00671Ω	.214Ω	.933Ω
12	.00162Ω	.00617Ω	.187Ω	0.700Ω
10	.00102Ω	.00647Ω	.184Ω	0.467Ω

*Measured values of steel armor

The mechanical grounding means of the combined metal sheath and grounding conductor provides a suitable grounding means as demonstrated by providing a fault path impedance lower than that recommended by Soare's and by demonstrating that the metal sheath of interlocked armor Type MC cables, of itself, does provide a suitable mechanical grounding means in lengths not exceeding 100 feet.



(Log #4242)

17- 17 - (517-13(a) Exception No. 3): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:

Exception No. 3: Lighting fixtures more than 7 1/2 ft (2.29 m) above the floor in a patient care area and switches located outside of ~~the~~ a patient vicinity shall ~~not be required to be grounded by an insulated grounding conductor.~~ be permitted to utilize any of the types of equipment grounding conductors included in Sec. 250-118, and any of the wiring methods otherwise permitted for the location by Chapter 3 of this Code.

SUBSTANTIATION: When I cover this exception on the national seminar circuit, I refer to it as the "thanks for nothing" ex-ception. Much to my astonishment, instead of being a mistake, the panel actually confirmed the text as re-flecting the intent in the past cycle. This proposal takes a "thanks for nothing" meaningless exception and converts it to something useful. If the panel rejects this approach in this cycle, I will probably propose re-moving it in the 2005 cycle.

The original substantiation for the existing exception (1995AM, Proposal 17-21a) seems to have been based on a panel response to Proposal 17-21, which attempted to include the light fixtures in the redundant grounding provisions, and which was rejected. This is shown in the comments in the voting. The submitter of Proposal 17-21 came back with Comment 17-16, in which he pointed out that without correlating changes in Section 517-13(b) the change was practically useless. The panel statement that Section 517-13(b) incor-porates by reference the provisions in subsection (a) has no conceivable basis in fact. Section 517-13(b) adds provisions on top of the rules in (a).

We are left with an exception that will allow a steel raceway without a separate grounding conductor in some cases. Any electrical contractor will tell you that the significant installation issue is what wiring method must be installed; the presence or absence of a piece of No. 12 green wire is of negligible importance. In other words, after you install a steel raceway to the switch and the light, congratulations, you can omit a green wire.

This proposal as submitted actually accomplishes something. It preserves the zone where redundant grounding has demonstrated safety value, that is, in the patient vicinity, and it removes those requirements in areas where there isn't any greater exposure than in other occupancies. In addition, by changing "the patient vicinity" to "a patient vicinity" this proposal corrects an error in the Code, whereby on the literal text the switch for a patient's light fixture couldn't go in its own patient vicinity, but it could go in an adjacent patient vicinity. This proposal is a companion to one that makes correlating changes in Section 517-13(b).

PANEL ACTION: Reject.
PANEL STATEMENT: The proposal wording would eliminate one of the basic requirements of the use of a metal raceway system or metal clad cables as nonmetallic wiring methods are included in Chapter 3.

The term "the patient" is used in a collective sense and is consistent with the definition of patient vicinity.

The panel disagrees that redundant grounding has only demonstrated safety value in the patient vicinity. The patient vicinity is only a part of the patient care area. The submitter has not provided substantiation that redundant grounding is not necessary in the whole patient care area.

Refer to panel action and statement on Proposal 17-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 3 Clark, Nash, Telecky
EXPLANATION OF NEGATIVE:
BENESH: The proposal should have been accepted in principle and the exception deleted. Acceptance in principle would still meet the intent of the submitter.

(Log #4243)

17- 18 - (517-13(b), Exception (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add the following Exception:

Exception: Wiring that is used to supply or control lighting fixtures more than 7 1/2 ft (2.29 m) above the floor in a patient care area shall be permitted to utilize any of the wiring methods recognized in Chapter 3 of this Code provided all of the following conditions are met:

(a) No portion of the wiring installed in accordance with this exception and located at or below the 7 1/2 ft (2.29 m) level is exposed;

(b) No outlet(s) supplied by such wiring is (are) located at or below the 7 1/2 ft (2.29 m) level in any patient care area; and

(c) No control point(s) supplied by such wiring is (are) located in any patient vicinity.

SUBSTANTIATION: Both Sections 517-13(a) Exception No. 3 and 517-13(b) need to be changed for this rule to really have any effect. The key to these proposals is maintaining the enhanced grounding requirements in place for any likely exposure to patient touch, and the key to that is bringing in the concept of "patient vicinity" here as well as Sec. 517-13(a) Exception No. 3 (defined in Section 517-3).

In a nutshell, if the switch is outside any patient vicinity, and if the wiring method isn't exposed below the 7 1/2-ft level, then any suitable wiring method can be used. Note, however, that the exception (see "b") is written so that the home run from any outlet below 7 1/2 ft in a patient care area must still qualify under the normal redundant grounding provisions of Section 517-13(b). Please refer to the companion proposal on Section 517-13(a) Exception No. 3 for additional substantiation.

PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has introduced the same concept of allowing all Chapter 3 wiring methods as submitter's Proposal 17-17 and, therefore, the panel statement for Proposal 17-17 applies.

Also refer to panel action and statement on Proposal 17-15.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3440)

17- 19 - (517-17 and (b)(2) (New)): Reject
SUBMITTER: Randall Kirkman, Energy, IL
RECOMMENDATION: Change the heading of Section 517-17 to "Selective Coordination and Ground Fault Protection".

In 517-17(b), designate the existing paragraph as (1) and add the following:

(2) The service and feeder overcurrent devices shall be fully selective such that the feeder device and not the service device shall open on all phase-to-phase, phase-to-neutral, or three-phase faults on the load side of the feeder device.

SUBSTANTIATION: The existing paragraph assures selective coordination for faults to ground only. It is just as critical to be selectively coordinated for phase-to-phase, phase-to-neutral, and phase-to-phase-to-phase faults. The paragraph as proposed above, will assure that Health Care Facilities will not lose their service overcurrent device because of any type of fault on the load side of a feeder device. "Ground-Fault Protection" was changed to "Selective Coordination and Ground Fault Protection" to more accurately reflect the subject matter of the revised section.

PANEL ACTION: Reject.
PANEL STATEMENT: 517-17 deals with with ground fault protection, not overcurrent device selectivity. Selectivity of overcurrent devices is a design issue. The submitter has not substantiated that there is a problem that would warrant the need to expand the concept of selectivity to include overcurrent devices.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3686)

17- 20 - (517-17): Reject
SUBMITTER: Steve Campolo, Leviton Manufacturing Co., Inc.
RECOMMENDATION: Revise text to read as follows:
517.18
(a) The physical integrity of each receptacle shall be confirmed by visual inspection.
(b) The continuity of the grounding circuit in each electrical receptacle shall be verified.
(c) Correct polarity of the hot and neutral connections in each electrical receptacle shall be confirmed.
(d) The retention force of the grounding blade of each electrical receptacle (except locking-type receptacles) shall be not less than 115 g (4 oz), as measured by a Listed receptacle tension tester.
SUBSTANTIATION: With the importance of good utilization equipment grounding and the availability of Listed receptacle tension testers, a quantitative and measurable value can now be achieved.
PANEL ACTION: Reject.
PANEL STATEMENT: This proposed requirement for testing of receptacles is inappropriate for Article 517. Such requirements for testing are included in NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2341)

17- 21 - (517-17(a) Exception No. 1 and 2 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add the new Exception(s) after the first paragraph to read:
Exception No 1: Facilities that do not require electrical life support equipment.
Exception No 2: The ground fault protection required by 517-17(a) shall not be required when the service equipment does not serve any occupancy that requires electrical life support equipment.
SUBSTANTIATION: As currently written, this section requires an additional level of Ground Fault Protection for electrical systems that also serve medical facilities (not just hospitals) when served from a service where Ground Fault Protection is required.
This poses several problems.
For instance it is now common to have dental offices (the dental office not having electrical life support equipment) in large shopping malls. It is not unusual for these malls to have requirements for Ground Fault Protection. In a mall (or other facility) if Ground Fault Protection is Required, the feeder for the dental office must have an additional level of Ground Fault Protection. In this example all this would accomplish is the protection of the remainder of the facility from an problem in the dental facility. It does not appear that this was the intent of this section.
In another example, if we use the same dental office in the same mall and require an additional level of Ground Fault Protection in the other feeders as well as this dental office (the dental office not having electrical life support equipment) we now have provided coordination of the devices. Was it the intent to provide this type of coordination in a dental office, or any other facility that falls under the requirements of NEC 517-40, 517-45, and 517-50 that do not require electrical life support equipment?
Hopefully this will clarify that this additional level of ground fault protection was intended to protect facilities that require electrical life support equipment, not dental offices.
The intent of this submittal is not to negate the requirement as written for hospitals or other facilities that require electrical life support equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter raises a significant problem for the continuity of service for a health care facility that is part of a multipurpose building. The proposal, however, does not resolve the problem. See Proposal 17-23 and the panel statement for action to reject.
Continuity of service to a health care facility in a multipurpose building, including those requiring ground fault protection, requires the selective and coordinated treatment of service and all feeders for the entire building and is the jurisdiction of CMP 4 and 10.
517-17 in the current code is appropriate for the free standing healthcare facilities and need not be modified.
The proposal should be submitted to NFPA 99. That document covers performance requirements for health care facilities.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3336)

17- 22 - (517-17(a)(1)): Reject
SUBMITTER: Dennis Darling, Ayres, Lewis, Norris and May, Inc.
RECOMMENDATION: Revise text to read as follows:
(1) On the load side of an emergency ~~essential~~ electrical system transfer switch, or...
SUBSTANTIATION: A FPN was added by CMP-17 in the 1993 cycle to express their intent to not allow GFP from preventing generators from supplying the essential electrical system in a health care facility. The FPN was changed to "shall not be installed" in the 1996 cycle to remove the FPN.
GFP is required on substation breakers in a hospital. In a case where a substation breaker supplies the normal side of an equipment ATS that in turn feeds a number of loads through a distribution panel, GFP should be allowed in the distribution panel so that a single equipment load could be tripped by a breaker in the distribution panel with GFP instead of a substation breaker. If the substation breaker is tripped, the ATS will start the generator and transfer the ground fault onto the generator.
PANEL ACTION: Reject.
PANEL STATEMENT: The addition of ground fault interruption on the equipment system introduces the potential for nuisance operation by interrupting the emergency and normal sources to the entire system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2342)

17- 23 - (517-17(b) (New)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 10 for action in Article 240. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Move section (b) to (c), change (c) to (d) and add a new section to be labeled 517-17 (b).
(b) Multiple Occupancy Buildings. Where a health care facility that falls under the requirements of 517-30 through 517-35 is installed in a multiple occupancy building and ground-fault protection is provided for operation of the service disconnecting means as specified by sections 230-95 and 215-10, an additional level of ground-fault protection shall be provided in the next level of feeder disconnecting means downstream towards the load for all occupancies except as listed in 517-17(a)(1), (2), and (3).
SUBSTANTIATION: In a multiple occupancy building that serves health care as well as other occupancies, it does not appear that ground-fault protection is required for the other occupancies.
Example: An oral surgeon is to occupy a suite in a mall or office building. The health care facility requires electrical life support equipment. Per NEC 517-50(c)(1), this facility must comply with sections 517-30 through 35.
In this example ground-fault protection is required for all feeders serving the suite (except as provided in 517-17(a) but it does not appear the ground-fault protection is required for the other occupancies. This seems to have the not so desirable effect of protecting the other occupancies from a fault in the health care facility while no real protection has been afforded the health care

facility from faults in the other occupancies. It does not seem that this was the true intent of the article.

It is the intent of this proposal to protect the health care facility from ground-faults in the other occupancies.

PANEL ACTION: Reject.

PANEL STATEMENT: While the intent of the proposal has merit, the proposed changes would be better addressed in those portions of the code that cover the entire building and that are not limited to health care facilities.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1740)

17- 24 - (517-18): Reject

SUBMITTER: Jamie McNamara, Hastings, MN

RECOMMENDATION: Revise as follows:

517-18. General Care Areas

(a).....

(b).....

(c) Pediatric Locations. Fifteen- and 20-ampere, 125-volt receptacles intended to supply patient care areas of pediatric wards, rooms, or areas shall be listed tamper resistant, ~~or~~ shall employ a listed tamper resistant cover or be ground fault circuit interrupter receptacles.

SUBSTANTIATION: GFCI receptacles are as safe or safer than tamper resistant covers on non GFCI protected receptacles. GFCI receptacles are easier to identified than tamper resistant receptacle.

PANEL ACTION: Reject.

PANEL STATEMENT: Ground fault circuit interrupter (GFCI) receptacles have not been evaluated for tamper resistance and do not prevent access to live components within the receptacle. Also they do not provide protection for faults between the grounded and ungrounded conductors.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3292)

17- 25 - (517-18): Reject

SUBMITTER: Michael Gorman, Electro-Lock Technologies, Inc.

RECOMMENDATION: Electro-Lock Technologies, Inc. proposes that the language of Section 518-18(c) be clarified to include technology of self-locking, cam operated safety-sockets as set forth in Electro-Lock Technologies, Inc.'s patent No. 5,297,973, dated March 29, 1994.

Electro-Lock Technologies, Inc. proposes the language be modified as follows:

(c) Pediatric Locations. Fifteen- and 20-ampere, 125-volt receptacles intended to supply patient care areas of pediatric wards, rooms, or areas shall be tamper resistant. For the purpose of this section, a tamper resistant receptacle is a receptacle that, by its construction and design, limits improper access to its energized contacts by prohibiting electrical flow until the outlet plug is locked in place, terminating current upon release of the plug and before removal from the socket, and which exposes the user to no electrical current. The cover for such outlets shall be designed so that, upon removal of the cover from the outlet, no exposed element of the outlet shall subject the user to any electrical current by inadvertence or neglect.

SUBSTANTIATION: The submitted proposal to modify the pediatric locations Section of 518-18(c) is aimed at replacing the existing dangers to children by mandating new construction including a locked socket and plug device in all electrical outlets. The clear intention of the present language is to protect children by mandating "tamper resistant" plugs and sockets. Regrettably, that phrase is undefined in this context. The proposed language takes that intent a step further to use readily available technology to limit, so far as is possible, risk or harm to children and others to shock or fire.

The common electrical outlet, even if made "tamper resistant" as suggested by the code, is antiquated technology, and it is the most dangerous part of every home, office, home and care facility in America, and especially in pediatric care facilities. According to the United States Consumer Product Safety Commission, in 1990, electrical plugs, cords, switches and electrical outlets were involved in about 13,000 life threatening residential fires. Each year, ninety deaths result from fires associated with electrical distribution systems in the United States alone. Each time a plug is pushed into a socket, an uncontrolled electrical charge is emitted. That charge often cause dangerous electrical shock to the unwary or causes fires. Often plugs are difficult to seat fully and firmly. Loose or unseated plugs are a major cause of injuries and accidental fires. The very nature of the electrical outlet, with its open slots, invites curious children to poke and prod with paperclips, dimes and other objects. Even if perfectly installed and used with care, the current standard electrical outlet and plug combination is more dangerous than would be tolerated in any new product on the market.

Beneath the plug, there are further, hidden dangers. Remove the outer, protective plate, and you are presented with live, often uninstalled wires. The outlet box and plugs, designed for another age, will surprise any novice that touches the wrong part of the box with severe shock and possibly injury. Any housewife or do-it-yourselfer has seen sparks arcing without protection outside of the socket. That kind of spark exposes the common stuff of a residential home, garage chemicals, old draperies, and other flammable to fire. That spark can also subject curious children, do-it-yourselfers and overworked house workers to intolerable risks. There must be another, safer way.

Electro-Lock Technologies, Inc.'s "Safety Socket" is new and safer technology. The Safety Socket addresses the risks of electrical fire and shock currently associated with our outmoded electrical outlet in two ways. First, with the Safety Socket, the electrical arcing takes place safely inside of the outlet. The socket will not dispense electricity unless uniquely designed Safety Socket plugs are inserted and locked into place. There is no current until the plug is completely seated and locked in by cams, which prevent any fingers or other articles to come in contact with electrical current. At the moment the plug is released from its cams, the current is terminated, before the plug is removed from its housing, preventing a cause of most accidental shocks to common plug and socket users. The advanced patented design of the Safety Socket is engineered to make it virtually impossible for even the most determined child to be shocked or injured by electrical outlets.

The Safety Socket protects the user in a second important way. The internal wiring system of the Safety Socket ends the tangled knot of wires just behind the faceplate. All wiring in the Safety Socket is internal. The worker or do-it-yourselfer will be safer now that the confused tangle of exposed wires has been eliminated; and, all circuitry been housed inside the Safety Socket wall unit. As an additional safety feature, the Safety Socket can be built with ground fault protection, which will protect from accidents involving water.

The need for new technology is urgent. Updated codes should mandate new construction to be safer than ever before. The proposal suggests a safer solution. The National Fire Protection Association (NFPA) mandates safety code for fire safety for all new construction in the United States, as well as much of the developed world. That code will be updated in 2002. The NFPA's stated goal is to increase the safety of occupants by requiring the use of updated technology. The voting members of the NFPA will soon have the opportunity to vote the Safety Socket into the new code. If that choice is made by the NFPA, the children affected by the new outlets will be safer as a direct consequence.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirement of listed tamper resistant receptacles or covers provides a defined level of protection. The submitter has not provided sufficient evidence in the proposal that there are problems with existing tamper resistant receptacles or covers in pediatric locations of hospitals that would necessitate a change of this magnitude. The intent of the present requirement is not to require tamper resistant plugs, just receptacles.

It appears to be inappropriate to mandate a proprietary technology in all pediatric areas of hospitals. The proposed requirement would require all cord connected equipment to be modified to facilitate them being plugged into these types of receptacles.

NFPA regulations 3-3.6 preclude the mandatory use of proprietary technology. However, there is nothing in the code to preclude its use provided it is listed as hospital grade and tamper resistant.

The panel disagrees with the submitter's substantiation. The requirements for tamper resistant receptacles are in the standard for Attachment Plugs and Receptacles - UL 498. The submitter's reference to residential incident data is not applicable to health care facilities.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2556)

17- 26 - (517-18(a)): Reject
SUBMITTER: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services
RECOMMENDATION: Revise as follows:
(a) Patient Bed Location. Each patient bed location shall be supplied by at least two branch circuits, one from the emergency system and one from the normal system. Emergency system receptacles shall be identified and shall also indicate the panelboard and circuit number supplying them. All branch circuits from the normal system shall originate in the same panelboard.
SUBSTANTIATION: Even though this is a general care area, if an emergency should exist and power is lost for some reason, hopefully maintenance personnel can go quickly to the emergency panelboard serving this area and identify the problem that exists.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation of a problem. It is impractical to mandate the identification of all emergency system receptacles. There is nothing in the code that would preclude this identification.
After installation, cover plates are often erroneously relocated during routine redecorating.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 3 Clark, Nash, Telecky
EXPLANATION OF NEGATIVE:
WHITE: I think it would help with maintenance and if there is a problem it should cut down on down time.

(Log #3441)

17- 27 - (517-18(c)): Accept in Principle
SUBMITTER: Thomas J. Ryan, III, St. Joseph's/Candler Health System
RECOMMENDATION: Revise text to read as follows:
"All receptacles ~~Fifteen- and 20-ampere, 125-volt receptacles intended to supply~~ located within the patient care areas of pediatric wards, rooms, or areas shall be listed tamper resistant or shall employ a listed tamper resistant cover."
SUBSTANTIATION: I work in a health care facility and have remolded a pediatrics ward. There are 30A. 125V. receptacles for floor cleaning machines in these areas and are not tamper resistant or employ a cover of the same. I know neither is made, but maybe a manufacturer could make covers for all listed receptacles, due to the live voltage present
PANEL ACTION: Accept in Principle.
Revise text to read as follows:
"Receptacles ~~Fifteen- and 20-ampere, 125-volt receptacles intended to supply~~ located within the patient care areas of pediatric wards, rooms, or areas shall be listed tamper resistant or shall employ a listed tamper resistant cover."
PANEL STATEMENT: The text is revised to comply with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1874)

17- 28 - (517-21): Reject
SUBMITTER: Ric Thomson, Candler Hospital, Engr Dept.
RECOMMENDATION: Revise as follows:
"... shall not be required for receptacles in those patient care areas where...".
Change "critical" to "patient care areas"; this would include "general care areas" in the text.
SUBSTANTIATION: What is the intent of 517-21? Why not include "general care areas" if you want GFI protection at the sinks, but GFI protection on all receptacles within 6 ft of the sink in patient rooms. In 517-21, why do they only mention "critical care areas." General care areas are important also if you are connected to medical equipment.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: 517-21 was added because of the concern of a GFCI interrupting power to life support equipment in a critical care area. Since this type of equipment would not be expected in a general care area, the panel does not believe the exemption from GFCI protection should apply in a general care area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #420)

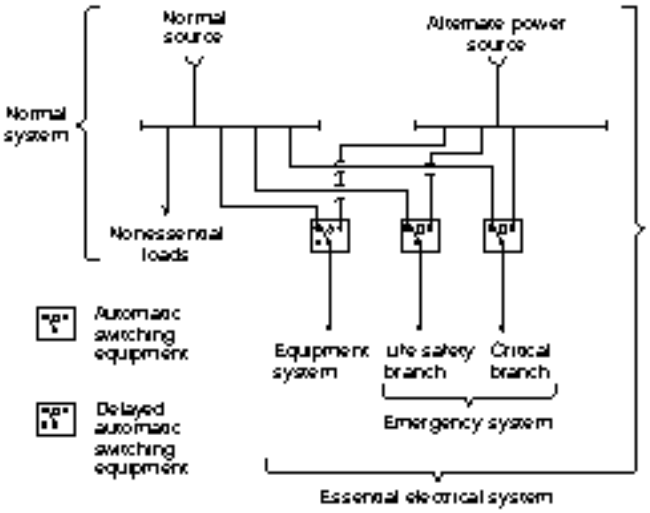
17- 29 - (517-30(3) Exception No. 7 (New)): Reject
SUBMITTER: James Silva, St. Luke's Hospital
RECOMMENDATION: Add an exception to 517-30(3) to read as follows:
Exception No. 7: In existing walls and partitions where receptacles, switches, etc are to be added, hospital grade metal clad cable may be fished. The hospital grade metal clad cable shall enter the partition within 8 in. of a junction box where the branch circuit is supplied by a nonflexible metal raceway.
SUBSTANTIATION: Working in a health care facility where patient environments change so rapidly to facilitate use of new equipment and technology, we are constantly requested to supply emergency power to various locations. When this code change was instituted it created a hardship in installing outlets, switches, etc., in old work applications, not only in completing the work but, also the follow up patching of walls or partitions after channeling to allow the installation of nonflexible metal raceways and has raised the cost of adding equipment tremendously. I feel that adding the proposed exception to 517-30(3) will allow added flexibility without compromising the original intent of the article and also render a cost savings without compromising safety.
PANEL ACTION: Reject.
PANEL STATEMENT: Metal clad cable does not provide the mechanical protection required for Emergency system conductors. The intent is to provide a high level of protection for emergency conductors. The panel has chosen to accomplish this by requiring nonflexible metallic raceway systems, MI or in encasement of concrete.
There has been no fact finding information presented to the panel to suggest that metal clad cable has equivalent mechanical protection to the current methods specified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1182)

17- 30 - (Figures 517-30(a) and 517-30(b)(4)): Reject
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Delete Figure 517-30(a) and the reference to the Figure in 517-30(b)(4).
SUBSTANTIATION: The change is necessary to correlate with a change made to 1999 NFPA 99, Section 3-4.2.2.1 which now requires each branch of the emergency system to have at least one transfer switch as shown in Figure 517-30(b).
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes that the figures have value. The figures have been revised through various panel proposals and the issue described in the submitter's substantiation has been resolved. Refer to the recomendation and substantiation of Panel Proposals 17-30a, 17-31a, 17-31e, and 17-31b.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1710)

17- 30a - (Figure 517-30(a)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Renumber existing Figure 517-30(a) as FPN Figure No. 1.
Revise the figure as shown:



{use "FPN Figure No. 1 Hospital - Minimum Requirement for Transfer Switch Arrangement" given to NFPA Staff}
SUBSTANTIATION: The proposed figure replaces the generator with the language alternate power source. This change is necessary, as 517-3 definition on Alternate Power Source does not mandate an onsite generator as the only type of alternate power source. Battery systems are permitted. It has been simplified to show only the minimum arrangement of the transfer switch requirements of 517 - 30 thereby eliminating any confusion of what the minimum requirements are for this essential electrical system. Renumbered to meet new NEC Style Manual. There has been no change in the technical requirements of this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1702)

17- 30b - (517-30(b)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-30(b) as follows (the change is limited to that shown in legislative format):
(b) General.
x1. Separate Systems. Essential electrical systems for hospitals shall be comprised of two separate systems capable of supplying a limited amount of lighting and power service, which is considered essential for life safety and effective hospital operation during the time the normal electrical service is interrupted for any reason. These two systems shall be the emergency system and the equipment system.
x2. Emergency System. The emergency system shall be limited to circuits essential to life safety and critical patient care. These are designated the life safety branch and the critical branch.
x3. Equipment System. The equipment system shall supply major electrical equipment necessary for patient care and basic hospital operation.
x4. Transfer Switches. The number of transfer switches to be used shall be based on reliability, design, and load considerations. Each branch of the essential electrical system shall be served by one or more transfer switches as shown in Figures 517-30(a) and 517-30(b). One transfer switch shall be permitted to serve one or more branches or systems in a facility with a maximum demand on the essential electrical system of 150 kVA as shown in Figure 517-30(c). FPN: See Standard for Health Care Facilities, NFPA 99-1999: 3-4.3.2, Transfer Switches; 3-4.2.1.4, Automatic Transfer Switch Features; and 3-4.2.1.6, Nonautomatic Transfer Device Features.
5. Other Loads. Loads served by the generating equipment not specifically named in Sections 517-32, 517-33, and 517-34 shall be served by their own transfer switches such that these loads
a. Shall not be transferred if the transfer will overload the generating equipment, and
b. Shall be automatically shed upon generating equipment overloading.
6. Contiguous Facilities. Hospital power sources and alternate power sources shall be permitted to serve the essential electrical systems of contiguous or same site facilities.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Titles are required for level 1 and 2 section subdivisions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1716)

17- 30c - (517-30(d)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Add the following wording to the end of the section. This shall be the last paragraph of (d):
"The sizing requirements in 700-5 and 701-6 shall not apply to hospital generator set(s)".
In paragraph 2 modify as follows:
"Feeders shall…~~one~~ given time."
SUBSTANTIATION: Articles 700 and 701 can be construed to mean hospital generators must be sized for connected load. Hospital emergency systems (with medical and other equipment) are entirely different from the emergency systems of commercial or assembly buildings. Change "one" to "given" to eliminate the possibility that AHJ's might interpret this to mean that all loads will operate "all at one time."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #4407)

17- 31 - (517-30(b)): Reject
SUBMITTER: Terry Marsh, Centex-Rodgers Construction Co.
RECOMMENDATION: Add new text to read as follows:
(b) In addition to the requirements of Section 517-30(a), in health care facilities where an essential electrical system is required, and an emergency and standby power system, or a stored electrical energy emergency and standby power system is utilized, the testing and acceptable of these systems shall be in accordance with NFPA 110, Standard for Emergency and Standby Power Systems, and NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems, respectively.
(c) Where stationary combustion engines or gas turbines are used in conjunction with an emergency or standby power system, it shall also comply with the requirements of NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.
SUBSTANTIATION: Although Article 517 does a good job of including extracts from NFPA 99, and in turn NFPA 99 includes text from NFPA 110, and refers to NFPA 37, there is no requirement in NFPA 70 to apply NFPA 99, and the reference in NFPA 99 to NFPA 37 is within the scope only, and does not appear to make it a direct requirement.
The FPN, following 517-30(a), tells you that the performance and testing requirements are in NFPA 99, however, since this is in the form of a FPN, it is not a direct requirement.
Since NFPA 70 is almost universally specified on all health care projects, and NFPA 37 and NFPA 110 are not, including them in the requirements of NFPA 70 will enable better enforcement in all health care facilities.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's request is beyond the scope of CMP 17 as the NEC is a construction and installation Code. NFPA 99 specifies performance and testing requirements for health care facilities. Refer to 517-1, the scope section of Article 517.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1711)

17- 31a - (Figure 517-30(b)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Delete Figure 517-30(b) in its entirety.
SUBSTANTIATION: The existing figure goes well beyond the minimum requirements and is attempting to design an essential electrical system for hospitals. Some of the inherent problems are: there is no requirement for multiple normal incoming services, the double ended service tie breaker is not even mentioned in 517-30, two equipment transfer switches are shown when only a delayed automatic is required.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1720)

17- 31b - (517-30(b)(4)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise the second and third sentence of 517-30(b)(4) as follows (the change is limited to that shown in legislative format):
Each branch of the essential electrical system shall be served by one or more transfer switches. ~~as shown in Figures 517-30(a) and 517-30(b).~~ One transfer switch shall be permitted to serve one or more branches or systems in a facility with a maximum demand on the essential electrical system of 150 kVA (210kW) ~~as shown in Figure 517-30(c).~~
SUBSTANTIATION: This is necessary to correlate with the proposed figure modifications and deletions. We have also changed the figure numbers to meet the new NEC Style manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1727)

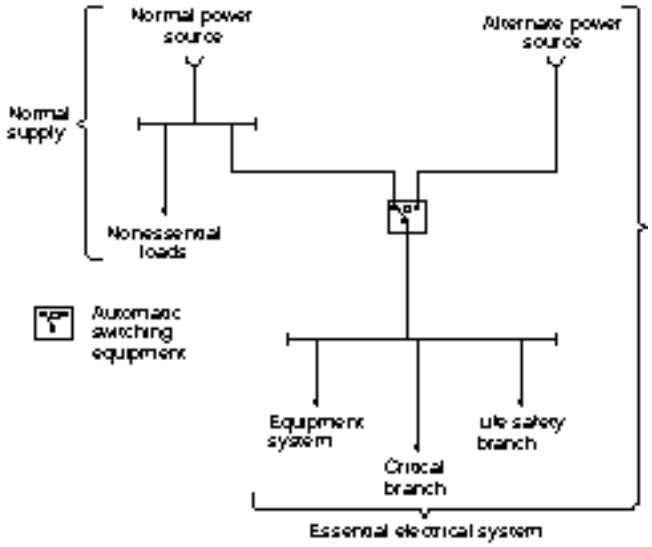
17- 31c - (517-30(b)(4)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise the second sentence of 517-30(b)(4) to read as follows:
"Each branch of the emergency system and each equipment system shall have one or more transfer switches."
SUBSTANTIATION: The text has been revised to correlate with NFPA 99-1999, Section 3-4.2.2.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1730)

17- 31d - (517-30(b)(5)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise the first sentence of 517-30(b)(5) as follows (the change is limited to that shown in legislative format):
Loads served by the generating equipment not specifically named in Sections 517-32, 517-33, and 517-34 Article 517 shall be served.....
SUBSTANTIATION: Some authority having jurisdictions are requiring that 517-30(b)(5) item (a) and (b) apply to health care facility loads. Health care facility loads should not be required to have load shed transfer switches.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1712)

17- 31e - (Figure 517-30(c)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Renumber existing Figure 517-30(c) as FPN Figure No. 2. Revise the figure as shown:



{use "FPN Figure No. 2 Hospital - Minimum Requirement (150 KVA or Less) for Transfer Switch Arrangement" given to NFPA Staff}
SUBSTANTIATION: The proposed figure replaces the generator with the language alternate power source. It has been simplified to show only the minimum arrangement of the transfer switch requirements of 517 - 30(b)(4) thereby eliminating any confusion of what the minimum requirements are for this essential electrical system. There has been no change in the technical requirements of this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1827)

17- 32 - (Figure 517-30(c)): Accept in Principle
SUBMITTER: Bruce Reynolds, State of Washington
RECOMMENDATION: Revise figure as follows:

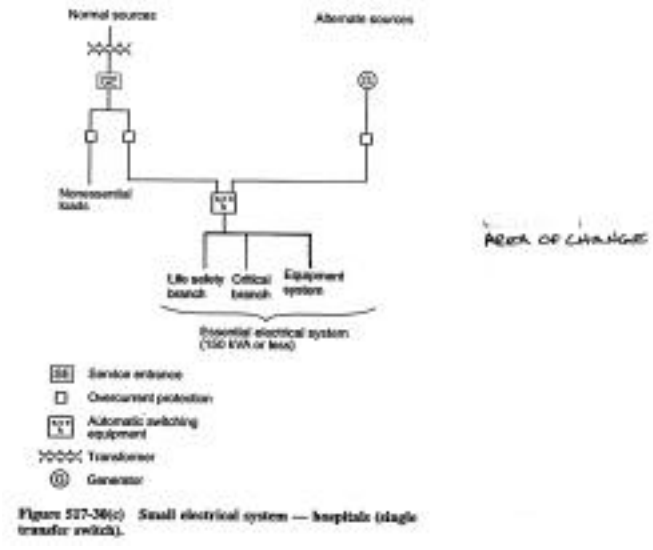


Figure 517-30(c) Small electrical system — hospitals (single transfer switch).

SUBSTANTIATION: The current figure does not show the separation of the life safety and critical branches from other systems as required in the text of NEC 517-30(c). The current figure seems to create confusion between it and the text.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The Panel Proposal 17-31e accomplishes the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2791)

17- 33 - (517-30(c)(3)): Accept
SUBMITTER: Jonathan DaBoi Saravia, E. Freetown, MA
RECOMMENDATION: Delete the second sentence.
SUBSTANTIATION: This new (1999) sentence does not add clarity and has created much controversy. This new sentence is being interpreted by some to allow the use of MC or AC for branch circuit conductors serving patient care areas since 517-13 Exception No. 1 permits their use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3296)

17- 34 - (517-30(c)(3)): Reject
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn.
RECOMMENDATION: Revise text to read as follows:
(3) Mechanical Protection of the Emergency System. The wiring of the emergency system of a hospital shall be mechanically protected by installation in nonflexible metal raceways, metal sheathed cables, or shall be wired with Type MI cable. Where installed as branch circuit conductors serving patient care areas, the installation shall comply with the requirements of Section 517-13.
SUBSTANTIATION: Armored Cable and Metal Clad cable provide greater mechanical protection than the other Chapter 3 cable wiring methods that are excluded by this section. Metal-sheathed cables are inherently suitable for more severe mechanical environments by virtue of their metallic outer covering. Mechanical Protection of the Emergency System is an appropriate application for metal-sheathed cables.
PANEL ACTION: Reject.
PANEL STATEMENT: The types of metal sheathed cable, armored cable and metal clad cable, mentioned in the submitter's proposal, do not provide the mechanical protection required for Emergency system conductors. The intent is to provide a high level of protection for emergency conductors. The panel has chosen to accomplish this by requiring nonflexible metallic raceway systems, MI or in encasement of concrete.
There has been no fact finding information presented to the panel to suggest that armored cable or metal clad cable has equivalent mechanical protection to the current methods specified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3904)

17- 35 - (517-30(c)(3)): Reject
SUBMITTER: James Conrad, Rockbestors-Surprenant Cable Corp.
RECOMMENDATION: Revise text to Section 517-30(c)(3) as follows:
"The wiring of the emergency system of a hospital shall be mechanically protected installation in nonflexible metal raceway, or shall be with Type MI cable. When limited to feeder circuits, Type MC having a welded corrugated sheath shall be permitted. Where installed as branch circuit conductors serving patient care areas, the installation shall comply with the requirements of Section 517-13."
SUBSTANTIATION: Type MC cable having a welded corrugated sheath offers a level of mechanical protection and should be allowed for this use in this (feeder circuit) application.
PANEL ACTION: Reject.
PANEL STATEMENT: Metal clad cable does not provide the mechanical protection required for Emergency system conductors. The intent is to provide a high level of protection for emergency conductors. The panel has chosen to accomplish this by requiring nonflexible metallic raceway systems, MI or in encasement of concrete.
There has been no fact finding information presented to the panel to suggest that metal clad cable has equivalent mechanical protection to the current methods specified.
When there is a listing for this cable and a distinctive Type designation, the cable may be considered if it can be shown to have equivalent mechanical protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3894)

17- 36 - (517-30(c)(3) Exception No. 5): Reject
SUBMITTER: David Dagenals, Dover, NH
RECOMMENDATION: Revise text to read as follows:
Exception No. 5: Flexible metal raceways and cable assemblies shall be permitted to be used in listed prefabricated medical headwalls, listed office furnishings, or where necessary for flexible connection to equipment and devices.
SUBSTANTIATION: This addition would permit the fishing of approved cable assemblies in those areas that are not readily accessible, i.e., preexisting walls. Making this change would be more consistent with Article 518-4 requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not intend to expand the use of flexible metal raceways and cable assemblies beyond the uses presently covered in this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1871)

17- 37 - (517-30(c)(3) Exception No. 6 (New)): Reject
SUBMITTER: Ric Thomson, Candler Hospital, Engr Dept.
RECOMMENDATION: Add an exception as follows:
(AC cable)
Exception No. 6: Listed armored cable assemblies can be used to fish branch circuits in existing walls.
SUBSTANTIATION: In existing facilities, it is hard to justify tearing out a section of wall to add one emergency receptacle "ac cable" is an acceptable wiring method, except where emergency circuits are being used. I believe the ac cable would protect the wiring, and meet the intent of the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not intend to expand the use of flexible metal raceways and cable assemblies beyond the uses presently covered in this section.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2343)

17- 38 - (517-30(c)(3) Exception No. 6 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add a new Exception No. 6 to read:
517-30(c)(3) Exception No. 6: For tap connections to light fixtures as permitted in Section 410-67(c).
SUBSTANTIATION: The present wording for this section will not permit flexible fixture whips to be used on the emergency systems lighting circuits. Some have interpreted Exception No. 5 as permitting this installation. This new proposal, if accepted will give clear guidance on this or if denied will clarify that this installation method was never permitted by the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The allowance intended by the proposed exception is already permitted by 517-30(c)(3) Exception No. 5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2993)

17- 39 - (517-30(c)(3) Exception No. 6 (New)): Reject
SUBMITTER: James Conrad, Rockbestors-Surprenant Cable Corp.
RECOMMENDATION: Add the following exception to Section 517-30(c)(3):

Exception No. 6: Where emergency feeder circuits are required by the authority having jurisdiction to be protected against potential damage by fire, a fire-resistive cable listed to maintain circuit integrity for a minimum of 2 hours, shall be permitted.

SUBSTANTIATION: Article 517 does not require the emergency circuits of a hospital to be protected against potential damage by fire. (Panel 17 has made it clear that they do not feel fire protection is necessary due to the redundancy and other fire protection features.) However, there is a growing number of state and/or local electrical codes that require emergency system of a hospital to have such "fire" protection. (Reference: Massachusetts, Rhode Island, Southern Nevada, etc.) When emergency systems for hospitals require the protection against potential damage by fire in these jurisdictions, the fire protection requirements must be implemented concurrently with the mechanical protection requirements in Section 517-30(c)(3). In these cases, it has become an industry challenge to meet these dual requirements especially in retrofitting older hospitals with new emergency systems.

The purpose of this proposal is to show the panel that these requirements (fire and mechanical protection) can be fulfilled with various fire resistive cable designs without the specific additional mechanical protection required by Section 517-30(c)(3).

As a reference, a similar need for both fire and mechanical protection exist in the code when addressing the supply wiring for fire pumps. In Section 695-6(b) Circuit Conductors states "...they shall be protected to resist potential damage by fire, structural failure, or operational accident." Although the wording is slightly different, the intent of the code is to provide fire protection as well as mechanical protection to the circuits. One way of providing this protection is by using a listed Electrical Circuit Protective System or more commonly referred to as Fire Resistive Cable.

UL is charged with the responsibility of creating a standard by which wiring systems can be qualified to meet the intent of this article and subsequently list them for this use. UL Subject 1724 entitled Fire Test For Electrical Circuit Protective Systems is the qualifying test for such systems. Once tested and qualified these systems are found in the UL Building Material Directory. Within this directory the following is stated with regard to Fire Resistive Cables, "The ability of the cables to remain electrically functional during a fire exposure and after the impact, erosion and cooling effects of a water hose stream test have been investigated." It is understandable why this statement can be made as the two hour qualification of a cable includes, temperatures as high as 1850°F while the cables are energized at rated voltage. Then, while the cables are nearly at the melting temperature of copper, they are de-energized and the test assembly is subjected to the impact, erosion, and cooling effect of a hose stream exposure. The hose stream is delivered through a 2 1/2-in. hose and discharged through a National Standard Playpipe of corresponding size equipped with a 1 1/8-in. discharge tip of the standard-taper. The hose stream is applied at 30 psi. Through all of this the cable must continue to function.

When addressing the issue of cable survivability in the event of a fire, many conditions must be considered — temperature rise and its effect on the electrical properties of the insulation is most obvious. Other considerations which must be taken into account such as physical integrity, thermal expansion, impact due to fallen debris, along with the impact and thermal shock due to water spray of fire fighting efforts; have the potential to mechanically damage the wiring system. Apparently UL considered these issues when devising the test standard and this attests to the high level of durability inherent in qualified fire rated systems.

It should also be noted that these cables must be installed under the strict guidelines imposed by UL in the Building Material Directory. The cable must be secured to a 2-hour fire rated masonry wall or concrete floor. They must be secured using a minimum 12-gauge strut and heavy-duty clamp. The spacing of these supports must be between 2 and 4 feet on center and properly secured to the fire rated surface. In itself, the very nature of these substantially rugged and secured installation practices will add a level of mechanical protection to the entire feeder system.

It is not the intent of this proposal to challenge or change the mechanical protection requirements found in this section. It is only to gain recognition of "fire resistive cables" when state or local codes require both fire and mechanical protection.

Note: Supporting material available for review at NFPA Headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: Fire resistivity is not a criteria for the requirements of 517-30(c)(3) which covers requirements for mechanical protection. Such an exception is not appropriate.

In addition there has been no fact finding information presented to the panel to suggest that all listed fire-resistive cable has equivalent mechanical protection to the current methods specified.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1732)

17- 39a - (517-30(e) (New), 517-33(c)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Delete 517-33(c) and add new 517-30(e) to read as follows:

x(e) Receptacle Identification. The cover plates for the electrical receptacles or the electrical receptacles themselves supplied from the emergency system shall have a distinctive color or marking so as to be readily identifiable. [NFPA 99-1999, 3-4.2.2.4]

SUBSTANTIATION: The text has been revised to correlate with NFPA 99-1999, 3-4.2.2.4. The current NEC requires identification of critical branch receptacles only.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1731)

17- 39b - (517-32): Accept
SUBMITTER: CMP 17
RECOMMENDATION: In the first sentence change "(f)" to "(g)".
SUBSTANTIATION: The change is need to correlate with the addition of (g) as incorporated by the panel action on Proposal 17-39c.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1726)

17- 39c - (517-32(g) (New)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-32 by adding a new (g) to read as follows:
"(g) Automatic Doors. Automatically operated doors used for building egress. [NFPA 99-1999, 3-4.2.2.2(b)7]"
SUBSTANTIATION: The text has been revised to correlate with NFPA 99-1999, Section 3-4.2.2.2(b)7.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2557)

17- 40 - (517-33(c)): Reject
SUBMITTER: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services
RECOMMENDATION: Revise as follows:
(c) Receptacle Identification. <u>The receptacles supplied by the critical branch shall be red in color so as to be distinctive and readily recognizable.</u>

SUBSTANTIATION: In the 1999 NEC, 517-33(c) does not address the part of distinctive and readily recognizable properly. There should be no misunderstanding as to what color is to be used on this very important part of the essential electrical system for the support of human life.
PANEL ACTION: Reject.
PANEL STATEMENT: 517-33(c) specifies the marking of the critical branch receptacles and is an extract from NFPA 99, 3-4.2.2.4(b)2. NFPA 99 is not prescriptive in the color needed. No substantiation is provided to indicate why the NEC should be more specific than NFPA 99. The submitter may consider submitting a proposal to NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky
COMMENT ON AFFIRMATIVE:
WHITE: The way the code is now if you have a painter come in and they change the receptacle's plate and put it on the wrong receptacle it gives the wrong information.

(Log #2806)

17- 41 - (517-33(c)): Reject
SUBMITTER: Bud Swathwood, Bud Swathwood Consulting
RECOMMENDATION: Delete the words "~~or marking~~" and in place (after, "color", insert the word "red" to read in part:
"...the critical branch shall have a distinctive color red so as to be readily recognizable."
SUBSTANTIATION: We need to be consistent in this identification for the authority having jurisdiction. This will leave no doubt to all concerned that the red outlets are the critical branch.
PANEL ACTION: Reject.
PANEL STATEMENT: 517-33(c) specifies the marking of the critical branch receptacles and is an extract from NFPA 99, 3-4.2.2.4(b)2. NFPA 99 is not prescriptive in the color needed. No substantiation is provided to indicate why the NEC should be more specific than NFPA 99. The submitter may consider submitting a proposal to NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3750)

17- 42 - (517-33(c)): Reject
SUBMITTER: John H. Schwab, Jr., City of Wauwatosa, WI
RECOMMENDATION: Revise text to read as follows:
"The receptacles ~~or the face plates for receptacles~~ supplied by the critical branch shall have a distinctive color or marking so as to be readily recognizable."
SUBSTANTIATION: It happens many times when repainting walls the faceplates get interchanged, thus a receptacle could have wrong faceplate. All Listed "med-gas columns" or "wall units" come with red receptacles on them so this will not impact premanufactured units.
PANEL ACTION: Reject.
PANEL STATEMENT: 517-33(c) specifies the marking of the critical branch receptacles and is an extract from NFPA 99, 3-4.2.2.4(b)2. The submitter may consider submitting a proposal to NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky
COMMENT ON AFFIRMATIVE:
WHITE: If you make it just the receptacles, it will eliminate the chance of a switch and of putting patients at risk.

(Log #3751)

17- 43 - (517-33(c)): Reject
SUBMITTER: John H. Schwab, Jr., City of Wauwatosa, WI
RECOMMENDATION: Revise text to read as follows:
"The receptacles...supplies by the critical branch shall be ~~have a distinctive~~ red color ~~or~~ marking so as to be readily recognizable."
SUBSTANTIATION: All Listed "wall units" and "med-gas columns" come in red color. Its about time we recognize the critical branch outlets in the code by the way they are installed in the hospitals.
PANEL ACTION: Reject.
PANEL STATEMENT: 517-33(c) specifies the marking of the critical branch receptacles and is an extract from NFPA 99, 3-4.2.2.4(b)2. NFPA 99 is not prescriptive in the color needed. No substantiation is provided to indicate why the NEC should be more specific than NFPA 99. The submitter may consider submitting a proposal to NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #3749)

17- 44 - (517-33(c), Exception (New)): Reject
SUBMITTER: John H. Schwab, Jr., City of Wauwatosa, WI
RECOMMENDATION: Add the following at the end of the sentence:
Exception: Any receptacles that are powered from the critical branch and also are from an uninterruptible power source shall be gray in color.
SUBSTANTIATION: This corresponds to the Listed "med-gas columns and wall units are supplied. Three different colored receptacles makes it very easy for nurses to know which receptacle should be used for what.
Normal - Ivory
Critical Care - Red
UPS - Gray
PANEL ACTION: Reject.
PANEL STATEMENT: 517-33(c) specifies the marking of the critical branch receptacles and is an extract from NFPA 99, 3-4.2.2.4(b)2. NFPA 99 is not prescriptive in the color needed. No substantiation is provided to indicate why the NEC should be more specific than NFPA 99. The submitter may consider submitting a proposal to NFPA 99.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1722)

17- 44a - (517-34 Exception (new)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Add a new Exception to 517-34 to read as follows:
"Exception: For essential electrical systems under 150 kVA, deletion of the time-lag intervals feature for delayed automatic connection to the equipment system shall be permitted."
SUBSTANTIATION: The addition of this exception is necessary to permit the installation of one transfer switch in essential electrical systems under 150 kVA. As the Code now reads a time lag feature would be mandatory thus requiring two transfer switches, one to handle the automatic connections of the emergency system and the second to handle the delayed automatic connections of the equipment system.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1725)

17- 44b - (517-34(b)(1)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-34(b)(1) as follows:
After the words "... and general patient rooms" add the words "and pressure maintenance (jockey or make-up) pump(s) for water-based fire protection systems."
SUBSTANTIATION: The text has been revised to correlate with NFPA 99-1999, Section 3-4.2.2.3(e)1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2344)

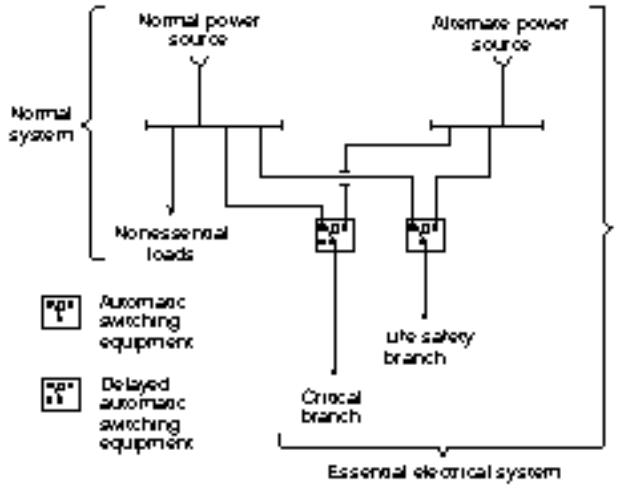
17- 45 - (517-34(b)(2), Exception (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add the following Exception after the second paragraph:
Exception: Existing facilities may use a battery lowering device provided the car will return to the first floor and the doors will automatically open.
SUBSTANTIATION: Existing multi-story occupancies may add ambulatory or other care facilities to office buildings, malls shopping centers and so on. Providing throw over to these elevators (provided they are not selected to service to patient, surgical…areas) can be very difficult and costly. This would give an additional level of protection to these elevators while not requiring extensive modifications to the existing elevator equipment.
The intent of this submittal is to still require stand-by power from the stand-by generator to all elevators that serve patient, surgical, obstetrical, and ground floors, but permit other elevators that are not intended to serve these areas to have a means to recall to the first/ground floor.
PANEL ACTION: Reject.
PANEL STATEMENT: The intent of this section of the code is to provide operation of an elevator to access these areas during an outage. The proposed exception would allow lowering of the elevators only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1719)

17- 45a - (517-34(b)(3)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Replace the existing text with text from NFPA 99, 3-4.2.2.3(e)(4) to read as follows:
"x(3) Supply, return, and exhaust ventilating systems for airborne infectious/isolation rooms, protective environment rooms, exhaust fans for laboratory fume hoods, nuclear medicine areas where radioactive material is used, ethylene oxide evacuation and anesthesia evacuation. Where delayed automatic connection is not appropriate, such ventilation systems shall be permitted to be placed on the critical branch. [NFPA 99-1999, 3-4.2.2.3(e)(4)]"
SUBSTANTIATION: The listed item is revised to correlate with NFPA 99-1999.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1713)

17- 45b - (Figure 517-41(a)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Renumber existing Figure 517-41(a) as FPN Figure No. 1. Revise the figure as shown:



{use "FPN Figure No. 1 Nursing Home and Limited Care Facilities - Minimum Requirement for Transfer Switch Arrangement" given to NFPA Staff}

SUBSTANTIATION: The proposed figure replaces the generator with the language alternate power source. This change is necessary as 517-3 definition on Alternate Power Source does not mandate an onsite generator as the only type of alternate power source. Battery systems are permitted. The bracketed essential electrical system has been extended to include the entire distribution system. It has been simplified to show only the minimum arrangement of the transfer switch requirements of 517 - 41 thereby eliminating any confusion of what the minimum requirements are for this essential electrical system. There has been no change in the technical requirements of this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1721)

17- 45c - (517-41(b)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise the second and third sentence of 517-41(b) as follows (the change is limited to that shown in legislative format):
Each branch of the essential electrical system shall be served by one or more transfer switches. ~~as shown in Figures 517-41(a) and 517-41(b).~~ One transfer switch shall be permitted to serve one or more branches or systems in a facility with a maximum demand on the essential electrical system of 150 kVA (120kW). ~~as shown in Figure 517-41(c).~~
SUBSTANTIATION: This is necessary to correlate with the proposed figure modifications and deletions. We have also changed the figure numbers to meet the new NEC Style manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1728)

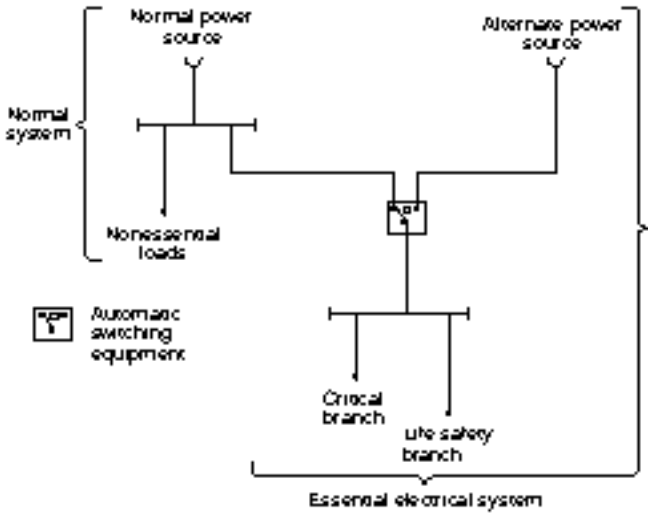
17- 45d - (517-41(b)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Remove the extract designation for 517-41(b).
SUBSTANTIATION: Changes in NFPA 99 -1999 preclude the material from being designated as extract material. There is no conflict between system requirements.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1714)

17- 45e - (Figure 517-41(b)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Delete Figure 517-41(b) in its entirety.
SUBSTANTIATION: The proposed figure is for a large essential electrical system that is rarely found in limited care facilities or nursing homes. There is nothing typical about this figure for these types of settings. The figure is also requiring more transfer switches than required by the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1715)

17- 45f - (Figure 517-41(c)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Renumber existing Figure 517-41(c) as FPN Figure No. 2.
Revise the figure as shown:



{use "FPN Figure No. 2 Nursing Home and Limited Care Facilities (150 KVA or Less) - Minimum Requirement for Transfer Switch Arrangement" given to NFPA Staff}

SUBSTANTIATION: The proposed figure replaces the generator with the language alternate power source. It also adds the three branches of emergency power that may be fed off of a single transfer switch for clarity. It has been simplified to show only the minimum arrangement of the transfer switch requirements of 517 - 41 thereby eliminating any confusion of what the minimum requirements are for this essential electrical system. There has been no change in the technical requirements of this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1826)

17- 46 - (Figure 517-41(c)): Accept in Principle
SUBMITTER: Bruce Reynolds, State of Washington
RECOMMENDATION: Revise figure as follows:

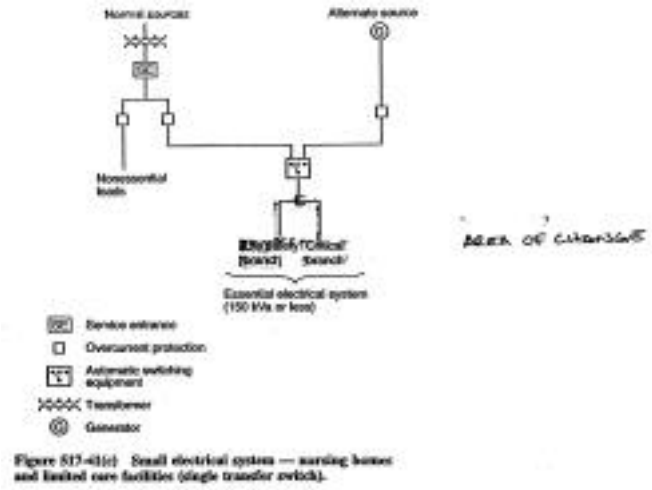


Figure 517-41(c) Small electrical system — nursing homes and limited care facilities (single transfer switch).

Figure 517-41(c). Small electrical system — nursing homes and limited care facilities (single transfer switch).

SUBSTANTIATION: The current figure does not show the separation of the life safety branch from others as required in the text of NEC 517-41(d). The current figure seems to create confusion between it and the text.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The Panel Proposal 17-45f accomplishes the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1733)

17- 46a - (517-41(e) (New)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Add a new 517-41(e) to read as follows:
x(e) Receptacle Identification. The cover plates for the electrical receptacles or the electrical receptacles themselves supplied from the emergency system shall have a distinctive color or marking so as to be readily identifiable. [NFPA 99-1999, 3-5.2.2.4]
SUBSTANTIATION: The text has been revised to correlate with NFPA 99-1999, 3-5.2.2.4. The current NEC does not require identification of emergency system receptacles in nursing homes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 3 Clark, Nash, Telecky
EXPLANATION OF NEGATIVE:
HILLEBRAND: While I realize that this change is proposed to correlate with NFPA 99-1999, combining 517-45 and 517-50 into one article will introduce confusion in the application of the NEC. The separate articles should remain and the wording revised to correlate with NFPA 99-1999. Such correlation need not be extracted text; it should be clear and not conflict with NFPA 99-1999.

(Log #CP1723)

17- 46b - (517-43(a) Exception (New)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Add a new Exception to 517-43(a) to read as follows:
"Exception: For essential electrical systems under 150 kVA, deletion of the time-lag intervals feature for delayed automatic connection to the equipment system shall be permitted."
SUBSTANTIATION: The addition of this exception is necessary to permit the installation of one transfer switch in essential electrical systems under 150 kVA. As the Code now reads a time lag feature would be mandatory thus requiring two transfer switches, one to handle the automatic connections of the emergency system and the second to handle the delayed automatic connections of the equipment system.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky
COMMENT ON AFFIRMATIVE:
BERND: The same new exception has been added under both subsections (a) and (b) of Section 517-43. It would appear that a single exception following the lead paragraph in Section 517-43 would be more appropriate, similar to the panel's action on Proposal 17-44a for Section 517-34.

(Log #CP1718)

17- 46c - (517-43(a)(5) [New]): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Add new text as 517-43(a)(5) to read as follows:
x(5) Supply, return and exhaust ventilating systems for airborne infectious isolation rooms. [NFPA 99-1999, 3-5.2.2.3(b)2]
SUBSTANTIATION: The listed item is added to correlate with NFPA 99-1999.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1724)

17- 46d - (517-43(b) Exception (New)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Add a new Exception to 517-43(b) to read as follows:
"Exception: For essential electrical systems under 150 kVA, deletion of the time-lag intervals feature for delayed automatic connection to the equipment system shall be permitted."
SUBSTANTIATION: The addition of this exception is necessary to permit the installation of one transfer switch in essential electrical systems under 150 kVA. As the Code now reads a time lag feature would be mandatory thus requiring two transfer switches, one to handle the automatic connections of the emergency system and the second to handle the delayed automatic connections of the equipment system.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky
COMMENT ON AFFIRMATIVE:
BERND: The same new exception has been added under both subsections (a) and (b) of Section 517-43. It would appear that a single exception following the lead paragraph in Section 517-43 would be more appropriate, similar to the panel's action on Proposal 17-44a for Section 517-34.

(Log #CP1717)

17- 46e - (517-45, 517-50): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Delete existing 517-45 and 517-50.
Add a new 517-45 to read as follows:
"517.45 Essential Electrical Systems for "Other" Health Care Facilities.
x(A) Essential Electrical Distribution. The essential electrical distribution system shall be a battery or generator system. [NFPA 99-1999, 13-3.3.2]
x(B) Electrical Life Support Equipment. Where electrical life support equipment is required, the essential electrical distribution system shall be as described in 517-30 through 517-35. [NFPA 99-1999, 13-3.3.2.1]
x(C) Critical Care Areas. Where critical care areas are present, the essential electrical distribution system shall be as described in 517-30 through 517-35. [NFPA 99-1999, 13-3.3.2.2]
(D) Power Systems. Battery systems shall be installed in accordance with the requirements of Article 700 and generator systems shall be as described in 517-30 through 517-35.
SUBSTANTIATION: This extracted material has been added, reorganized and revised to correlate with changes in NFPA 99-1999.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2345)

17- 47 - (517-50(b)(1)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Revise the following by deleting the word that is struck out and replace it with the underlined word.
(1) Task illumination that is related to the safety of life ~~and~~ or is necessary for the safe cessation of procedures.
SUBSTANTIATION: This proposal is an attempt to clarify when standby power is required for task illumination. As presently written the article seems to indicate that task illumination is only required for procedures where the loss of illumination could endanger a patients life and egress (exiting) illumination is required.
Hopefully this submission will show that standby power is required for any procedure that is being performed that must be safely stopped when there is a loss of power to the lighting for that area, even if it does not involve the possible loss of life of a patient. As an example, a dentist who may be doing work ranging from fillings to tooth extraction, standby lighting should be required so that the dentist may safely cease the procedure, not complete it.
PANEL ACTION: Reject.
PANEL STATEMENT: 517-50(b)(1) is an extract from NFPA 99 and is performance related. The submitter should propose these changes to the NFPA 99 committee.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1703)

17- 47a - (517-60(a)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-60(a) as follows (the change is limited to that shown in legislative format):
(a) Hazardous (Classified) Location.
x1. Use Location. In a location where flammable anesthetics are employed, the entire area shall be considered to be a Class I, Division 1 location that shall extend upward to a level 5 ft (1.52 m) above the floor. The remaining volume up to the structural ceiling is considered to be above a hazardous (classified) location.
2. Storage Location. Any room or location in which flammable anesthetics or volatile flammable disinfecting agents are stored shall be considered to be a Class I, Division 1 location from floor to ceiling.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Titles are required for level 1 and 2 section subdivisions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1704)

17- 2d - (517-61(a)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-61(a) as follows (the change is limited to that shown in legislative format):
(a) Within Hazardous (Classified) Anesthetizing Locations.
x1. Isolation. Except as permitted in Section 517-160, each power circuit within, or partially within, a flammable anesthetizing location as referred to in Section 517-60 shall be isolated from any distribution system by the use of an isolated power system.
2. Design and Installation. Isolated power system equipment shall be listed for the purpose and the system designed and installed so that it meets the provisions and is in accordance with Part G.
x3. Equipment Operating at More Than 10 Volts. In hazardous (classified) locations referred to in Section 517-60, all fixed wiring and equipment, and all portable equipment, including lamps and other utilization equipment, operating at more than 10 volts between conductors shall comply with the requirements of Sections 501-1 through 501-15 and Sections 501-16(a) and (b) for Class I, Division 1 locations. All such equipment shall be specifically approved for the hazardous atmospheres involved.
4. Extent of Location. Where a box, fitting, or enclosure is partially, but not entirely, within a hazardous (classified) location(s), the hazardous (classified) location(s) shall be considered to be extended to include the entire box, fitting, or enclosure.
5. Receptacles and Attachment Plugs. Receptacles and attachment plugs in a hazardous (classified) location(s) shall be listed for use in Class I, Group C hazardous (classified) locations and shall have provision for the connection of a grounding conductor.
6. Flexible Cord Type. Flexible cords used in hazardous (classified) locations for connection to portable utilization equipment, including lamps operating at more than 8 volts between conductors, shall be of a type approved for extra-hard usage in accordance with Table 400-4 and shall include an additional conductor for grounding.
7. Flexible Cord Storage. A storage device for the flexible cord shall be provided and shall not subject the cord to bending at a radius of less than 3 in. (76 mm).
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Titles are required for level 1 and 2 section subdivisions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1705)

17- 47b - (517-61(b)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-61(b) as follows (the change is limited to that shown in legislative format):
(b) Above Hazardous (Classified) Anesthetizing Locations.
1. Wiring Methods. Wiring above a hazardous (classified) location referred to in Section 517-60 shall be installed in rigid metal conduit, electrical metallic tubing, intermediate metal conduit, Type MI cable, or Type MC cable that employs a continuous, gas/vaportight metal sheath.
2. Equipment Enclosure. Installed equipment that may produce arcs, sparks, or particles of hot metal, such as lamps and lampholders for fixed lighting, cutouts, switches, generators, motors, or other equipment having make-and-break or sliding contacts, shall be of the totally enclosed type or be constructed so as to prevent escape of sparks or hot metal particles.
Exception: Wall-mounted receptacles installed above the hazardous (classified) location in flammable anesthetizing locations shall not be required to be totally enclosed or have openings guarded or screened to prevent dispersion of particles.
3. Luminaires. Surgical and other lighting fixtures shall conform to Section 501-9(b).
Exception No. 1: The surface temperature limitations set forth in Section 501-9(b)(2) shall not apply.
Exception No. 2: Integral or pendant switches that are located above and cannot be lowered into the hazardous (classified) location(s) shall not be required to be explosionproof.
4. Seals. Approved seals shall be provided in conformance with Section 501-5, and Section 501-5(a)(4) shall apply to horizontal as well as to vertical boundaries of the defined hazardous (classified) locations.
5. Receptacles and Attachment Plugs. Receptacles and attachment plugs located above hazardous (classified) anesthetizing locations shall be listed for hospital use for services of prescribed voltage, frequency, rating, and number of conductors with provision for the connection of the grounding conductor. This requirement shall apply to attachment plugs and receptacles of the 2-pole, 3-wire grounding type for single-phase, 120-volt, nominal, ac service.
6. 250 Volt Receptacles and Attachment Plugs Rated 50 and 60 Amperes. ~~Plugs and r~~Receptacles and attachment plugs rated 250-volts, for connection of 50-ampere, and 60-ampere ac medical equipment for use above hazardous (classified) locations shall be arranged so that the 60-ampere receptacle will accept either the 50-ampere or the 60-ampere plug. Fifty-ampere receptacles shall be designed so as not to accept the 60-ampere attachment plug. The attachment plugs shall be of the 2-pole, 3-wire design with a third contact connecting to the insulated (green or green with yellow stripe) equipment grounding conductor of the electrical system.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Titles are required for level 1 and 2 section subdivisions. Other changes are editorial for consistency.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1706)

17- 47c - (517-61(c)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-61(c) as follows (the change is limited to that shown in legislative format):
(c) Other-than-Hazardous (Classified) Anesthetizing Locations.
1. Wiring Methods. Wiring serving other-than-hazardous (classified) locations, as defined in Section 517-60, shall be installed in a metal raceway system or cable assembly. The metal raceway system, or cable armor or sheath assembly, shall qualify as an equipment grounding return path in accordance with Section 250-118. Type MC and Type MI cable shall have an outer metal armor or sheath that is identified as an acceptable grounding return path.
Exception: Pendant receptacle constructions that employ at least Type SJO or equivalent flexible cords suspended not less than 6 ft (1.83 m) from the floor shall not be required to be installed in a metal raceway or cable assembly.
2. Receptacles and Attachment Plugs. Receptacles and attachment plugs installed and used in other-than-hazardous (classified) locations shall be listed for hospital use for services of prescribed voltage, frequency, rating, and number of conductors with provision for connection of the grounding conductor. This requirement shall apply to 2-pole, 3-wire grounding type for single-phase, 120-, 208-, or 240-volt, nominal, ac service.
3. 250 Volt Receptacles and Attachment Plugs Rated 50 and 60 Amperes. ~~Plugs and r~~Receptacles and attachment plugs rated 250 volts, for connection of 50-ampere, and 60-ampere ac medical equipment for use in other-than-hazardous (classified) locations shall be arranged so that the 60-ampere receptacle will accept either the 50-ampere or the 60-ampere plug. Fifty-ampere receptacles shall be designed so as not to accept the 60-ampere attachment plug. The attachment plugs shall be of the 2-pole, 3-wire design with a third contact connecting to the insulated (green or green with yellow stripe) equipment grounding conductor of the electrical system.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Titles are required for level 1 and 2 section subdivisions. Other changes are editorial for consistency.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2554)

17- 48 - (517-61(c)(1)): Reject
SUBMITTER: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services
RECOMMENDATION: Revise as follows:
(1) Wiring serving other-than-hazardous (classified) locations, as defined in Section 517-60, shall be installed in a metal raceway system or cable assembly. The metal raceway system, or cable armor or sheath assembly, shall qualify as an equipment grounding return path in accordance with Section 250-118. Type MC and Type MI cable shall have an outer metal armor or sheath that is identified as an acceptable grounding return path. There shall be a clear and conspicuous sign visible at all times to persons in each area served stating there shall be no flammable inhalation anesthetic agents used in this area. Letters shall be blocktype and at least 1 in. (25.44 mm) in height.
SUBSTANTIATION: In most healthcare facilities, flammable inhalation anesthetic agents are not used anymore, but these agents still do exist, and if they would be used in other-than-hazardous (classified) anesthetizing locations a clear and present danger would exist. Some design engineers still include the wiring design for hazardous (classified) locations to ensure that no hazard will exist regardless of the anesthetizing agent used. Therefore, at least a sign indicating that flammable anesthetizing agents shall not be used in other-than-hazardous (classified) anesthetizing locations should state this clearly and definitively.
PANEL ACTION: Reject.
PANEL STATEMENT: NFPA 99 specifies the safeguards for anesthetizing locations and the designation as well as signage that is required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #928)

17- 49 - (517-63(f)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Circuits in Anesthetizing Locations. Except as permitted in (e) above, each isolated power circuit within, or partially within, a flammable anesthetizing location as referred to in Section 517-60 shall ~~be isolated from any distribution system supplying other than anesthetizing locations~~ not occupy the same raceway, cable, or enclosure with conductors of other systems.
SUBSTANTIATION: Present wording is somewhat confusing. Reference to "above" is not specific and could include power wiring for (b) or (c). Does "power" mean isolated power? Does "isolated" mean physically or electrically? Is "other-than-anesthetizing locations" intended to mean "other-than-hazardous (classified)" locations? The hyphenated phrase is suspiciously close to terminology of Section 517-60(b).

PANEL ACTION: Reject.
PANEL STATEMENT: Isolated power system is defined in 517-3. Section 517-63(f) requires isolated power systems as described for flammable anesthetizing locations as does 517-61(a)(1).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #929)

17- 50 - (517-64(b)(2)(4), and (c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b)(2) A common low-voltage isolating transformer installed in other-than-hazardous (classified) location, or in an unclassified location, or (b)(4) Common batteries made up of storage cells located in an other-than-hazardous (classified) location, or in an unclassified location.
In (c) add:
(3) Have ungrounded secondaries.
SUBSTANTIATION: Editorial. An other-than-hazardous (classified) location is a specific location defined in Section 517-60(b). Present literal requirements preclude installation above hazardous (classified) locations or in locations not described in Section 517-60(b). If such nonflammable anesthetizing agents rooms are not available what location is suitable?
Subsection (c) appears to assume or intend ungrounded secondaries but is not explicit. "Isolating", "isolating type" transformers commonly describe separate winding type, unrelated to whether the secondary is grounded or ungrounded. These type transformers are included in grounding requirements of Section 250-30.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation that there is a problem with the present text. The proposed text does not clarify what is currently in the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1707)

17- 50a - (517-73(a)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-73(a) as follows (the change is limited to that shown in legislative format):
(a) Diagnostic Equipment.
1. Branch Circuits. The ampacity of supply branch-circuit conductors and the current rating of overcurrent protective devices shall not be less than 50 percent of the momentary rating or 100 percent of the long-time rating, whichever is greater.
2. Feeders. The ampacity of supply feeders and the current rating of overcurrent protective devices supplying two or more branch circuits supplying X-ray units shall not be less than 50 percent of the momentary demand rating of the largest unit plus 25 percent of the momentary demand rating of the next largest unit plus 10 percent of the momentary demand rating of each additional unit. Where simultaneous biplane examinations are undertaken with the X-ray units, the supply conductors and overcurrent protective devices shall be 100 percent of the momentary demand rating of each X-ray unit.
FPN: The minimum conductor size for branch and feeder circuits is also governed by voltage regulation requirements. For a specific installation, the manufacturer usually specifies minimum distribution transformer and conductor sizes, rating of disconnecting means, and overcurrent protection.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Titles are required for level 1 and 2 section subdivisions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #1512)

17- 51 - (517-80): Reject
SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text as follows:
517-80. Patient Care Areas. Wiring methods ~~Equivalent insulation and isolation to that~~ required for the electrical distribution systems in patient care areas shall also be the wiring method provided for communications, signaling systems, data system circuits, fire alarm systems, and systems less than 120 volts, nominal.
FPN: An acceptable alternate means of providing isolation for patient/nurse call systems is by the use of nonelectrified signaling, communications, or control devices held by the patient or within reach of the patient.
SUBSTANTIATION: The present wording of "equivalent insulation and isolation" is ambiguous and unclear as to what the intent should be. The revised wording makes it clear that the wiring methods for the communications, signaling, and other such circuits have to be the same as the wiring methods for the power circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: "Equivalent insulation and isolation" is not necessarily intended to limit the wiring methods to those required for the electrical distributions systems in patient care areas. However, there is nothing to prohibit the use of such wiring methods.
A task group has been appointed to review the language for possible clarification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1708)

17- 51a - (517-160(a)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-160(a) as follows (the change is limited to that shown in legislative format):
(a) Installations.
1. Isolated Power Circuits. Each isolated power circuit shall be controlled by a switch that has a disconnecting pole in each isolated circuit conductor to simultaneously disconnect all power. Such isolation shall be accomplished by means of one or more transformers having no electrical connection between primary and secondary windings, by means of motor generator sets, or by means of suitably isolated batteries.
x2. Circuit Characteristics. Circuits supplying primaries of isolating transformers shall operate at not more than 600 volts between conductors and shall be provided with proper overcurrent protection. The secondary voltage of such transformers shall not exceed 600 volts between conductors of each circuit. All circuits supplied from such secondaries shall be ungrounded and shall have an approved overcurrent device of proper ratings in each conductor. Circuits supplied directly from batteries or from motor generator sets shall be ungrounded, and shall be protected against overcurrent in the same manner as transformer-fed secondary circuits. If an electrostatic shield is present, it shall be connected to the reference grounding point.
3.Equipment Location. The isolating transformers, motor generator sets, batteries and battery chargers, and associated primary or secondary overcurrent devices shall not be installed in hazardous (classified) locations. The isolated secondary circuit wiring extending into a hazardous anesthetizing location shall be installed in accordance with Section 501-4.
x4. Isolation Transformers. An isolation transformer shall not serve more than one operating room except as covered in (a) and (b).
For purposes of this section, anesthetic induction rooms are considered part of the operating room or rooms served by the induction rooms.
a. Induction Rooms. Where an induction room serves more than one operating room, the isolated circuits of the induction room shall be permitted to be supplied from the isolation transformer of any one of the operating rooms served by that induction room.
b. Higher Voltages. Isolation transformers shall be permitted to serve single receptacles in several patient areas where
1. The receptacles are reserved for supplying power to equipment requiring 150 volts or higher, such as portable X-ray units, and
2. The receptacles and mating plugs are not interchangeable with the receptacles on the local isolated power system.

5. Conductor Identification. The isolated circuit conductors shall be identified as follows:
Isolated Conductor No. 1 — Orange
Isolated Conductor No. 2 — Brown
For 3-phase systems, the third conductor shall be identified as yellow. Where isolated circuit conductors supply 125-volt, single-phase, 15- and 20-ampere receptacles, the orange conductor(s) shall be connected to the terminal(s) on the receptacles that are identified in accordance with Section 200-10(b) for connection to the grounded circuit conductor.
6. Wire-Pulling Compounds. Wire-pulling compounds that increase the dielectric constant shall not be used on the secondary conductors of the isolated power supply.
FPN No. 1: It is desirable to limit the size of the isolation transformer to 10 kVA or less and to use conductor insulation with low leakage to meet impedance requirements.
FPN No. 2: Minimizing the length of branch-circuit conductors and using conductor insulations with a dielectric constant less than 3.5 and insulation resistance constant greater than 6100 megohm-meters (20,000 megohm-ft) at 16°C (60°F) reduces leakage from line to ground reducing the hazard current.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Titles are required for level 1 and 2 section subdivisions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #930)

17- 52 - (517-160(a)(1), (3)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence of (a)(1):
Such isolation shall be accomplished by means of one or more transformers with ungrounded secondaries, having no electrical connection between primary and secondary windings, by means of motor-generator sets or ~~by means of~~ suitably isolated batteries with ungrounded outputs.
Add to (3): The grounding electrode conductor and grounding electrode as specified in Sections 250-30(b) and 250-169 shall not be required.
SUBSTANTIATION: Sections relative to isolated power infer or indicate the secondary (supply source) is ungrounded but are not specific. However, just indicating the circuits/conductors are ungrounded does not specifically require the supply system to be ungrounded. (see Sections 210-10, 215-7 e.g.)
There does not appear to be anything in this article that modifies the requirements of Sections 250-30(b) and 250-169. Those requirements do not appear to be warranted for the limited extent and use of isolated power systems.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel believes that the existing text of 517-160 when taken as a whole adequately describes the requirements for isolated power systems. Section 517-160 specifically modifies the requirements of 250-30(b) and 250-169 in this application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #2558)

17- 53 - (517-160(a)(6), FPN No. 2): Reject
SUBMITTER: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services
RECOMMENDATION: Revise as follows:
FPN No. 2: Minimizing the length of branch-circuit conductors and using conductor insulations with a dielectric constant less than 3.5 and insulation resistance constant greater than 6100 megohm-meters (20,000 megohm-ft) at 16°C (60°F) reduces leakage from line to ground reducing the hazard current.
Note: XHHW 90°C conductor has been found under proper testing to accomplish this.
SUBSTANTIATION: In my experience in the installation of isolated circuit conductors in hospitals, the design engineers always specify XHHW 90°C-conductors, and these conductors have been tried and proven to properly meet the criteria of FPN No. 2. Also, it is my understanding that the International Committee of Electrical Engineers "ICEE" did perform tests on 90°C conductors and found that they accomplished the technical requirements of FPN No. 2. By inserting the XHHW-90°C in FPN No. 2, it gives electrical inspectors, installers, and design engineers who are not familiar with what conductor insulation to use for isolated circuit conductors, a proper guideline without doing lengthly research to find the right insulation to use for this purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not intended to limit the design options available to the user. The FPN is only there to describe the characteristics desired and not a specific insulation system. For further information refer to NFPA 99-1999, 3-3.2.2.2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #CP1709)

17- 53a - (517-160(b)): Accept
SUBMITTER: CMP 17
RECOMMENDATION: Revise 517-160(b) as follows (the change is limited to that shown in legislative format):
(b) Line Isolation Monitor.
1. Characteristics. In addition to the usual control and overcurrent protective devices, each isolated power system shall be provided with a continually operating line isolation monitor that indicates total hazard current. The monitor shall be designed so that a green signal lamp, conspicuously visible to persons in each area served by the isolated power system, remains lighted when the system is adequately isolated from ground. An adjacent red signal lamp and an audible warning signal (remote if desired) shall be energized when the total hazard current (consisting of possible resistive and capacitive leakage currents) from either isolated conductor to ground reaches a threshold value of 5 mA under nominal line voltage conditions. The line monitor shall not alarm for a fault hazard of less than 3.7 mA or for a total hazard current of less than 5 mA.
Exception: A system shall be permitted to be designed to operate at a lower threshold value of total hazard current. A line isolation monitor for such a system shall be permitted to be approved with the provision that the fault hazard current shall be permitted to be reduced but not to less than 35 percent of the corresponding threshold value of the total hazard current, and the monitor hazard current is to be correspondingly reduced to not more than 50 percent of the alarm threshold value of the total hazard current.
2. Impedance. The line isolation monitor shall be designed to have sufficient internal impedance such that, when properly connected to the isolated system, the maximum internal current that can flow through the line isolation monitor, when any point of the isolated system is grounded, shall be 1 mA.
Exception: The line isolation monitor shall be permitted to be of the low-impedance type such that the current through the line isolation monitor, when any point of the isolated system is grounded, will not exceed twice the alarm threshold value for a period not exceeding 5 milliseconds.
FPN: Reduction of the monitor hazard current, provided this reduction results in an increased "not alarm" threshold value for the fault hazard current, will increase circuit capacity.
3. Ammeter. An ammeter calibrated in the total hazard current of the system (contribution of the fault hazard current plus monitor hazard current) shall be mounted in a plainly visible place on the line isolation monitor with the "alarm on" zone at approximately the center of the scale.
Exception: The line isolation monitor shall be permitted to be a composite unit, with a sensing section cabled to a separate display panel section on which the alarm or test functions are located.
FPN: It is desirable to locate the ammeter so that it is conspicuously visible to persons in the anesthetizing location.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual. Titles are required for level 1 and 2 section subdivisions.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

ARTICLE 518 — PLACES OF ASSEMBLY

(Log #3227)

15- 11 - (518): Reject

SUBMITTER: James K. Lathrop, Koffel Assoc., Inc.

RECOMMENDATION: Revise the title of Article 518 as follows:

Article 518 — ~~Places of~~ Assembly Occupancies

Revise 518-1 as follows:

518-1. Scope. This article covers all buildings or portions of buildings ~~or structures~~ designed or intended for the ~~assembly~~ gathering together of 100 or more persons for such purposes as deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar purposes.

Revise 518-2(a) as follows:

518-2(a) Examples. ~~Places of a~~Assembly occupancies shall include, but not be limited to, the following:

Armories
Assembly halls
Auditoriums
~~Auditoriums within~~
~~Business establishments~~
~~Mercantile establishments~~
~~Other occupancies~~
~~Schools~~
Bowling lanes
~~Church chapels~~
Club rooms
College and university classrooms, 100 persons and over
Conference rooms
Courtrooms
Dance halls
Dining facilities
Drinking establishments
Exhibition halls
Gymnasiums
Mortuary chapels
Multipurpose rooms
Museums
Passenger stations and terminals of air, surface, underground, and marine public transportation facilities
~~Places of awaiting transportation~~
Places of religious worship
Pool rooms
Recreation piers
Restaurants
Skating rinks
Libraries

Also: change “Place of assembly” to “assembly occupancy” in 240-2, 333-4, 336-5(a), 518-3(a), 640-3(e), and 770-21 (2 locations). Do not change it in 700-1 FPN No. 3 since it is not used in the same context and is a good example of why it should be changed in Article 518.

SUBSTANTIATION: While preparing another proposal for a client, I discovered a significant problem with Article 518. This proposal is based on my extensive experience with NFPA 101, Life Safety Code®, and with the U.S. model building codes. It is not submitted on behalf of any client.

The current National Electrical Code does not define “Places of Assembly.” The current scope is way too broad in that most office buildings, in fact most buildings, have 100 or more persons assembled, but not for the purposes associated with an assembly occupancy. (From a literal viewpoint “intended for the assembly of 100 people” appears to be a feat not yet accomplished, cloning maybe, assembly not yet.) The proposed revision is from the definition contained in NFPA 101 and is compatible with most building codes. The threshold used by the NEC of 100 rather than 50 has been maintained, as this is the threshold that has been consistently justified and there appears to be no justification at this time to alter it.

The term structure is not used in NFPA 101 and should not be used here since the definition of building is a structure supporting or sheltering any use or occupancy. This is also consistent with the model building codes.

The list in 518-2 has been modified to be consistent with NFPA 101, Life Safety Code, also. The dispute last code cycle regarding “church chapels” was very much off target. It appears to be beyond any reason that places of religious worship, regardless of size (as long as they are over 100), would not be an assembly occupancy. If the argument that chapels imply a small place of religious worship, what do we do with large facilities? It only applies to structures and, therefore, a graveside ceremony would not be an issue. The list does not include theaters and motion picture theaters as they are regulated in Article 520.

Since auditoriums are covered whether part of another occupancy or not, the list of possible areas that an auditorium could exist within has been deleted, this is consistent with NFPA 101. Dining halls have been maintained although not in NFPA 101. This would be a good addition for NFPA 101. This is an eating establishment that is rarely called a restaurant.

PANEL ACTION: Reject.

PANEL STATEMENT: The NEC does define “Places of Assembly.” They are buildings or portions of buildings or structures designed or intended for the assembly of 100 or more persons anywhere for any reason, except where modified elsewhere by the NEC. If buildings or structures contain physical subdivisions such as room walls or other barriers, the article concerns itself with only those subdivisions containing 100 people or more, and excludes those subdivisions that contain less. A trivial example would be a restroom with 99 versus 101 stalls.

Structures are included because there are Places of Assembly that are open platforms and not enclosed buildings.

Section 518-2(a) contains EXAMPLES of possible Places of Assembly. There are many places on that list that are not under the jurisdiction of Article 518 due to the fact that less than 100 people are involved. There are also many places not on that list that are Places of Assembly because 100 or more people are involved. Section 518-2(a) could be deleted from the Code and the Code would still contain the same requirements.

Per Article 90-1(a), the purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity. The Code deals with any hazards due to the existence and use of electrical equipment.

Possible electrical induced hazards include fire, smoke, toxicity, structured integrity, burns, shocks, explosions, blinding flashes, and electrocutions.

If all electrical equipment was removed from a building there would still be hazards due to such things as fire, smoke, toxicity, structural integrity, plumbing, mechanical, and egress which are addressed by other codes.

Subdivisions of other codes are required for their matrix of issues. The NEC includes subdivisions required for the NEC matrix of issues. The matrix of issues in the codes covering different aspects do not necessarily match. Occupancies in the Life Safety Code were developed for Life Safety Code issues. Places of Assembly were developed for Electrical Code issues.

Per Section 90-1(b), compliance with the Code will result in an installation that is essentially free (not absolutely free) from hazard. This implies an imperfect document, and therefore, risk management. As the risk increases the likelihood of a problem may need to be decreased. The Code Panel has determined that there is sufficient enough increase in risk when 100 people or more are involved to justify reducing the likelihood of a problem with increased restrictions. Furthermore, some areas involve more risky operations again resulting in increased restrictions for that use.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: This proposal recommends harmonization with the Life Safety Code, NFPA 101, the building codes (both model codes and the new International Code) and with the use of English-language terms, and is being rejected in favor of retaining a unique NEC Code-Making Panel 15 view of the world. As explained by the proponent, people are not built (assembled) in “places of assembly”: they merely occupy the spaces, usually of their own volition. Thus, the term occupancy, is used throughout the United States (including Article 220 of the NEC), is excluded from the title of Article 518 and Section 518-1. This is in contrast with the action taken on Proposal 15-1 where the foreign term “luminaire” is incorporated for harmonization purposes.

(Log #CP1501)

15- 11a - (518-2): Accept

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 15

RECOMMENDATION: Delete 518-2(a) and renumber 518-2(b) and (c) accordingly. Retain the current title "518.2 General Classification"

SUBSTANTIATION: No list of examples can be all-inclusive. The existing list of examples has caused confusion and has often been construed as definitive.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 16
NEGATIVE: 2
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

BURROWS: Examples of Places of Assembly must be retained to aid the user of this code. Deleting this subsection will not help the user to make a distinction between "places of assembly" and buildings or structures designed for more than 100 persons, where an assembly of 100 or more will not occur.

Section 518-2(a) must be retained. It is user friendly to provide examples for the proper application of Article 518. The present text of 518-2(a) is clear in its intent as an example with the phrase "shall include, but not be limited to".

This Panel has received numerous proposals over several code cycles to add or delete "example locations". We must not take the approach that deleting this section will stop future proposals from doing the same. Examples are used throughout this code to provide for a more user friendly document.

FLACH: The text in the 1999 NEC is clear. The title of Section 518-2(a) is Examples. The text reads: "Places of Assembly shall include, but not be limited to, the following:"

I agree that the list is not complete, but it helps to make the Code user friendly.

Add to the list if necessary, but do not remove it.

COMMENT ON AFFIRMATIVE:

VANNICE: When this proposal was first drafted the existing Section (a) had the list deleted but retained some form of the 100-person requirement . Later on it was decided that Section (a) should be deleted in its entirety in the name of redundancy with respect to the Scope. Since then it has been suggested to me that the 100-person requirement may not be enforceable if it only appears in the Scope. If this is so we may need to put the 100-person requirement back in a reconstituted Section (a). I still agree that the list should be deleted.

(Log #931)

15- 12 - (518-3(b)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Temporary Wiring. In exhibition halls used for display booths, as in trade shows, the temporary wiring shall be ~~installed~~ permitted in accordance with Article 305.

(remainder unchanged).

SUBSTANTIATION: Editorial. "Temporary" wiring infers flexible cords and cables, which should be permitted, not mandated.

PANEL ACTION: Reject.

PANEL STATEMENT: Temporary wiring does not infer flexible cords or cables. Article 305 already permits but does not mandate flexible cords and cables. This proposal appears to be more than just an editorial comment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #478)

15- 13 - (518-3(b), Exception): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 518-3(b) Exception - revise third sentence as follows:

"A permanent sign shall be attached to the cable tray at intervals not to exceed 7.5 m (25 ft) ~~25 ft (6.1 m).~~"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

The SI units were corrected to agree with the inch-pound units.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #479)

15- 14 - (518-4(a)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 518-4(a) - revise as follows:

"(a) General. The fixed wiring methods shall be metal raceways, flexible metal raceways, nonmetallic raceways encased in not less than 50 mm (2 in.) ~~2 in. (50.8 mm)~~ of concrete, Type MI, MC, or AC cable containing an insulated equipment grounding conductor sized in accordance with Table 250-122."

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #2976)

15- 15 - (518-4(a), Exception): Accept

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions

RECOMMENDATION: Revise text to read as follows:

(a) General. The fixed wiring methods shall be metal raceways, flexible metal raceways, nonmetallic raceways encased in not less than 2 in. (50.8 mm) of concrete, Type MI, MC, or AC cable containing an insulated equipment grounding conductor sized in accordance with Table 250-122.

Exception: Fixed wiring methods shall be as provided in:

a. Audio signal processing, amplification, and reproduction equipment — Article 640

b. Communications circuits — Article 800

c. Class 2 and Class 3 remote-control and signaling circuits — Article 725

d. Fire alarm circuits — Article 760

e. Optical Fiber Cables and Raceways — Article 770.

SUBSTANTIATION: This proposal clarifies that the Optical Fiber Cables and Raceways is an acceptable wiring method per Article 770.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15
NEGATIVE: 3
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

BURROWS: The addition of this new text is in direct conflict with past action of this Panel with respect to the application of ENT. This new text will circumvent the intent of the Panel with respect to allowable installations of ENT which are presently limited to "spaces with finish rating" in 518(c).

Acceptance of this proposal will allow ENT to be used in any manner in any place of assembly where fiber optic cable is installed per 770-6 Exception. I do not believe that this is the intent of the Panel.

FLACH: This proposal allows nonmetallic raceways in Places of Assembly. (See Section 770-6 Exception). I suggest revising item (c) to read: "Optical Fiber Cables in metal raceways - Article 770."

KLEIN: The Panel comment would allow general purpose and standard plenum nonmetallic raceways in places of assembly.

In addition, the support of optical fiber cables within a place of assembly, (or any other occupancy) is not sufficiently addressed in Article 770.

(Log #3245)

15- 16 - (518-4(b) and (c)): Reject

SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council

RECOMMENDATION: Revise text as follows:

518-4. Wiring Methods.

(a) (No changes)

~~(b) Nonrated Construction. Nonmetallic sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid nonmetallic conduit shall be permitted to be installed in those buildings or portions thereof that are not required to be of fire rated construction by the applicable building code.~~

~~FPN: Fire rated construction is the fire resistive classification used in building codes.~~

(~~c~~ b) Spaces with Finish Rating. Nonmetallic-sheathed cable, ~~E~~electrical nonmetallic tubing and rigid nonmetallic conduit shall be permitted to be installed in restaurants, conference and meeting rooms in hotels or motels, dining facilities, and church chapels where:

(1) The nonmetallic-sheathed cable, electrical nonmetallic tubing or rigid nonmetallic conduit is installed concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

(2) The nonmetallic-sheathed cable, electrical nonmetallic tubing or rigid nonmetallic conduit is installed above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

Nonmetallic-sheathed cable, ~~E~~electrical nonmetallic tubing and rigid nonmetallic conduit are not recognized for use in other space used for environmental air in accordance with Section 300-22(c).

FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

SUBSTANTIATION: The wording of Section 518-4(b) is vague and ambiguous at best. Is the intent of this section to prohibit use of wiring methods noted in buildings that are of "protected" construction type such as 5A (Protected Wood Frame), 3A (Protected Ordinary), or 2A/2B (Protected Noncombustible) under the Model Building Codes, and in non-fire rated construction if certain walls in such a building are required to have a fire rating by other section of the building code, even if:

1. These buildings are 3 stories or less in height, complying with Section 336-5(a)?

2. These buildings are 3 stories or less in height and are sprinklered, wherein interior corridor walls and other interior walls and floors can be non-fire rated?

One can design a non-fire rated construction type building under the building codes (or NFPA 101), and because of issues dealing with corridors, tenant spaces, or hazardous areas would require some fire rated walls or floor separations. I could design this same non-fire rated construction type building and sprinkler the building, and all the fire rated wall and floor issues are permitted to be non-fire rated. Under the building codes (or NFPA 101) even in fire rated construction types, when the building is sprinklered, the only fire rated walls would be load bearing walls.

The Electrical Code Handbook's commentary on page 672 is even more confusing trying to explain this bizarre restriction where one side of a storage room can use one type of wiring, but the other side of the storage room adjoining the corridor can not. The plain fact is that there is no technical reason to prohibit the wiring systems in 518-4(b) to non-fire rated construction, or to non-fire rated walls in non-fire rated construction types.

By the time this code proposal is reviewed by the Panel 15 Committee, the rejected report and proposals of the NEC Task Group on NM Cable will have been made available to the Panels. Even though the NEC Technical Correlating Committee rejected the code proposals because of non-consensus on the Task Group, writing the Task Group's Report and the negative comments from the Task Group's Committee Members, everyone can easily "read between the lines." The Task Group could find no technical reasons or fire/life/injury data to support restricting NM Cable above and beyond any other wiring method.

Based on the lack of findings in the NEC Task Group on NM Cable of any hazard with the use and installation of NM Cable, and the submitted report "Type NM Cable Fire Hazard Analysis," prepared by Paul D. Sullivan, P.E., based on fire testing by Dr. Fred Mowrer (Fire Protection Engineering Department, University of Maryland), and a third party review of the Fire Hazard Report by Dr. Fred Clarke (Benjamin/Clarke Associates, Inc.), NM cable is no more hazardous than the use of ENT.

The submitted fire hazard analysis report was based on the original "Fire Hazard Analysis; The Use of ENMT" that was submitted with the 1987 NEC TCR Code Proposal 8-49 (including the 1987 NEC TCD 8-32 and 8-32A) to remove the three story limit for ENMT. The conclusions of this report were (pages 10-11):

1. "Type NM cable will not decrease the level of life safety within a building of any height when located in ceiling and wall spaces separated from the interior of the building by a 15 minute finish rating (i.e. 1/2" thick gypsum wallboard), and on this basis should not arbitrarily be limited to 3 stories in height."

2. "In terms of building firesafety, these results indicate that Type NM Cable, like ENMT (which is not limited to 3 stories by the National Electrical Code), will not contribute to the hazard of a fire when the cable is separated from the interior of the building by a 15 minute finish rating (NFPA 70 Section 331-3(2))."

The deletion of 518-4(b) and the revision of 518-4(c) would be justified based on the work of the NEC Task Group on NM Cable, and the submitted report that is based on actual fire testing of NM Cable and ENT.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-17.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

(Log #4098)

15- 17 - (518-4(b) and (c)): Reject

SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council

RECOMMENDATION: Revise text as follows:

518-4. Wiring Methods.

(a) (No changes)

~~Nonrated Construction. Nonmetallic sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid nonmetallic conduit shall be permitted to be installed in those buildings or portions thereof that are not required to be of fire rated construction by the applicable building code.~~

~~FPN: Fire rated construction is the fire resistive classification used in building codes.~~

(~~c~~) (b) Spaces with Finish Rating. Nonmetallic-sheathed cable, ~~E~~ electrical nonmetallic tubing and rigid nonmetallic conduit shall be permitted to be installed in restaurants, conference and meeting rooms in hotels or motels, dining facilities, and church chapels where:

(1) The nonmetallic-sheathed cable, electrical nonmetallic tubing or rigid nonmetallic conduit is installed concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

(2) The nonmetallic-sheathed cable, electrical nonmetallic tubing or rigid nonmetallic conduit is installed above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

Nonmetallic-sheathed cable, ~~E~~ electrical nonmetallic tubing and rigid nonmetallic conduit are not recognized for use in other space used for environmental air in accordance with Section 300-22(c).

FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

SUBSTANTIATION: The wording of section to 518-4(b) is vague and ambiguous at best. Is the intent of this section to prohibit use of wiring methods noted in buildings that are of "protected" construction type such as 5A (Protected Wood Frame), 3A (Protected Ordinary), or 2A/2B (Protected Noncombustible) under the Model Building Codes, and in non-fire rated construction if certain walls in such a building are required to have a fire rating by other section of the building code, even if:

1. These buildings are 3 stories or less in height, complying with Section 336-5(a)?

2. These buildings are 3 stories or less in height and are sprinklered, wherein interior corridor walls and other interior walls and floors can be non-fire rated?

One can design a non-fire rated construction type building under the building codes (or NFPA 101), and because of issues dealing with corridors, tenant spaces, or hazardous areas would require some fire-rated walls or floor separations. I could design this same non-fire rated construction type building and sprinkler the building, and all the fire-rated wall and floor issues are permitted to be non-fire rated. Under the building codes (or NFPA 101) even in fire-rated construction types, when the building is sprinklered, the only fire-rated walls would be load bearing walls.

The Electrical Code Handbook's commentary on page 675 refers one over to the commentary for Section 518-4 on page 672. The commentary on page 672 is even more confusing trying to explain this bizarre restriction where one side of a storage room can use one type of wiring, but the other side of the storage room adjoining the corridor can not. The plain fact is that there is no technical reason to prohibit the wiring systems in 520-5(b) to non-fire rated construction, or to non-fire rated walls in non-fire rated construction types.

By the time this code proposal is reviewed by the Panel 15 Committee, the rejected report and proposals of the NEC Task Group on NM Cable will have been made available to the Panels. Even though the NEC Technical Correlating Committee rejected the code proposals because of non-consensus on the Task Group, writing the Task Group's Report and the negative comments from the Task Group's Committee Members, everyone can easily "read between the lines." The Task Group could find no technical reasons or fire/life/injury data to support restricting NM Cable above and beyond any other wiring method.

Based on the lack of findings in the NEC Task Group on NM Cable of any hazard with the use and installation of NM Cable, and the submitted report "Type NM Cable Fire Hazard Analysis," prepared by Paul D. Sullivan, P.E., based on fire testing by Dr. Fred Mowrer (Fire Protection Engineering Department, University of Maryland), and a third party review of the Fire Hazard Report by Dr. Fred Clarke (Benjamin/Clarke Associates, Inc.), NM cable is no more hazardous than the use of ENT.

The submitted fire hazard analysis report was based on the original "Fire Hazard Analysis; The Use of ENMT" that was submitted with the 1987 NEC TCR Code Proposal 8-49 (including the 1987 NEC TCD 8-32 and 8-32A) to remove the three story limit for ENMT. The conclusions of this report were (pages 10-11):

1. "Type NM cable will not decrease the level of life safety within a building of any height when located in ceiling and wall spaces separated from the interior of the building by a 15-minute finish rating (i.e., 1/2-in. thick gypsum wallboard), and on this basis should not arbitrarily be limited to 3 stories in height."

2. In terms of building fire safety, these results indicate that Type NM Cable, like ENMT (which is not limited to 3 stories by the National Electrical Code), will not contribute to the hazard of a fire when the cable is separated from the interior of the building by a 15-minute finish rating (NFPA 70, Section 331-3(2)."

The deletion of 518-4(b) and the revision of 518-4(c) would be justified based on the work of the NEC Task Group on NM Cable, and the submitted report that is based on actual fire testing of NM Cable and ENT.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The fire hazard assessment presented does not address a realistic heat input into the NM cable. NM cable is made of plasticized PVC and not rigid PVC, it is not required to be highly fire retarded and would ignite under conditions of fairly low heat input generating a significant amount of heat and potentially spreading the flame beyond the area of origin. Electrical nonmetallic tubing and rigid nonmetallic conduit are made of rigid PVC, which will not ignite unless an intense heat source is applied and continues to be imposed on the raceway, and that is why they are permitted in this section.

Support documentation addresses flammability and toxicity issues as they relate to survivability. However, another issue is protection of the conductors so they don't become the source of ignition. Section 336-6(b) doesn't allow for this - it states "The cable shall be protected from physical damage where necessary . . . " - this proposal would negate that requirement. The thermal barrier required for ENT and RNMC does not necessarily provide this physical protection.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #3228)

15- 18 - (518-4(c)): Reject

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

SUBMITTER: James K. Lathrop, Koffel Assoc., Inc./Rep. Carlon, Lamson and Sessions

RECOMMENDATION: Revise 518-4(c) as follows:

(c) Spaces with Finish Rating. Electrical nonmetallic tubing and rigid nonmetallic conduit shall be permitted to be installed in club rooms, college and university classrooms, conference and meeting rooms in hotels or motels, courtrooms, drinking establishments, dining facilities, restaurants, mortuary chapels, museums, passenger stations and terminals of air, surface, underground, and marine public transportation facilities, ~~and church chapels,~~ libraries, and places of religious worship where

(1) The electrical nonmetallic tubing or rigid nonmetallic conduit is installed concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

(2) The electrical nonmetallic tubing or rigid nonmetallic conduit is installed above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

Electrical nonmetallic tubing and rigid nonmetallic conduit are not recognized for use in other space used for environmental air in accordance with Section 300-22(c).

FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

SUBSTANTIATION: There is no justification to prohibit the use of electrical nonmetallic tubing and rigid nonmetallic conduit in the additional uses listed. The NFPA 101, Life Safety Code®, that is charged with the protection of life against fire in buildings does not establish any different requirements amongst these types of assembly occupancies. In fact, the scope of the Technical Correlating Committee on Safety to Life establishes that committee as the committee to have primary responsibility for documents on the protection of human life from fire and other circumstances capable of producing similar consequences. The Technical Committee on Assembly Occupancies and Membrane Structures is established as the committee having primary responsibility for documents on protection of human life from fire and other circumstances capable of producing similar consequences in assembly occupancies. Due to the fact that the Life Safety Code does not have different requirements for the uses listed the NEC would have to justify the differences based on electrical safety. Recognizing that the electrical code is also usually used with a building code, it should be noted that the International Building Code (IBC) developed by all three model building code organizations in the United States breaks assembly occupancies into five groups, A-1 through A-5. Of those five groups the current list in 518-4(c) involves two, A-2 and A-3. Since the IBC does not establish different requirements within a use category and uses in both A-2 and A-3 are currently allowed by the NEC, it makes no sense not to allow the additional uses specified.

Several of the additions are due to a recommended change to 518-2 to coordinate the NEC with the Life Safety Code. These include college and university classrooms (100 persons and over), drinking establishments and libraries. These offer no hazard to life due to electrical installations greater than those already on the list do. Not adding these to the list in 518-4(c) would actually extend the prohibition without substantiation.

Without any historical or research data to validate their action, the panel has consistently rejected logical expansion of the list of uses where ENT and RNMC are permitted for assembly occupancies. ENT and RNMC are permitted wiring methods in high-rise buildings; residential occupancies, including board and care facilities; health care facilities; and detention and correctional occupancies. Clearly if they can be used in these occupancies, many of which are defined in place occupancies, fire, smoke, and

toxicity is not an issue. In these occupancies the fire history has been improving over the last several years. Since the mid-1980s the fire history in these occupancies, where ENT and RNMC are permitted, has improved consistently with other occupancies. There has been an approximate 1/3 decrease in the number of fires in occupancies where ENT and RNMC have been permitted for several years which is consistent with the decrease in the number of fires overall (excluding 1- and 2-family dwellings). (This is based on the NFPA annual fire loss report in the September/October issue each year in the NFPA Journal. The categories of stores and offices, apartments, and institutional were used to represent typical occupancies that ENT and RNMC are permitted to be used in.) If ENT and RNMC were a problem it would have shown up either in the statistics or in litigation, neither of which has occurred.

A review of previous panel substantiations for not permitting ENT or RNMC in similar applications has not revealed any technical rationale for the prohibition. The rejection of Proposal 15-29 during the last code cycle was based on a substantiation that lacked any technical merit. Electrical wiring methods do not behave differently because they are in assembly occupancy. Most other occupancies can have many more than 100 people in them and ENT and RNMC is permitted. The Life Safety Code and the model building codes address the problems of people being unfamiliar with their surroundings, which is a key element in assembly occupancies. There is no valid reason to prohibit ENT or RNMC in the proposed listed uses.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation does not provide technical merit or data to expand the uses already permitted.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 15

NEGATIVE: 3

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

AMOS: I am voting against the Panel Action to reject this proposal.

Nonmetallic tubing and rigid nonmetallic conduit is already allowed in a myriad of locations that meet the same criteria as the submitter suggests. Other proposals call for eliminating the reference to particular occupancies because there can never be a "complete" list of occupancies. If the list of examples in 518-2(a) are deleted, there would no longer be a need to list examples in 518-4(c) which would make the rejection a moot point. To reject this proposal on the basis that the proposer did not provide technical data, is really an injustice to the submitter. There is no need to provide any additional data that has not already been presented to the Panel over the years. This is a wiring method that is tried and tested since the early 80's with no negative impact on life or property. This is conduit installed behind a 15-minute finish rated wall, in a room where combustible materials are abundant. How could the use of nonmetallic conduit possibly be considered to be objectionable? To follow the Panel's substantiation: "The Panel, does not provide any technical date to support not expanding its use".

The Panel incorporated 19 separate proposals into rewriting the article to be more user friendly and to comply with the Style Manual. However, we maintained our clearance requirements regarding our overhead distribution.

GLENN: I am voting against the panel action to reject this proposal. The panel's statement that the substantiation does not provide technical merit or data to expand the use of ENT and RNMC to these other venues does not follow good reason. The submitter's substantiation showed that the NFPA Annual Fire Loss Report indicates that in the locations where ENT and RNC are now used there has been a decrease not an increase in fires. If this is the case, what is our reason for not allowing ENT and RNMC to be used in a location that is protected with a 15-minute finish rating?

ENT and RNMC are listed for these types of applications. Fire records show no increase in fire related problems in areas that now use ENT and RNMC. These materials have been in use for over 25 years. In these applications, these materials are required to be covered by 2 in. of concrete or behind a fire rated wall. These are just some of the reasons to accept this proposal.

HIRSCHLER: No evidence exists of fire fatalities resulting from the use of electrical nonmetallic tubing (ENT) or rigid nonmetallic conduit (RNMC) protected by a wall with a 15 min. finish rating. None of these wiring methods are new, they both have a long history of safe use: PVC conduits were introduced in the early 1960's and RNMC was first approved for use in the NEC in 1968, while ENT was first approved in the NEC in 1984.

Furthermore, the panel was already informed in previous cycles that (a) electrical cables installed within ENT can continue to function, when the ENT is installed in code-compliant fashion, even after a fire in the place of assembly has reached flashover; (b) ENT meets the physical property requirements of NEMA and UL for listing for this application, in terms of crushing resistance, impact resistance and tensile and (c) both ENT and RNMC have been safely used for 9 years in the Reedy Creek Improvement District. It has also been shown earlier that the use of nonmetallic raceways (electrical nonmetallic tubing (ENT) and rigid nonmetallic conduit (RNMC) in the occupancies allowed by the code, with the protection required by the code, does not introduce any significant additional hazard to the occupants, or hinder escape in any way. In all the occupancies mentioned in the code there is extra protection, in terms of means of egress, already provided by the model building codes.

Moreover, the fire load (as represented by the combustible materials and products in the room) in places of assembly includes seating for the attendance (which is intended for 100 or more persons). Thus, it is likely that at least 5,000 pounds (100 times a 50 pound seat) of combustible material, of high flammability (since there are no mandatory requirements of fire performance of seating), is present in the assembly room. The fire resulting from ignition of this mass of combustibles vastly exceeds the potential contribution of a few pounds of nonmetallic conduit installed behind a half inch gypsum board wall.

The standard material used in ENT and in RNMC is unplasticized poly(vinyl chloride) (unplasticized PVC), which is of very low combustibility. In fact, unplasticized poly (vinyl chloride) (unplasticized PVC), which is of very low combustibility. In fact, unplasticized PVC will only burn when subjected to intense heat or flame and will cease burning as soon as the source of heat or flame is withdrawn from its vicinity. In terms of fire hazard, the key question is: "How big is the fire?" The answer is given by the maximum heat release rate. A burning object will spread a fire to nearby products only if its gives off enough heat to ignite them. Moreover, the heat has to be released fast enough not to be dissipated or lost while traveling through the cold air surrounding anything not on fire. The rate of heat release has been shown to be much more important than either ease of ignition, smoke toxicity or flame spread in controlling the time available for potential victims of a fire to escape. The maximum rate of heat released by unplasticized PVC when it burns is smaller than that of almost any nonmetallic material, and is indistinguishable from the heat released by the ignition source itself in many cases. The addition of PVC rigid nonmetallic conduit and electrical nonmetallic conduit in concealed spaces does not add any significant fire hazard to such spaces, due to the excellent fire performance of PVC and the good history of safe use of the product.

It is informative to compare the rate of heat release of unplasticized PVC (material used to make electrical nonmetallic tubing ro rigid nonmetallic conduit) with that of the polyurethane foam typically used as the resilient material in an auditorium seat (when considering equal areas):

Product	Conduit PVC	Chair Polyurethane Foam
Incident Heat Flux: 20 kW/m^2		
Peak rate of heat release	50-100 kW/m^2	250-300 kW/m^2
Incident Heat Flux: 40 kW/m^2		
Peak rate of heat release	120-180 kW/m^2	700-750 kW/m^2
Weight of Products	0.1 – 0.2 pounds per foot of raceway	50-100 pounds per seat

This proposal should have been approved, or at least approved in part if the panel believes that there is a specific hazard associated with one or more of the additional uses proposed. The panel statement is inadequate; the panel should have justified why each individual additional occupancy recommended for permitted use of ENMT and RMC is inappropriate for such use. For example it is unclear what additional hazard is associated with university classrooms that is not inherent on other meeting rooms.

COMMENT ON AFFIRMATIVE:

VANNICE: See also Panel Statement to Proposal 15-11.

(Log #2932a)

15- 18a - (519 (New)): Reject

SUBMITTER: Christopher Pharo, Rep. IBEW

RECOMMENDATION: This proposal is to add the following code article.

Article 519. Day-care Facilities.

519-1. Scope. A for profit facility responsible for the maintenance, supervision, and overall well being of children.

519-4. Wiring Methods. Except as modified in this article, wiring methods shall comply with the applicable requirements of Chapters 1 through 4 of this code.

519-6. Grounding of Receptacles and Fixed Electric Equipment.

(a) Childcare Areas. In an area used for the supervision of children, the grounding terminals of all receptacles and all noncurrent carrying conductive surfaces of fixed electric equipment likely to become energized that are subject to personal contact, operating over 100 volts, shall be grounded by an insulated copper conductors. The grounding conductor shall be sized in accordance with Table 250-122 and installed in metal raceways with the branch circuit conductors supplying these receptacles or fixed equipment.

(b) Methods. In addition to the requirements of Section 519-6(a), all branch circuits serving childcare areas shall be provided with a ground path for fault current by installation in a metal raceway system or cable assembly. The metal raceway system, or cable armor or sheath assembly, shall itself qualify as an equipment grounding return path in accordance with Section 250-118.

519-8. Protection.

(a) Childcare Areas. All 15 and 20 ampere, 125 volt receptacles intended to supply childcare areas shall be listed tamper resistant or shall employ a listed tamper resistant cover.

(b) Other Areas. Other areas that contain receptacles and fixed equipment and not intended for childcare shall be considered effectively isolated if lockable door hardware is installed.

519-10. Essential Electrical System.

(a) System Operation. The essential electrical system for these facilities shall be capable of supplying a limited amount of lighting and power. This is considered fundamental in the event of any emergency evacuation that may be needed.

(b) Sources of Power. The essential electrical system must be comprised of either an emergency generator or equipment supplied with an integral battery back-up.

(c) Equipment on the Essential Electrical System.

(1) Illumination of means of egress.

(2) Fire alarm system.

(3) Exit signs.

(4) Elevators.

SUBSTANTIATION: Due to today's economy, both the mother and father must work in order to make ends meet. These families rely on day-care to supervise their children while they are at work. As of this code cycle, these facilities do not fall into any specific category within the NEC. As far as the code is concerned, this facility shall be treated just like any commercial business.

Young children are incapable of self-preservation. Therefore it is up to the NEC to: (1) regulate what wiring methods may be used, (2) determine if an essential electrical system is needed, and (3) protect children from e hazards of electrical devices and equipment. Without this article, or something similar, we continue to place our defenseless children in harms way.

Government and State agencies have already stepped in to regulate exactly who is caring for our children and how they do it. Now is the time for the NEC to rise up and establish minimum safety guidelines for the safe construction and maintenance of day-care facilities.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Proposal 15-18b which address the same issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

COMMENT ON AFFIRMATIVE:

KRAMER: The reference to 15-55 is a typo, my notes show the correct reference to be 18b, which does address child care facilities, unlike 15-55.

VANNICE: I believe that the proposal referenced in the Panel Statement should be 15-18b, and not 15-55.

(Log #2932)

17- 54 - (519 (New)): Reject

SUBMITTER: Christopher Pharo, Rep. IBEW

RECOMMENDATION: This proposal is to add the following code article.

Article 519. Day-care Facilities.

519-1. Scope. A for profit facility responsible for the maintenance, supervision, and overall well being of children.

519-4. Wiring Methods. Except as modified in this article, wiring methods shall comply with the applicable requirements of Chapters 1 through 4 of this code.

519-6. Grounding of Receptacles and Fixed Electric Equipment.

(a) Childcare Areas. In an area used for the supervision of children, the grounding terminals of all receptacles and all noncurrent carrying conductive surfaces of fixed electric equipment likely to become energized that are subject to personal contact, operating over 100 volts, shall be grounded by an insulated copper conductors. The grounding conductor shall be sized in accordance with Table 250-122 and installed in metal raceways with the branch circuit conductors supplying these receptacles or fixed equipment.

(b) Methods. In addition to the requirements of Section 519-6(a), all branch circuits serving childcare areas shall be provided with a ground path for fault current by installation in a metal raceway system or cable assembly. The metal raceway system, or cable armor or sheath assembly, shall itself qualify as an equipment grounding return path in accordance with Section 250-118.

519-8. Protection.

(a) Childcare Areas. All 15 and 20 ampere, 125 volt receptacles intended to supply childcare areas shall be listed tamper resistant or shall employ a listed tamper resistant cover.

(b) Other Areas. Other areas that contain receptacles and fixed equipment and not intended for childcare shall be considered effectively isolated if lockable door hardware is installed.

519-10. Essential Electrical System.

(a) System Operation. The essential electrical system for these facilities shall be capable of supplying a limited amount of lighting and power. This is considered fundamental in the event of any emergency evacuation that may be needed.

(b) Sources of Power. The essential electrical system must be comprised of either an emergency generator or equipment supplied with an integral battery back-up.

(c) Equipment on the Essential Electrical System.

(1) Illumination of means of egress.

(2) Fire alarm system.

(3) Exit signs.

(4) Elevators.

SUBSTANTIATION: Due to today's economy, both the mother and father must work in order to make ends meet. These families rely on day-care to supervise their children while they are at work. As of this code cycle, these facilities do not fall into any specific category within the NEC. As far as the code is concerned, this facility shall be treated just like any commercial business.

Young children are incapable of self-preservation. Therefore it is up to the NEC to: (1) regulate what wiring methods may be used, (2) determine if an essential electrical system is needed, and (3) protect children from e hazards of electrical devices and equipment. Without this article, or something similar, we continue to place our defenseless children in harms way.

Government and State agencies have already stepped in to regulate exactly who is caring for our children and how they do it. Now is the time for the NEC to rise up and establish minimum safety guidelines for the safe construction and maintenance of day-care facilities.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel does not believe day care facilities warrant a separate Article in the NEC. Any special requirements for day care facilities should be added to the applicable sections of Chapters 1 through 4. A proposal has been made to add a requirement for tamper resistant receptacles to Article 210 for day care facilities and the panel believes that is the

appropriate location for such a requirement. NFPA 101 covers the life safety issues associated with day care facilities.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

(Log #41a)

15- 18b - (519-1 (New)): Reject
NOTE: The following proposal consists of Comment 15-28 on Proposal 15-31 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 15-31 was:
To have an article titled, Child Care Facilities. To list requirements which child care facilities must follow to ensure the wellbeing of the children.
SUBMITTER: David E. Shapiro, Rep. Safety First Electrical Contracting
RECOMMENDATION: Proposing new text:
526-1. Definition: Child Care Facilities are establishments, or portions of establishments, where children under age twelve are supervised by adults other than their parents, that include provision for naps or sleep, and establishments or portions of establishments where children under age seven are supervised by adults other than their parents in any ratio more demanding than one adult to three children, not counting administrators.
FPN: Child care facilities include, but are not limited to, day care centers, after-school and preschool facilities, whether commercial or not. Authorities having jurisdiction may wish to apply the application of this article to facilities for older children who are disturbed or retarded.
526-2. Layout. Child care facilities shall meet or exceed Code requirements for sleeping areas of hotels.
526-3. Receptacles.
(a) Design. All receptacles permitting ready access shall be Listed as tamper-proof.
(b) Protection. All receptacles in portions of the facility to which children have access, whether or not the receptacles are themselves readily accessibly, shall have GFCI protection.
526-4. Egress. Where 20 or more children are to be present simultaneously, Article 518 shall apply.
526-5. Replacement. Section 526-3 shall apply to replacement of receptacles.
SUBSTANTIATION: GFCI protection will greatly reduce, though not eliminate, injuries due to children sticking objects into readily-accessible receptacles. GFCI protection will reduce, though not eliminate, injuries due to chewing on cords plugged into less accessible receptacles. Where 20 or more young or very young children are served, perhaps, napping, ingress and egress in the case of any emergency can be as much as five times as difficult, and thus warrant the restrictions brought into play with a school or auditorium with 100 adults or older children.
PANEL ACTION: Reject.
PANEL STATEMENT: Comment 15-28 on Proposal 15-31 in the 1998 Annual Meeting NEC Report on Proposals was placed on hold for further study by a task force.
After further research and getting the original proposers backup documentation, it is the opinion of the task force that the NEC is not the place for this type of an article. Childcare facilities are rarely stand-alone facilities, they range from baby sitting neighbors, to church basements, schools, and office complexes, all of which are in existing buildings.
For the most part the facilities are converted classrooms or offices to accommodate a childcare facility where the wiring has already been installed. Our research included discussions with existing childcare facilities operators who agree that the jury is still out on what constitutes “child proof.” Experience has shown that anything out of the ordinary, such as a special cover on a receptacle, becomes an attractive challenge to the inquisitive child. The most problematic aspect of this proposal is enforcement since the majority of these facilities are in existing buildings where the wiring has already been approved by the AHJ.
It is the opinion of the task force that mandating a minimum standard should be left to the childcare licensing agency not the NEC, to make sure the facility is safe for the intended use. The general opinions of the operators interviewed is that the everyday hazards, such as tripping, lead paint, asbestos tiles, electric cords and household products are their main concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #41)

17- 55 - (519-1 (New)): Reject
NOTE: The following proposal consists of Comment 15-28 on Proposal 15-31 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 15-31 was:
To have an article titled, Child Care Facilities. To list requirements which child care facilities must follow to ensure the wellbeing of the children.
SUBMITTER: David E. Shapiro, Rep. Safety First Electrical Contracting
RECOMMENDATION: Proposing new text:
526-1. Definition: Child Care Facilities are establishments, or portions of establishments, where children under age twelve are supervised by adults other than their parents, that include provision for naps or sleep, and establishments or portions of establishments where children under age seven are supervised by adults other than their parents in any ratio more demanding than one adult to three children, not counting administrators.
FPN: Child care facilities include, but are not limited to, day care centers, after-school and preschool facilities, whether commercial or not. Authorities having jurisdiction may wish to apply the application of this article to facilities for older children who are disturbed or retarded.
526-2. Layout. Child care facilities shall meet or exceed Code requirements for sleeping areas of hotels.
526-3. Receptacles.
(a) Design. All receptacles permitting ready access shall be Listed as tamper-proof.
(b) Protection. All receptacles in portions of the facility to which children have access, whether or not the receptacles are themselves readily accessibly, shall have GFCI protection.
526-4. Egress. Where 20 or more children are to be present simultaneously, Article 518 shall apply.
526-5. Replacement. Section 526-3 shall apply to replacement of receptacles.
SUBSTANTIATION: GFCI protection will greatly reduce, though not eliminate, injuries due to children sticking objects into readily-accessible receptacles. GFCI protection will reduce, though not eliminate, injuries due to chewing on cords plugged into less accessible receptacles. Where 20 or more young or very young children are served, perhaps, napping, ingress and egress in the case of any emergency can be as much as five times as difficult, and thus warrant the restrictions brought into play with a school or auditorium with 100 adults or older children.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not believe day care facilities warrant a separate Article in the NEC. Any special requirements for day care facilities should be added to the applicable sections of Chapters 1 through 4. A proposal has been made to add a requirement for tamper resistant receptacles to Article 210 for day care facilities and the panel believes that is the appropriate location for such a requirement. NFPA 101 covers the life safety issues associated with day care facilities.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 3 Clark, Nash, Telecky

ARTICLE 520 — THEATERS, AUDIENCE AREAS OF MOTION PICTURE AND TELEVISION STUDIOS, AND SIMILAR LOCATIONS

(Log #480)

15- 19 - (520): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 520-5(a) - revise as follows:
"(a) General. The fixed wiring method shall be metal raceways, nonmetallic raceways encased in at least 50 mm (2 in.) ~~2 in. (50.8 mm)~~ of concrete, Type MI cable, or Type MC cable."
520-42 - last sentence, change "6 in. (152 mm)" to "150 mm (6 in.)"
520-43 - change "No. 20 MSG" to "0.81 mm (0.032 in.)" and change "1/2 in. (12.7 mm)" to "13 mm (_ in.)"
520-47 - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
520-53(a) - change "No. 24 MSG" to "0.51 mm (0.020 in.)"
520-53(h)(2) - change "6 in. (152.4 mm)" to "150 mm (6 in.)" in two places.
520-53(h)(3) - change "10 ft (3.05 m)" to "3.0 m (10 ft)" in two places.
520-53(h)(4) - change "20 ft (6.1 m)" to "6.0 m (20 ft)" in two places.
520-53(h)(4)(e) - change "7 ft (2.13 m)" to "2.1m (7 ft)"
520-53(j) - change "100 ft (30.5 m)" to "30 m (100 ft)" in three places.
520-63(a) - change "18 in. (457 mm)" to "450 mm (18 in.)"
520-68(a)(4)(b) - change "20 ft (6.1 m) to "6.0 m (20 ft)"
520-69(c) - change "3.3 ft (1 m)" to "1.0 m (3.3 ft)"
520-72 - change "8 ft (2.44 m)" to "2.5 m (8 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
MSG is no longer in general use so the equivalent minimum thickness (nominal - tolerance) is being substituted.
PANEL ACTION: Accept.
PANEL STATEMENT: Editorially add "(1/2 in.)" to the line for 520-43 where value in the recomendation is blank.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #3423)

15- 20 - (520): Accept
SUBMITTER: Kenneth E. Vannice, NSI Corp./Rep. US Inst. for Theater Tech. Engr. Comm.
RECOMMENDATION: This proposal is to change the title of Article 520 to read as follows:
"Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations."
SUBSTANTIATION: Article 525 has been misapplied by authorities having jurisdiction to touring concerts and theater productions in outdoor Performance Areas. This change is required to clarify that Article 520 should be applied to these Performance Areas, and that Article 525 has nothing to do with these areas.
When a temporary stage or performance area is installed outdoors in a stadium or parking lot, it is appropriate to apply the requirements of Article 520 to the installation, which is, in fact, more stringent and different than Article 525 in many areas. This is because the same portable equipment and installation techniques are used in these temporary venues as in a permanent theater or similar location.
There is considerable confusion on the part of the authority having jurisdiction regarding the application of Article 525 to this type of Performance Area. Often, the requirements of Article 525, which are specifically targeted at the requirements of carnivals, fairs, and circuses, are completely at odds with the type of equipment and installation techniques used in a temporary Performance Area. For instance, the GFCI requirements of Article 525 are totally inappropriate for the large phase-control dimming systems in use in Performance Areas. In addition, these areas are installed and operated by qualified personnel, and are not accessible to the general public in the way carnival rides are.
This proposal is related to our proposal to revise Section 520-2.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #3424)

15- 21 - (520-1): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Kenneth E. Vannice, NSI Corp./Rep. US Inst. for Theater Tech. Engr. Comm.
RECOMMENDATION: This proposal is to add the following text to Scope 520-1 as follows:
"This article covers all buildings or that part of a building or structure, indoor or outdoor, designed or used for presentation, dramatic, musical, motion picture projection, or similar purposes and to specific audience seating areas within motion picture or television studios."
SUBSTANTIATION: The intent of this proposal is to clarify that Article 520 applies to any performance area whether it is an indoor staged production or an outdoor stage in a stadium parking lot or similar locations.
PANEL ACTION: Accept.
PANEL STATEMENT: Correct the spelling of "building" in the first sentence.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #3425)

15- 22 - (520-2-Performance Area): Accept in Principle
SUBMITTER: Kenneth E. Vannice, NSI Corp./Rep. US Inst. for Theater Tech. Engr. Comm.
RECOMMENDATION: Add a new definition to read as follows:
Performance Area. A temporary stage structure, whether indoors or outdoors, constructed of scaffolding, truss, platforms, or similar devices, which is used for the presentation of theatrical or musical productions, and the audience seating area associated with such structure.
SUBSTANTIATION: The intent of this proposal is to clarify that Article 520 applies to any performances area whether it is an indoor staged production or an outdoor stage in a stadium parking lot or similar location.
This proposal is related to our proposal to revise the title of Article 520.
This definition is derived from the NFPA NEC 1999 Handbook and NEC subsection 518-2(c).
PANEL ACTION: Accept in Principle.
Add a new definition to read as follows:
Performance Area. The stage and audience seating area associated with a temporary stage structure, whether indoors or outdoors, constructed of scaffolding, truss, platforms, or similar devices, which is used for the presentation of theatrical or musical productions or for public presentations.
PANEL STATEMENT: The revised wording more clearly states the requirement. The term "public presentations" was added because although they are not theatrical or musical, the use of the space is the same and should have similar requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #4097)

15- 23 - (520-5(a) and (c)): Reject
SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council
RECOMMENDATION: Revise text as follows:
520-5. Wiring Methods.
(a) General.
(1) The fixed wiring method shall be metal raceways, nonmetallic raceways encased in at least 2 in. (50.8 mm) of concrete, Type MI cable, or Type MC cable.
Exception: Fixed wiring methods shall be as provided in Article 640 for audio signal processing, amplification and reproduction

equipment, in Article 800 for communication circuits, in Article 725 for Class 2 and Class 3 remote-control and signaling circuits, and in Article 760 for fire alarm circuits.

(2) Nonmetallic-sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid nonmetallic conduit shall be permitted to be installed concealed within walls, floors, and ceilings where the walls, floors, and ceilings that provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies. When installed above suspended ceilings, the suspended ceilings shall provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

(b) Portable Equipment. (No Changes)

~~(c) Nonrated construction. Nonmetallic-sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid nonmetallic conduit shall be permitted to be installed in those buildings or portions thereof that are not required to be of fire-rated construction by the applicable building code.~~

SUBSTANTIATION: The wording of section to 520(c) is vague and ambiguous at best. The wording is identical to the wording used in 518-4(b). Is the intent of this section to prohibit use of wiring methods noted in buildings that are of "protected" construction type such as 5A (Protected Wood Frame), 3A (Protected Ordinary), or 2A/2B (Protected Noncombustible) under the Model Building Codes, and in non-fire rated construction if certain walls in such a building are required to have a fire rating by other section of the building code, even if:

1. These buildings are 3 stories or less in height, complying with Section 336-5(a)?
2. These buildings are 3 stories or less in height and are sprinklered, wherein interior corridor walls and other interior walls and floors can be non-fire rated?

One can design a non-fire rated construction type building under the building codes (or NFPA 101), and because of issues dealing with corridors, tenant spaces, or hazardous areas would require some fire-rated walls or floor separations. I could design this same non-fire rated construction type building and sprinkler the building, and all the fire-rated wall and floor issues are permitted to be non-fire rated. Under the building codes (or NFPA 101) even in fire-rated construction types, when the building is sprinklered, the only fire-rated walls would be load bearing walls.

The Electrical Code Handbook's commentary on page 675 refers one over to the commentary for Section 518-4 on page 672. The commentary on page 672 is even more confusing trying to explain this bizarre restriction where one side of a storage room can use one type of wiring, but the other side of the storage room adjoining the corridor cannot. The plain fact is that there is no technical reason to prohibit the wiring systems in 520-5(b) to non-fire rated construction, or to non-fire rated walls in non-fire rated construction types.

By the time this code proposal is reviewed by the Panel 15 Committee, the rejected report and proposals of the NEC Task Group on NM Cable will have been made available to the Panels. Even though the NEC Technical Correlating Committee rejected the code proposals because of non-consensus on the Task Group, writing the Task Group's Report and the negative comments from the Task Group's Committee Members, everyone can easily "read between the lines." The Task Group could find no technical reasons or fire/life/injury data to support restricting NM Cable above and beyond any other wiring method.

Based on the lack of findings in the NEC Task Group on NM Cable of any hazard with the use and installation of NM Cable, and the submitted report "Type NM Cable Fire Hazard Analysis," prepared by Paul D. Sullivan, P.E., based on fire testing by Dr. Fred Mowrer (Fire Protection Engineering Department, University of Maryland), and a third party review of the Fire Hazard Report by Dr. Fred Clarke (Benjamin/Clarke Associates, Inc.), NM cable is no more hazardous than the use of ENT.

The submitted fire hazard analysis report was based on the original "Fire Hazard Analysis; The Use of ENMT" that was submitted with the 1987 NEC TCR Code Proposal 8-49 (including the 1987 NEC TCD 8-32 and 8-32A) to remove the three story limit for ENMT. The conclusions of this report were (pages 10-11):

1. "Type NM cable will not decrease the level of life safety within a building of any height when located in ceiling and wall spaces separated from the interior of the building by a 15-minute finish rating (i.e., 1/2-in. thick gypsum wallboard), and on this basis should not arbitrarily be limited to 3 stories in height."
2. In terms of building fire safety, these results indicate that Type NM Cable, like ENMT (which is not limited to 3 stories by the National Electrical Code), will not contribute to the hazard of a fire when the cable is separated from the interior of the building by a 15-minute finish rating (NFPA 70, Section 331-3(2)."

The deletion of 520-5(c) and the revision of 520-5(a) would be justified based on the work of the NEC Task Group on NM Cable, and the submitted report that is based on actual fire testing of NM Cable and ENT.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The fire hazard assessment presented does not address a realistic heat input into the NM cable. NM cable is made of plasticized PVC and not rigid PVC, it is not required to be highly fire retarded and would ignite under conditions of fairly low heat input generating a significant amount of heat and potentially spreading the flame beyond the area of origin. Electrical nonmetallic tubing and rigid nonmetallic conduit are made of rigid PVC, which will not ignite unless an intense heat source is applied and continues to be imposed on the raceway, and that is why they are permitted in this section.

Support documentation addresses flammability and toxicity issues as they relate to survivability. However, another issue is protection of the conductors so they don't become the source of ignition. Section 336-6(b) doesn't allow for this - it states "The cable shall be protected from physical damage where necessary . . . " - this proposal would negate that requirement. The thermal barrier required for ENT and RNMC does not necessarily provide this physical protection.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

(Log #3294)

15- 24 - (520-5(a)(2)): Accept

SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn.

RECOMMENDATION: Revise text to read as follows:

520-5. Wiring Methods.

(a) General. The fixed wiring method shall be metal raceways, nonmetallic raceways encased in at least 2 in. (50.8 mm) of concrete, ~~Type MI cable, or Type MC cable.~~ Type MI cable, MC cable, or AC cable containing an insulated equipment grounding conductor sized in accordance with Table 250-122.

SUBSTANTIATION: The proposed revision will provide the same wiring methods for Article 520, Theaters, Audience Areas of Motion Picture and Television Studios, and Similar Locations, as is now permitted for Article 518, places of assembly.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

NEGATIVE: 1

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: There has been no substantiation introduced to show that AC cable exhibits the physical integrity that this panel has always required for wiring methods used in theaters. Moreover, AC cable has not been shown to have the same fire safety characteristics of MI cable or MC cable, because of the insulated conductors, which do not have to meet sufficient fire safety requirements.

(Log #4244)

15- 25 - (520-5(d)): Reject

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Add the following new subsection (d):

(d) Spaces with Finish Rating. Where this article applies to one or more portions of restaurants, or to conference or meeting rooms in hotels or motels, dining facilities and church chapels, electrical nonmetallic tubing and rigid nonmetallic conduit shall be permitted to be installed in audience seating areas not exceeding 1000 persons under either of the following conditions.

(1) The electrical nonmetallic tubing or rigid nonmetallic conduit is installed concealed within walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

(2) The electrical nonmetallic tubing or rigid nonmetallic conduit is installed above suspended ceilings not used as other

space for environmental air as covered in Section 300-22(c). The suspended ceilings shall provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

FPN: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature rise of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

SUBSTANTIATION: In the 1996 Code cycle, and over the figurative dead bodies of the majority of CMP 15 members, the Standards Council placed a more liberal version of this allowance into Article 518. Subsequently, the EC&M Code Forum department was asked if that allowance applied to a meeting room with a stage at one end. We said no to the stage equipment, but yes to the perimeter wiring around the audience seating area. One member of CMP 15 wrote and vehemently objected, so we reconsidered, and then reaffirmed our original conclusion. We didn't think the new rule went into the Code only to be effectively nullified by an incidental stage presence at one end. Most conference facilities and large restaurants have some facilities for stage uses.

The new provision in Sec. 518-2(c), declaring any such audience seating area covered by Article 520, ups the ante considerably. In fact, it is tantamount to circumventing the Council decision. Very few conference facilities with occupancy loads over 100 don't have some sort of stage facility. This proposal restores the status quo ante, by putting the same requirement into Article 520. In response to a helpful conversation with the same CMP 15 member who objected to our original conclusion in the EC&M article, this proposal has been drawn to exclude from coverage very large venues. These inherently involve greater risk and more directly involve a stage focus, with specialized stage equipment likely to be positioned throughout. The 1000 person limit comes from CMP 15's articles, in Section 700-9(d), where it establishes a threshold for enhanced feeder protection.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal seeks to modify Art 520 insofar as it applies to certain Art. 518 venues. The submitter has ignored the qualifications of "Theatrical Areas" in the specific Section 518-2(c) which requires the application of Art. 520, and this would essentially nullify 518-2(c). These Theatrical Areas are "…for the presentation of theatrical or musical productions". This does not apply to a meeting room with a raised platform for a panel or a lecture. Only stages used for these types of productions require the application of Art. 520 to audience seating areas in Art. 518, which clearly excludes the majority of platforms (sometimes referred to as stages) in meeting rooms. These types of productions typically require lower light levels in audience seating areas, higher audience seating density, and the high likelihood of theatrical luminaires and branch circuits over the audience seating area as well as the stage. The "theatrical area " of an Art. 518 occupancy must provide the same level of protection to the audience as that of a theater covered by Art. 520, since the uses are identical. There is no basis for the 1000 person limit in the proposal, since many theaters covered by Art. 520 have much smaller seating capacities than 1000.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

NEGATIVE: 1

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: The proponent made a reasonable suggestion, consistent with the use of ENT and RNMC in Article 518. The panel should have accepted this proposal in part and chosen the occupancy spaces suitable for the use of plastic conduit.

COMMENT ON AFFIRMATIVE:

VANNICE: The submitter seems to believe that the addition of "audience seating areas" to the 1999 Edition of NEC Section 518-2(c) was offered as some form of retaliation. That is far from the truth.

Section 518-2(c) addresses the presence of projection booths, stage platforms or areas for the presentation of theatrical or musical productions. It doesn't address projection systems not requiring a booth (see Article 540), or platforms containing head dinner tables, lecture podiums, panel discussion tables, overhead projector equipment and the like. For the purpose of discussion, I limit this paragraph to portable systems only. Equipment suitable for use in stage and studio applications is greatly different than equipment suitable for general use. Stage and studio equipment is covered by different UL standards, and is excepted to be used under the supervision of specially trained personnel and not the general public. Section 518-2(c) attempts to separate those areas where stage and studio equipment is likely to be used from those areas where general-use equipment is being used. The submitters of the "audience seating areas" clause saw very little difference between a light tower full of stage fixtures wired with portable cord to a stage switchboard on a stage platform, and light towers located in the audience areas with portable cord funning down the aisle areas. It was a case of grounded equipment wired with extra-hard usage cord vs. in some cases ungrounded equipment wired with hard usage or less cord. It was not a case of metallic vs. non-metallic raceway.

Turning now to the fixed equipment case, the issues are similar. It has been stated above the difference between the stage/studio equipment (and other professional equipment) operated by trained personnel and general-use equipment operated by the general public. If a stage in the end of a ballroom is wired to be lit with general-use light track and set up with a wait staff, it is probably not a theatrical venue. If the stage is lit with stage lighting equipment it should be wired like a theatrical venue.

(Log #3748)

15- 26 - (520-11): Reject

SUBMITTER: John H. Schwab, Jr., City of Wauwatosa, WI

RECOMMENDATION: Add new Section 520-11

520-11. Illumination. All illumination, both normal and emergency and for both movie time and intermission shall conform to NFPA 101, Life Safety Code.

SUBSTANTIATION: This would give designers, engineers, and electricians all a place to start from for illumination. Inspectors also have a place of reference to enforce illumination in theaters.

PANEL ACTION: Reject.

PANEL STATEMENT: 1. "Normal" illuminance criteria for any location is not within the scope of either the NEC or the Code for Safety to Life From Fire in Buildings and Structures (NFPA 101).

2. Emergency illuminance criteria is not within the scope of the National Electrical Code. The NEC specifically states in Article 90-1 (c) that it is not intended to be a design specification and in 90-2 (a) that it only covers installations and not the issues of design.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

(Log #932)

15- 27 - (Table 520-44 Note): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise first sentence:

Ampacity shown is the ampacity for multiconductor cords and cables where only three copper conductors are current-carrying, as described in Section 400-5.

SUBSTANTIATION: Editorial. Since the neutral is a current-carrying conductor, the code indicates certain conditions where it is not so considered such as Sections 310-15(b)(4) and 400-5. Since this table is in Chapter 5 it may be perceived as not encompassing those sections.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

(Log #1083)

15- 28 - (520-53(h)(2)): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change "No. 2" to "2 AWG" and "No. 6" to "6 AWG".

SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #2519)

15- 29 - (520-53(h)(2)): Accept

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-9. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Richard E. Loyd, Perryville, AR

RECOMMENDATION: Revise as follows:

(2) Single-Conductor Cables. Single-conductor portable supply cable sets shall not be smaller than No. 2 conductors. The equipment grounding conductor shall not be smaller than No. 6 conductor. Single conductor grounded neutral cables for a supply shall be sized as per Section 520-53(o)(2). Where single conductors are paralleled for increased ampacity, the paralleled conductors shall be of the same length and size. Single conductor supply cables shall be grouped together but not bundled. The equipment grounding conductor shall be permitted to be of a different type, provided it meets the other requirements of this section, and it shall be permitted to be reduced in size as permitted by Section 250-122. Grounded (neutral) and equipment grounding conductors shall be identified in accordance with Sections 200-6, 250-134(b), and 310-12. Grounded conductors shall be permitted to be identified by marking at least the first 6 in. (152.4 mm) from both ends of each length of conductor with white ~~or natural gray.~~ Equipment grounding conductors shall be permitted to be identified by marking at least the first 6 in. (152.4 mm) from both ends of each length of conductor with green or green with yellow stripes. Where more than one nominal voltage exists within the same premises, each ungrounded conductor shall be identified by system.

SUBSTANTIATION: This term is undefined. The past Chairman of CMP-5 and others with historical data as to where this term originally came from all relate to products or product manufacturing process that has not been used for the past 35 to 50 years. Since it is a term that was used to define a product no longer made it should be deleted to eliminate the confusion that continues to exist in the industry.

There are many shades of white and many shades of black. How does one determine if gray is a shade of black or white? Different manufacturers use various shades of each color and often two or three different manufacturers wire will be installed on the same job site. The continued use of the term causes confusion and is or could be a safety issue that might result in life threatening shock hazard.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
NEGATIVE: 2
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: I agree with Mr. Lanni's reason for negative vote.

LANNI: Eliminating the word "natural gray" narrows the color to white. There are variations of white which the natural gray color encompasses that will now become a new issue of confusion. To get pure white a natural PVC needs to have a white color additive. The white insulation discolors in time causing a legal issue and a safety issue that might result in a life threatening shock hazard. If natural gray is confusing, off-white, dirty white or natural white might be a better substitute. Better yet, natural gray could be defined, leaving the code unchanged. What a novel idea!

(Log #4299)

15- 30 - (520-53(h)(2)): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 5-9. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Charles F. Mello, Milwaukie, OR

RECOMMENDATION: Revise text as follows:

(2) Single-Conductor Cables. Single-conductor portable supply cable sets shall not be smaller than No. 2 conductors. The equipment grounding conductor shall not be smaller than No. 6 conductor. Single conductor grounded neutral cables for a supply shall be sized as per Section 520-53(o)(2). Where single conductors are paralleled for increased ampacity, the paralleled conductors shall be of the same length and size. Single conductor supply cables shall be grouped together but not bundled. The equipment grounding conductor shall be permitted to be of a different type, provided it meets the other requirements of this section, and it shall be permitted to be reduced in size as permitted by Section 250-122. Grounded (neutral) and equipment grounding conductors shall be identified in accordance with Sections 200-6, 250-134(b), and 310-12. Grounded conductors shall be permitted to be identified by marking at least the first 6 in. (152.4 mm) from both ends of each length of conductor with white or ~~natural~~ gray. Equipment grounding conductors shall be permitted to be identified by marking at least the first 6 in. (152.4 mm) from both ends of each length of conductor with green or green with yellow stripes. Where more than one nominal voltage exists within the same premises, each ungrounded conductor shall be identified by system.

SUBSTANTIATION: Delete the word natural since the color natural gray is not defined and in fact does not exist as a specified color for wire insulation. This proposal goes with the definition of gray within a specified range of color per the Munsell color system as used by industry for wire color coding. The definition of the gray is provided in another proposal.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's recommendation would permit gray, a previously permitted ungrounded conductor insulation color, to be used to identify the grounded conductor.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 2
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: I agree with Mr. Lanni's reason for negative vote.

LANNI: See my Explanation of Negative on proposal 15-29 (Log #4299).

(Log #4245)

15- 31 - (520-53(h)(5)): Reject

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

"Supply conductors ~~not reduced in ampacity~~ shall be permitted to pass through holes in walls specifically designed for the purpose. If penetration is through the fire-resistant–rated wall, it shall be in accordance with Section 300-21. The provisions of Section 520-53(3) and Section 520-53(h)(4) shall not apply to these conductors."

SUBSTANTIATION: Supply conductors could have their ampacity reduced for dozens of reasons that aren't relevant to this application, whether through running in high temperature ambients, or being subject to mutual conductor heating, or having excessive harmonic loading, etc. This proposal eliminates the former vague usage in favor of the exact provisions the 1999 change apparently intended to reference.

PANEL ACTION: Reject.

PANEL STATEMENT: 520-53(h)(5) only applies to portable switchboards. Therefore the other conditions of the submitter's substantiation do not apply.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:
AFFIRMATIVE: 15
NEGATIVE: 3
NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

KOVACIK: I agree with the negative comments of Mr. Kramer and Mr. Vannice.

KRAMER: The proposal should have been Accepted in Principle, with a change to the wording of 520-53(h)(5) to read:

(5) Supply Conductors Not Reduced in ~~Amapcity~~ Size. Supply conductors not reduced in ~~Amapcity~~size under the provisions of Section 520-53(h)(3) or Section 520-53(h)(4) shall be permitted to pass through holes specifically designed for the purpose. If penetration is through the fire-resistant-rated wall, it shall be in accordance with Section 300-21.

The existing 520-53(h)5 doesn't make a lot of sense; what are "supply conductors not reduced in ampacity"? 520-53(h)3 and 520-(h)4 (the so-called "theater tap rules") allow a short conductor to be increased in ampacity (reduced in size) under stringent conditions. One is the prohibition against the penetration of walls;

however a conductor carrying its normal current may go through a wall. 520-53(h)5 is the place were this is spelled out, but the term 'reduced in amapcity' makes this unclear.

VANNICE: The submitter is correct that "Supply Conductors Not Reduced in Ampacity" is vague unless specifically related to 520-53(h)(3) and 520-53(h)(4) where the term is "...supply conductors shall be permitted to be reduced is size...". In fact, the section is not referring simply to conductors that have had their amapcity lowered (which, as the submitter points out, could happen for a number of reasons including long-run voltage drop compensation), but rather to conductors that are undersized with respect to the overcurrent device that are fed from, under the "tap" rules of 520-53(h)(3) and 520-53(h)(4). The existing wording simply makes no sense under scrutiny.

This proposal should have been Accept in Principle, with a change to the wording of 520-53(h)(5) to read:

(5) Supply Conductors Not Reduced in ~~Ampacity~~ Size "Supply conductors not reduced in ~~ampacity~~ size under the provisions of Section 520-53(h)(3) or Section 520-53(h)(4) shall be permitted to pass through holes...".

(Log #3225)

15- 32 - (520-67): Accept

SUBMITTER: Karl G. Ruling, Entertainment Services and Technology Assn.

RECOMMENDATION: Add text as follows:

"The connector shall be rated in amperes and designed so that differently rated devices cannot be connected together, however, a 20-ampere T-slot receptacle shall be permitted to accept a 15-ampere attachment plug of the same voltage rating. Alternating-current multipole connectors shall be polarized and comply with Sections 410-56(g) and 410-58."

SUBSTANTIATION: The current text prohibits the use of what are commonly called "Edison connectors" on 20A circuits in the theatre. The standard 20A female T-slot Edison connector is designed to allow a 15A male to plug into it, which is prohibited by the current language in 520-67. This has two negative consequences:

1) A readily available, inexpensive, and reasonably rugged connector is prohibited by the NEC, with little or no increase in safety. Contrary to the current prohibition, this 20A connector is commonly used in nonprofessional theatres, and I have seen no evidence that its use has contributed to fires. It certainly is to be preferred over the 15A connector, which also is sometimes used although it too is prohibited on 20A circuits.

2) The current text makes it almost impossible to use any common lamp or appliance in a theatre or the audience area of a motion picture or television studio. These lamps and appliances come with cordsets that use parallel blade connectors designed to plug into 15A slot or 20A T-slot receptacles. It is now customary to use 20A overcurrent protection on stage lighting circuits and convenience outlet circuits. These circuits cannot use the 15A Edison receptacle, per Section 520-9. These circuits also cannot use the 20A T-slot receptacles per the current wording of Section 520-67. Thus, some receptacle that will not accept a 15A male parallel-blade plug must be used on 20A branch circuits, and there is no way to use a vacuum cleaner in an auditorium or a prop table lamp on a stage without modifying the appliance's cordset. Requiring the user to modify an appliance's cordset in order to use the appliance does not enhance safety.

Allowing the use of 20A T-slot connectors in Article 520, as it is allowed in 410-56(i), would enhance safety and eliminate a serious inconvenience.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

COMMENT ON AFFIRMATIVE:

KOVACIK: The word "however" at the beginning of the text being added should be deleted. It adds no clarity and detracts from the positive language in which the recommendation was written. It is possible NFPA staff might consider this an editorial change.

(Log #481)

15- 33 - (520-68(a)(3)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise first paragraph as follows:

"(3) High-Temperature Applications. A special assembly of conductors in sleeving not longer than 1.0 m (3.3 ft) ~~3.3 ft (1 m)~~ shall be permitted to be employed in lieu of flexible cord if the individual wires are stranded and rated not less than 125°C (257°F) and the outer sleeve is glass fiber with a wall thickness of at least 0.635 mm (0.025 in.) ~~0.025 in. (0.635 mm) .~~

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

The SI units for thickness are not rounded since a minimum value is specified for safety.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

ARTICLE 522 —

(Log #3246)

15- 34 - (522-5(a) and (c)): Reject

SUBMITTER: Ronald G. Nickson, Nat'l Multi Housing Council

RECOMMENDATION: Revise as follows:

522-5. Wiring Methods.

(a) General.

(1) The fixed wiring method shall be metal raceways, nonmetallic raceways encased in at least 2 in. (50.8 mm) of concrete, Type MI cable, or Type MC cable.

Exception: Fixed wiring methods shall be as provided in Article 640 for audio signal processing, amplification and reproduction equipment, in Article 800 for communication circuits, in Article 725 for Class 2 and Class 3 remote-control and signaling circuits, and in Article 760 for fire alarm circuits.

(2) Nonmetallic-sheathed cable, Type AC cable, electrical nonmetallic tubing and rigid nonmetallic conduit shall be permitted to be installed concealed within walls, floors, and ceilings where the walls, floors, and ceilings that provide a thermal barrier of material that has at least a 15 minute finish rating as identified in listings of fire-rated assemblies. When installed above suspended ceilings, the suspended ceilings shall provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

(b) Portable Equipment. (No changes)

~~(c) Nonrated Construction. Nonmetallic sheathed cable, Type AC cable, electrical nonmetallic tubing, and rigid nonmetallic conduit shall be permitted to be installed in those buildings or portions thereof that are not required to be of fire rated construction by the applicable building code.~~

SUBSTANTIATION: The wording of Section 520(c) is vague and ambiguous at best. The wording is identical to the wording used in 518-4(b). Is the intent of this section to prohibit use of wiring methods noted in buildings that are of "protected" construction type such as 5A (Protected Wood Frame), 3A (Protected Ordinary), or 2A/2B (Protected Noncombustible) under the Model Building Codes, and in nonfire rated construction if certain walls in such a building are required to have a fire rating by other section of the building code, even if:

1. These buildings are 3 stories or less in height, complying with Section 336-5(a)?

2. These buildings are 3 stories or less in height and are sprinklered, wherein interior corridor walls and other interior walls and floors can be nonfire rated?

One can design a nonfire rated construction type building under the building codes (or NFPA 101), and because of issues dealing with corridors, tenant spaces or hazardous areas would require some fire rated walls or floor separations, I could design this same nonfire rated construction type building and sprinkler the building, and all the fire rated wall and floor issues are permitted to be nonfire rated. Under the building codes (or NFPA 101) even in fire rated construction types, when the building is sprinklered, the only fire rated walls would be load bearing walls.

The Electrical Code Handbook's commentary on page 675 refers one over to the commentary for Section 518-4 on page 672. The

commentary on page 672 is even more confusing trying to explain this bizarre restriction where one side of a storage room can use one type of wiring, but the other side of the storage room adjoining the corridor can not. The plain fact is that there is no technical reason to prohibit the wiring systems in 520-5(b) to nonfire rated construction, or to nonfire rated walls in nonfire rated construction types.

By the time this code proposal is reviewed by the Panel 15 Committee, the rejected report and proposals of the NEC Task Group on NM cable will have been made available to the panels. Even though the NEC Technical Correlating Committee rejected the code proposals because of nonconsensus on the Task Group, writing the Task Group's report and the negative comments from the Task Group's committee members, everyone can easily "read between the lines". The Task Group could find no technical reasons or fire/life/injury data to support restricting NM cable above and beyond any other wiring method.

Based on the lack of findings in the NEC Task Group on NM cable of any hazard with the use and installation of NM Cable, and the report "Type NM Cable Fire Hazard Analysis," prepared by Paul D. Sullivan, PE., based on fire testing by Dr. Fred Mowrer (Fire Protection Engineering Department, University of Maryland), and a third party review of the Fire Hazard Report by Dr. Fred Clarke (Benjamin/Clarke Associates, Inc.), NM cable is no more hazardous than the use of ENT.

The fire hazard analysis report was based on the original "Fire Hazard Analysis, The Use of ENMT" that was submitted with the 1987 NEC TCR Code Proposal 8-49 (including the 1987 NEC TCD 8-32 and 8-32A) to remove the three story limit for ENMT. The conclusions of this report were:

1. "Type NM cable will not decrease the level of life safety within a building of any height when located in ceiling and wall spaces separated from the interior of the building by a 15 minute finish rating (i.e., 1/2 in. thick gypsum wallboard), and on this basis should not arbitrarily be limited to 3 stories in height."
2. "In terms of building firesafety, these results indicate that Type NM Cable, like ENMT (which s not limited to 3 stories by the National Electrical Code), will not contribute to the hazard of a fire when the cable is separated from the interior of the building by a 15 minute finish rating (NFPA 70 Section 331-3(2))."

The deletion of 520-5(c) and the revision of 520-5(a) would be justified based on the work of the NEC Task Group on NM Cable, and the report that is based on actual fire testing of NM cable and ENT.

PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Proposal 15-17.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
COMMENT ON AFFIRMATIVE:
VANNICE: This proposal appears to change Section 520-5 and not 522-5 as indicated.

ARTICLE 525 — CARNIVALS, CIRCUSES, FAIRS, AND SIMILAR EVENTS

(Log #482)

15- 35 - (525): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 525-12(b) - change "15 ft (4.57 m)" to 4.5 m (15 ft)" in two places.
525-15(a) - change "6 in. (152 mm)" to "150 mm (6 in.)"
525-18(a) - change "12 in. (305 mm)" to "300 mm (12 in.)"
525-30 - change "6 ft (1.83 m)" to "1.8 m (6 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3385)

15- 36 - (525): Accept in Principle in Part
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Rearrange Article 525 under the following headings:
A. General Requirements,
B. Power Sources,
C. Power Distribution,
D. Power Utilization, and
E. Grounding and Bonding.
1999 edition to read as follows:
A. General Requirements.
525-1. Scope. This article covers the installation of portable wiring and equipment for carnivals, circuses, exhibitions, fairs, traveling attractions, and similar functions, including wiring in or on all structures.
525-3. Other Articles.
(a) Permanent Structures. Articles 518 and 520 shall apply to wiring in permanent structures.
(b) Portable Wiring and Equipment. Wherever the requirements of other articles of this Code and Article 525 differ, the requirements of Article 525 shall apply to the portable wiring and equipment.
(c) Audio Signal Processing. Amplification, and Reproduction Equipment. Article 640 shall apply to the wiring and installation of audio signal processing, amplification, and reproduction equipment.
(d) Wiring Methods. Unless otherwise provided for in this article, wiring methods shall comply with the applicable requirements of Chapters 1 through 4 of this Code.
(e) Overcurrent Protection. Overcurrent protection of equipment and conductors shall be provided in accordance with Article 240.
(f) Motors. Motors and associated equipment shall be installed in accordance with Article 430.
(g) Attractions Utilizing Pools, Fountains, and Similar Installations with Contained Volumes of Water. This equipment shall be installed to comply with the applicable requirements of Article 680.
525-5. Overhead Conductor Clearances.
(a) Vertical Clearances. Conductors shall have a vertical clearance to ground in accordance with Section 225-18. These clearances shall apply only to wiring installed outside of tents and concessions.
(b) Clearance to Rides and Attractions. Amusement rides and amusement attractions shall be maintained not less than 15 ft (4.57 m) in any direction from overhead conductors operating at 600 volts or less, except for the conductors supplying the amusement ride or attraction. Amusement rides or attractions shall not be located under or within 15 ft (4.57 m) horizontally of conductors operating in excess of 600 volts.
B. Power Sources.
525-10. Separately Derived Systems.
(1) Generators. Generators shall comply with the requirements of Article 445.
(2) Transformers. Transformers shall comply with applicable requirements of Sections 240-3(a), (b)(3), and (c); Section 250-30; and Article 450.
525-11. Services. Services shall be installed in accordance with applicable requirements of Article 230 and, in addition, shall comply with the following.
(1) Guarding. Service equipment shall not be installed in a location that is accessible to unqualified persons, unless the equipment is lockable.
(2) Mounting and Location. Service equipment shall be mounted on a solid backing and be installed so as to be protected from the weather, unless of weatherproof construction.
C. Power Distribution.
525-20. Portable Distribution or Termination Boxes. Portable distribution or termination boxes shall comply with (a) through (d).
(a) Construction. Boxes shall be designed so that no live parts are exposed to accidental contact. Where installed outdoors the box shall be of weatherproof construction and mounted so that the bottom of the enclosure is not less than 6 in. (152 mm) above the ground.
(b) Busbars and Terminals. Busbars shall have an ampere rating not less than the overcurrent device supplying the feeder supplying the box. Where conductors terminate directly on busbars, busbar connectors shall be provided.
(c) Receptacles and Overcurrent Protection. Receptacles shall have overcurrent protection installed within the box. The

overcurrent protection shall not exceed the ampere rating of the receptacle, except as permitted in Article 430 for motor loads.
(d) Single-Pole Connectors. Where single-pole connectors are used, they shall comply with Section 530-22.
525-21. Wiring Methods.
(a) Type. Where flexible cords or cables are used and are not subject to physical damage, they shall be permitted to be listed for hard usage. When used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant.
(b) Single Conductor. Single conductor cable shall be permitted only in sizes No. 2 or larger.
(c) Splices. Flexible cords or cables shall be continuous without splice or tap between boxes or fittings.
(d) Cord Connectors. Cord connectors shall not be laid on the ground unless listed for wet locations. Connectors and cable connections shall not be placed in audience traffic paths or within areas accessible to the public unless guarded.
(e) Support. Wiring for an amusement ride, attraction, tent, or similar structure shall not be supported by any other ride or structure unless specifically designed for the purpose.
(f) Protection. Flexible cords or cables run on the ground, where accessible to the public, shall be covered with approved nonconductive mats. Cables and mats shall be arranged so as not to present a tripping hazard.
D. Power Utilization.
525-25. Wiring Methods.
(a) Open Conductors. Open conductors are prohibited except as part of a listed assembly or festoon lighting installed in accordance with Article 225.
(b) Inside Tents and Concessions. Electrical wiring for temporary lighting, where installed inside of tents and concessions, shall be securely installed, and where subject to physical damage, shall be provided with mechanical protection. All temporary lamps for general illumination shall be protected from accidental breakage by a suitable fixture or lampholder with a guard.
(c) Boxes and Fittings. A box or fitting shall be installed at each connection point, outlet, switchpoint, or junction point.
(d) Disconnecting Means. Each ride and concession shall be provided with a fused disconnect switch or circuit breaker located within sight and within 6 ft (1.83 m) of the operators station. The disconnecting means shall be readily accessible to the operator, including when the rise is in operation. Where accessible to unqualified persons, the enclosure for the switch or circuit breaker shall be of the lockable type. A shunt trip device that opens the fused disconnect or circuit breaker when a switch located in the ride operators console is closed shall be a permissible method of opening the circuit.
525-26. Protection of Electrical Equipment. Electrical equipment and wiring methods in or on rides, concessions, or other units shall be provided with mechanical protection where such equipment or wiring methods are subject to physical damage.
E. Grounding and Bonding.
525-30. General. All system and equipment grounding shall be in accordance with Article 250.
525-31. Equipment. The following equipment connected to the same source shall be bonded:
1. Metal raceways and metal sheathed cable.
2. Metal enclosures of electric equipment. Metal frames and metal parts of rides, concessions, trailers, trucks, or other equipment that contain or support electrical equipment.
525-32. Equipment Grounding Conductor. All equipment requiring grounding shall be grounded by an equipment grounding conductor of a type and size recognized by Section 250-118 and installed in accordance with Article 250. The equipment grounding conductor shall be bonded to the system grounded conductor at the service disconnecting means, or in the case of a separately derived system such as a generator, at the generator or first disconnecting means supplied by the generator. The grounded circuit conductor shall not be connected to the equipment grounding conductor on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means.
525-35. Ground-Fault Circuit-Interrupter Protection for Personnel.
(a) General-Use 15- and 20-Ampere, 125-Volt Receptacles. All 125-volt, single-phase, 15- and 20-ampere receptacle outlets that are in use by personnel shall have listed ground-fault circuit-interrupter protection for personnel. The ground-fault circuit interrupter shall be permitted to be an integral part of the attachment plug or located in the power-supply cord, within 12 in. (305 mm) of the attachment plug. For the purposes of this section, listed cord sets incorporating ground-fault circuit-interrupter protection for personnel shall be permitted. Egress lighting shall not be connected to the load side terminals of a ground-fault circuit-interrupter receptacle.
(b) Appliance Receptacles. Receptacles supplying items, such as cooking and refrigeration equipment, which are incompatible with ground-fault circuit-interrupter devices shall not be required to have ground-fault circuit-interrupter protection.
(c) Other Receptacles. Other receptacle outlets not covered in (a) or (b) shall be permitted to have ground-fault circuit-interrupter protection for personnel, or a written procedure shall be continuously enforced at the site by one or more designated persons to ensure the safety of equipment grounding conductors for all cord sets and receptacles, as described in Section 305-6(b)(2).
SUBSTANTIATION: Reorganizing Section 525 is an effort to make it more "user friendly".
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3705)

15- 37 - (525): Accept in Principle in Part

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Rearrange Article 525 under the following headings:
A. General Requirements.
B. Power Sources.
C. Power Distribution.
D. Power Utilization, and
E. Grounding and Bonding.
1999 Edition to read as follows:
Article 525 — Carnivals, Circuses, Fairs, and Similar Events
A. General Requirements.
525-1. Scope. This article covers the installation of portable wiring and equipment for carnivals, circuses, exhibitions, fairs, traveling attractions, and similar functions, including wiring in or on all structures.
525-3. Other Articles.
(a) Permanent Structures. Articles 518 and 520 shall apply to wiring in permanent structures.
(b) Portable Wiring and Equipment. Wherever the requirements of other articles of this code and Article 525 differ, the requirements of Article 525 shall apply to the portable wiring and equipment.
(c) Audio Signal Processing, Amplification, and Reproduction Equipment. Article 640 shall apply to the wiring and installation of audio signal processing, amplification, and reproduction equipment.
(d) Wiring Methods. Unless otherwise provided for in this article, wiring methods shall comply with the applicable requirements of Chapters 1 through 4 of this code.
(e) Overcurrent Protection. Overcurrent protection of equipment and conductors shall be provided in accordance with Article 240.
(f) Motors. Motors and associated equipment shall be installed in accordance with Article 430.
(g) Attractions Utilizing Pools, Fountains, and Similar Installations with Contained Volumes of Water. This equipment shall be installed to comply with the applicable requirements of Article 680.
525-5. Overhead Conductor Clearances.
(a) Vertical Clearances. Conductors shall have a vertical clearance to ground in accordance with Section 225-18. These clearances shall apply only to wiring installed outside of tents and concessions.
(b) Clearance to Rides and Attractions. Amusement rides and amusement attractions shall be maintained not less than 15 ft (4.57 m) in any direction from overhead conductors operating at 600 volts or less, except for the conductors supplying the amusement ride or attraction. Amusement rides or attractions shall not be located under or within 15 ft (4.57 m) horizontally of conductors operating in excess of 600 volts.
B. Power Sources.

525-10. Separately Derived Systems.
(1) Generators. Generators shall comply with the requirements of Article 445.
(2) Transformers. Transformers shall comply with applicable requirements of Sections 240-3(a), (b)(3) and (c); Section 250-30; and Article 450.
525-11. Services. Services shall be installed in accordance with applicable requirements of Article 230 and, in addition, shall comply with the following.
(1) Guarding. Service equipment shall not be installed in a location that is accessible to unqualified persons, unless the equipment is lockable.
(2) Mounting and Location. Service equipment shall be mounted on a solid backing and be installed so as to be protected from the weather, unless of weatherproof construction.
C. Power Distribution.
525-20. Portable Distribution or Termination Boxes. Portable distribution or termination boxes shall comply with (a) through (d).
(a) Construction. Boxes shall be designed so that no live parts are exposed to accidental contact. Where installed outdoors the box shall be of weatherproof construction and mounted so that the bottom of the enclosure is not less than 6 in. (152 mm) above the ground.
(b) Busbars and Terminals. Busbars shall have an ampere rating not less than the overcurrent device supplying the feeder supplying the box. Where conductors terminate directly on busbars, busbar connectors shall be provided.
(c) Receptacles and Overcurrent Protection. Receptacles shall have overcurrent protection installed within the box. The overcurrent protection shall not exceed the ampere rating of the receptacle, except as permitted in Article 430 for motor loads.
(d) Single-Pole Connectors. Where single-pole connectors are used, they shall comply with Section 530-22.
525-21. Wiring Methods.
(a) Type. Where flexible cords or cables are used and are not subject to physical damage, they shall be permitted to be listed for hard usage. When used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant.
(b) Single Conductor. Single conductor cable shall be permitted only in sizes No. 2 or larger.
(c) Splices. Flexible cords or cables shall be continuous without splice or tap between boxes or fittings.
(d) Cord Connectors. Cord connectors shall not be laid on the ground unless listed for wet locations. Connectors and cable connections shall not be placed in audience traffic paths or within areas accessible to the public unless guarded.
(e) Support. Wiring for an amusement ride, attraction, tent, or similar structure shall not be supported by any other ride or structure unless specifically designed for the purpose.
(f) Protection. Flexible cords or cables run on the ground, where accessible to the public, shall be covered with approved nonconductive mats. Cables and mats shall be arranged so as not to present a tripping hazard.
D. Power Utilization.
525-25. Wiring Methods.
(a) Open Conductors. Open conductors are prohibited except as part of a listed assembly or festoon lighting installed in accordance with Article 225.
(b) Inside Tents and Concessions. Electrical wiring for temporary lighting, where installed inside of tents and concessions, shall be securely installed, and where subject to physical damage, shall be provided with mechanical protection. All temporary lamps for general illumination shall be protected from accidental breakage by a suitable fixture or lampholder with a guard.
(c) Boxes and Fittings. A box or fitting shall be installed at each connection point, outlet, switchpoint, or junction point.
(d) Disconnecting Means. Each ride and concession shall be provided with a fused disconnect switch or circuit breaker located within sight and within 6 ft (1.83 m) of the operators station. The disconnecting means shall be readily accessible to the operator, including when the ride is in operation. Where accessible to unqualified persons, the enclosure for the switch or circuit breaker shall be of the lockable type. A shunt trip device that opens the fused disconnect or circuit breaker when a switch located in the ride operators console is closed shall be a permissible method of opening the circuit.
525-26. Protection of Electrical Equipment. Electrical equipment and wiring methods in or on rides, concessions, or other units shall be provided with mechanical protection where such equipment or wiring methods are subject to physical damage.
E. Grounding and Bonding.
525-30. General. All system and equipment grounding shall be in accordance with Article 250.
525-31. Equipment. The following equipment connected to the same source shall be bonded:
1. Metal raceways and metal sheathed cable.
2. Metal enclosures of electric equipment.
3. Metal frames and metal parts of rides, concessions, trailers, trucks, or other equipment that contain or support electrical equipment.
525-32. Equipment Grounding Conductor. All equipment requiring grounding shall be grounded by an equipment grounding conductor of a type and size recognized by Section 250-118 and installed in accordance with Article 250. The equipment grounding conductor shall be bonded to the system grounded conductor at the service disconnecting means, or in the case of a separately derived system such as a generator, at the generator or first disconnecting means supplied by the generator. The grounded circuit conductor shall not be connected to the equipment grounding conductor on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means.
525-35. Ground-Fault Circuit-Interrupter Protection for Personnel.
(a) General-Use 15- and 20-Ampere, 125-Volt Receptacles. All 125-volt, single-phase, 15- and 20-ampere receptacle outlets that are in use by personnel shall have listed ground-fault circuit-interrupter protection for personnel. The ground-fault circuit interrupter shall be permitted to be an integral part of the attachment plug or located in the power-supply cord, within 12 in. (305 mm) of the attachment plug. For the purposes of this section, listed cord sets incorporating ground-fault circuit-interrupter protection for personnel shall be permitted. Egress lighting shall not be connected to the load side terminals of a ground-fault circuit-interrupter receptacle.
(b) Appliance Receptacles. Receptacles supplying items, such as cooking and refrigeration equipment, which are incompatible with ground-fault circuit-interrupter devices shall not be required to have ground-fault circuit-interrupter protection.
(c) Other Receptacles. Other receptacle outlets not covered in (a) or (b) shall be permitted to have ground-fault circuit-interrupter protection for personnel, or a written procedure shall be continuously enforced at the site by one or more designated persons to ensure the safety of equipment grounding conductors for all cord sets and receptacles, as described in Section 350-6(b)(2).

SUBSTANTIATION: Reorganizing Section 525 is an effort to make it more, "user friendly."

PANEL ACTION: Accept in Principle in Part.

Rearrange Article 525 under the following headings:

A. General Requirements.
B. Power Sources
C. Wiring Methods
D. Grounding and Bonding

Article 525 - Carnivals, Circuses, Fairs, and Similar Events

A. General Requirements.

525-1. Scope. This article covers the installation of portable wiring and equipment for carnivals, circuses, fairs, and similar functions, including wiring in or on all structures.

525-3. Other Articles.

(a) Portable Wiring and Equipment. Wherever the requirements of other articles of this code and Article 525 differ, the requirements of Article 525 shall apply to the portable wiring and equipment.

(b) Permanent Structures. Articles 518 and 520 shall apply to wiring in permanent structures.

(c) Audio Signal Processing, Amplification, and Reproduction Equipment. Article 640 shall apply to the wiring and installation of audio signal processing, amplification, and reproduction equipment.

(d) Attractions Utilizing Pools, Fountains, and Similar Installations with Contained Volumes of Water. This equipment shall be installed to comply with the applicable requirements of Article 680.

525-5. Overhead Conductor Clearances.

(a) Vertical Clearances. Conductors shall have a vertical clearance to ground in accordance with Section 225-18. These clearances shall apply only to wiring installed outside of tents and concessions.

(b) Clearance to Rides and Attractions. Amusement rides and amusement attractions shall be maintained not less than 4.5 m (15 ft.) in any direction from overhead conductors operating at 600 volts or less, except for the conductors supplying the amusement ride or attraction. Amusement rides or attractions

shall not be located under or within 4.5 m (15 ft) horizontally of conductors operating in excess of 600 volts.

525-6. Protection of Electrical Equipment. Electrical equipment and wiring methods in or on rides, concessions, or other units shall be provided with mechanical protection where such equipment or wiring methods are subject to physical damage.

B. Power Sources.

525-10. Separately Derived Systems.

(a) Generators. Generators shall comply with the requirements of Article 445.

(b) Transformers. Transformers shall comply with applicable requirements of Sections 240-3(a), (b)(3) and (c), Section 250-30, and Article 450.

525-11. Services. Services shall be installed in accordance with applicable requirements of Article 230 and, in addition, shall comply with the following.

(a) Guarding. Service equipment shall not be installed in a location that is accessible to unqualified persons, unless the equipment is lockable.

(b) Mounting and Location. Service equipment shall be mounted on a solid backing and be installed so as to be protected from the weather, unless of weatherproof construction.

C. Wiring Methods.

525-20. Wiring Methods.

(a) Type. Where flexible cords or cables are used they shall be listed for extra hard usage. Where flexible cords or cables are used and are not subject to physical damage, they shall be permitted to be listed for hard usage. Where used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant. Extra hard usage flexible cords or cables shall be permitted for use as permanent wiring on portable amusement rides and attractions where not subject to physical damage.

(b) Single-Conductor. Single-conductor cable shall be permitted only in sizes 2 AWG or larger.

(c) Open Conductors. Open conductors are prohibited except as part of a listed assembly or festoon lighting installed in accordance with Article 225.

(d) Splices. Flexible cords or cables shall be continuous without splice or tap between boxes or fittings.

(e) Cord Connectors. Cord connectors shall not be laid on the ground unless listed for wet locations. Connectors and cable connections shall not be placed in audience traffic paths or within areas accessible to the public unless guarded.

(f) Support. Wiring for an amusement ride, attraction, tent, or similar structure shall not be supported by any other ride or structure unless specifically designed for the purpose.

(g) Protection. Flexible cords or cables, where accessible to the public, and where placed on pavement or other hard and smooth surface, shall be permitted to be covered with nonconductive matting, provided that the matting does not constitute a greater trip hazard than the uncovered cables. Flexible cords or cables, where accessible to the public, placed on soft dirt or grass shall be dressed so as to be uncrossed, in a direct line, and separated by one cable diameter. Matting shall not be used to cover cables or cords placed in soft dirt or grass. It shall be permitted to bury cables in a shallow trench. The requirements of Section 300-5 shall not apply.

(h) Boxes and Fittings. A box or fitting shall be installed at each connection point, outlet, switchpoint, or junction point.

525-21. Rides, Tents and Concessions.

(a) Disconnecting Means. Each ride and concession shall be provided with a fused disconnect switch or circuit breaker located within sight and within 1.8 m (6 ft) of the operators station. The disconnecting means shall be readily accessible to the operator, including when the ride is in operation. Where accessible to unqualified persons, the enclosure for the switch or circuit breaker shall be of the lockable type. A shunt trip device that opens the fused disconnect or circuit breaker when a switch located in the ride operators console is closed shall be a permissible method of opening the circuit.

(b) Portable Wiring Inside Tents and Concessions. Electrical wiring for lighting, where installed inside of tents and concessions, shall be securely installed, and where subject to physical damage, shall be provided with mechanical protection. All lamps for general illumination shall be protected from accidental breakage by a suitable fixture or lampholder with a guard.

525-22. Portable Distribution or Termination Boxes. Portable distribution or termination boxes shall comply with (a) through (d).

(a) Construction. Boxes shall be designed so that no live parts are exposed to accidental contact. Where installed outdoors the box shall be of weatherproof construction and mounted so that the bottom of the enclosure is not less than 150 mm (6 in.) above the ground.

(b) Busbars and Terminals. Busbars shall have an ampere rating not less than the overcurrent device supplying the feeder supplying the box. Where conductors terminate directly on busbars, busbar connectors shall be provided.

(c) Receptacles and Overcurrent Protection. Receptacles shall have overcurrent protection installed within the box. The overcurrent protection shall not exceed the ampere rating of the receptacle, except as permitted in Article 430 for motor loads.

(d) Single-Pole Connectors. Where single-pole connectors are used, they shall comply with Section 530-22.

525-23. Ground-Fault Circuit-Interrupter Protection.

(a) Receptacles Requiring GFCI Protection.

(1) General-Use 15- and 20-Ampere, 125-Volt Receptacles. All 125-volt, single-phase, 15- and 20-ampere 20-ampere, NEMA configuration 5-15 and 5-20 receptacles shall have listed ground-fault circuit-interrupter (GFCI) protection. Only those receptacles used during disassembly and reassembly or readily accessible to the general public shall be required to comply.

(2) Other applicable sections. Receptacles which require GFCI protection under other sections, including, but not limited to:

a. 551-40(c)
b. 551-41(c)
c. 680-6
d. 680-41(a)
e. 680-42
f. 680-51(a)
g. 680-56(a)
h. 680-57(b)

(b) Where GFCI protection is not required.

(1) Egress Lighting. Egress lighting shall not be connected to the load side terminals of a ground-fault circuit-interrupter receptacle. Branch circuits which supply egress lighting shall not be protected by a GFCI circuit breaker.

(2) Other Receptacles. Receptacles other than NEMA 5-15 or 5-20 which only facilitate quick and safe disconnecting and reconnecting of electrical equipment shall not be required to have GFCI protection. These receptacle outlets shall be permitted to have GFCI protection.

D. Grounding and Bonding.

525-30. Equipment Bonding. The following equipment connected to the same source shall be bonded:

1. Metal raceways and metal sheathed cable.
2. Metal enclosures of electric equipment.
3. Metal frames and metal parts of rides, concessions, tents, trailers, trucks, or other equipment that contain or support electrical equipment.

525-31. Equipment Grounding. All equipment requiring grounding shall be grounded by an equipment grounding conductor of a type and size recognized by Section 250-118 and installed in accordance with Article 250. The equipment grounding conductor shall be bonded to the system grounded conductor at the service disconnecting means, or in the case of a separately derived system such as a generator, at the generator or first disconnecting means supplied by the generator. The grounded circuit conductor shall not be connected to the equipment grounding conductor on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means.

525-32. Grounding conductor continuity assurance. The effectiveness of the grounding conductor(s) to reduce electrical shock hazards as required by Sections 210-7(c), 250-114, 250-138, and 305-4(d) shall be tested each time that portable electrical equipment is reconnected.

PANEL STATEMENT: Article 525 was revised to comply with the Manual of Style and to be more user friendly.

The text has been revised to incorporate the panel actions on Proposals:

15-35, 36, 37, 38, 39, 43, 44, 45, 46, 47, 48, 50, 51, 53, 54, 55, 58, 59, 15-50a, 15-50b.

1999 Article 525 to Proposed Restructured 525 Cross-Reference:

1999 NEW
1 1
3a 3b
3b 3a
3c 3c
40 3d

12 5 Metric
6 6
10a 10
10b 11
13a * 20a * 1st Sentence of old 13a deleted

13b 20b
13c 20c
13d ** 20d ** 1st part of old 13d is new 20d
13d + 20e + 2nd part of old 13d is new 20e
13e 20f

13f 20g
14 20h
30 21a
13g 21b
15 22

18 23
21 30
22 31

16 Deleted
17 Deleted
20 Deleted
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3426)

15- 38 - (525-1): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Kenneth E. Vannice, NSI Corp./Rep. US Inst. for Theater Tech. Engr. Comm.
RECOMMENDATION: This proposal is to revise Section 525-1 as follows:
Scope. This Article covers the installation of portable wiring and equipment for carnivals, circuses, ~~exhibitions,~~ fairs, traveling attractions and similar functions including wiring in or on all structures.
SUBSTANTIATION: The deletion of the word "exhibitions" will cause the correct location of this type of event into Article 518. Subsection 518-3(b) mentions exhibition halls "such as trade shows." Since this term has been used in Article 518 for several Code cycles, and no reason has been given to transfer the rules governing exhibitions to Article 525, then this word should be deleted from Article 525's Scope.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3427)

15- 39 - (525-1): Accept
SUBMITTER: Kenneth E. Vannice, NSI Corp./Rep. US Inst. for Theater Tech. Engr. Comm.
RECOMMENDATION: Revise text to read as follows:
Scope. This Article covers the installation of portable wiring and equipment for carnivals, circuses, exhibitions, fairs, ~~traveling attractions,~~ and similar functions including wiring in or on all structures.
SUBSTANTIATION: The term "traveling attractions" has been incorrectly applied to touring musical concerts or theatrical productions which set up temporary performance areas. Due to the type of equipment used and the installation techniques used by these events in the performance area, the more stringent requirements of Article 520 should be applied. The term "traveling attractions" is very vague and undefined, and causes confusion on the part of authorities having jurisdiction to where Article 525 should be applied. This change is needed to clarify that Article 520 should be applied to performance areas, and Article 525 should only be applied to carnivals, circuses, fairs, and similar functions.
During the enforcement phase of the 1996 NEC, at least one instance has been reported where the authority having jurisdiction applied the requirements of Article 525 to an outdoor musical concert venue. The venue included a stage and lighting towers. There was no carnival, fair or circus involved with this specific venue.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3691)

15- 40 - (525-1): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add text as follows:
Electrical installations which are covered by Section 525 shall be required to comply with the version of the NEC which was in effect when the equipment was built.
SUBSTANTIATION: The majority of electrical installations in other structures are inspected at the time they are built; and reinspected only if a major modification is done which requires a building permit, or reconnection to the utility. The electrical installations at carnivals are inspected and reinspected several times within a year. It becomes an undue financial burden to comply with ever changing electrical codes.
PANEL ACTION: Reject.
PANEL STATEMENT: The equipment needs to comply with the applicable code for safety reasons. The electrical equipment is continually disconnected and reconnected. Cost is insignificant when compared to life safety.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3698)

15- 41 - (525-6): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Delete the word "methods" which appears twice in this sentence.
SUBSTANTIATION: The term, "... wiring methods..." should read, "... wiring..." It is the wiring which should be protected; not the wiring methods.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "wiring methods" is broader than "wiring" and includes raceways and wireways. Refer to Chapter 3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3692)

15- 42 - (525-13): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Insert new paragraphs (e), as follows, and renumber (e) - (g) to (f) - (h).
(e) Repair of flexible cords and cables.
1. Multiconductor cord. Flexible multiconductor cords may be repaired if <u>all</u> of the following criteria are met: 1) the conductors are No. 8 AWG or larger, 2) at least two of the conductors are undamaged, 3) at least 25 percent of the diameter of the outside insulation is undamaged, and 4) the repair will not overlap a previous repair.
The conductors shall be spliced using crimp type splices. The splices shall be staggered along the length of the cord. The splices shall be of the insulated type, or they shall be insulated with heat-shrink tubing.

The outside insulation shall be recovered with heat-shrink tubing of a type which will restore the, "extra-hard usage", properties of the cord.

2. Single-conductor cable. The insulation of single-conductor cable may be repaired with heat-shrink tubing of a type which will restore the, "extra-hard usage", properties of the cable.

Single-conductor cable shall not be spliced.

SUBSTANTIATION: Large gauge cords and cables are very expensive in long lengths. This procedure has proven to effect successful repairs to cords larger than No. 8 AWG, and to cables larger than No. 2 AWG.

PANEL ACTION: Reject.

PANEL STATEMENT: Splices have been prohibited in Article 525 for increased safety. An inspector can not usually verify that the splice or repair has been done correctly.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 1

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

DUNN: This proposal could be Accept in Part. If the splicing is objectionable, accept at least the repair of the outside insulation if there is no damage to the conductor(s).

(Log #933)

15- 43 - (525-13(a)): Accept in Principle

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(a) Type. Unless otherwise provided for in this article, wiring methods shall comply with the applicable requirements of Chapters 1 through 4 of this code. Where flexible cords or cables are used ~~and~~ they shall be listed for extra hard usage, except where not subject to physical damage, they shall be permitted to be listed for hard usage. Where ~~When~~ used outdoors, flexible cords and cables shall also be listed for wet locations and be sunlight resistant.

SUBSTANTIATION: The proposed additional sentence restores the wording revised by the panel in Comment 15-45 of the A98 ROC. Without this sentence the permitted use of hard usage cord has no relevance since there is no specific type mandated.

PANEL ACTION: Accept in Principle.

Revise to read as follows:

(a) Type. Unless otherwise provided for in this article, wiring methods shall comply with the applicable requirements of Chapters 1 through 4 of this code. Where flexible cords or cables are used they shall be listed for extra hard usage. Where not subject to physical damage, they shall be permitted to be listed for hard usage. Where ~~When~~ used outdoors, flexible cords and cables shall also be listed for wet locations and be sunlight resistant.

PANEL STATEMENT: The text is revised to comply with the Manual of Style.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #3693)

15- 44 - (525-13(a)): Accept in Principle

SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.

RECOMMENDATION: Add the following wording to the end of 525-13(a):

Flexible cords or cables shall be permitted for use as permanent wiring on portable amusement rids and attractions.

SUBSTANTIATION: Article 400-8 prohibits the use of flexible cords or cables as the permanent wiring of a structure. This forces the use of THHN wires run through some wireway for the permanent wiring on portable amusement rides. As these rides move, either during their operation or during their transportation from one location to another, this type (THHN) of wiring is subjected to wear which it wouldn't be subjected to as the wiring of an immovable building or structure. There are situations where, within one circuit, the wiring switches from flexible cable to wires within wireway and back to flexible cable again. By allowing the use of flexible cable, in one continuous run, these splices can be eliminated.

There have been no problems encountered with the use of flexible cords or cables as the permanent wiring on portable rides. Flexible cords or cables have been installed along the steel structural members, as well as within structural members and wireways.

PANEL ACTION: Accept in Principle.

Add the following wording to the end of 525-13(a):

Extra hard usage flexible cords or cables shall be permitted for use as permanent wiring on portable amusement rides and attractions where not subject to physical damage.

PANEL STATEMENT: The use of extra hard usage cord or cable will now be permitted on portable amusment rides and attractions, which was the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #3747)

15- 45 - (525-13(a)): Accept

SUBMITTER: John H. Schwab, Jr., City of Wauwatosa, WI

RECOMMENDATION: Add the following after first sentence:

"Where flexible cord or cables are used they shall be listed for extra-hard-usage.

SUBSTANTIATION: This sentence will bring code in conformity with page 299 of IAEI analysis of 1999 code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #1084)

15- 46 - (525-13(b)): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change "No. 2" to "2 AWG".

SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #3694)

15- 47 - (525-13(f)): Accept in Principle

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.

RECOMMENDATION: Revise to read as follows:

(f) Protection. Flexible cords or cables, where accessible to the public, and where placed on pavement or other hard and smooth surface, are permitted to be covered with matting, provided that the matting does not constitute a greater trip hazard than the uncovered cables.

Flexible cords or cables, where accessible to the public, placed on soft dirt or grass shall be dressed so as to be uncrossed, in a direct line, and slightly separated. Matting shall not be used to cover cables or cords placed in soft dirt or grass.

It shall be permitted to bury cables in a shallow trench. The requirements of Section 300-50 shall not apply.

SUBSTANTIATION: As presently worded this section is often interpreted to mean that cable mats are always to be used to protect the cables. Extra-hard-usage cable is already required and does not require further protection from physical damage. There are no cable mats available which are more sturdy than the extra-hard-usage cable which is currently required.

The mats which are currently available do provide some convenience to the public when correctly used on hard, smooth

surfaces. Especially for wheel chairs and strollers. However, experience shows that they are not the panacea they are perceived to be.

On soft dirt or grass any cables in traffic areas will press down into the dirt if properly dressed. Cable mats do not conform to an uneven surface and increase the very "trip and fall" hazard which they are supposed to alleviate.

If the ground should not be paved, but is too hard for the cables to press down into, it shall be permissible to place the cables in a shallow trench.

PANEL ACTION: Accept in Principle.

Revise to read as follows:

(f) Protection. Flexible cords or cables, where accessible to the public, and where placed on pavement or other hard and smooth surface, shall be permitted to be covered with nonconductive matting, provided that the matting does not constitute a greater trip hazard than the uncovered cables.

Flexible cords or cables, where accessible to the public, placed on soft dirt or grass shall be dressed so as to be uncrossed, in a direct line, and separated by one cable diameter. Matting shall not be used to cover cables or cords placed in soft dirt or grass.

It shall be permitted to bury cables in a shallow trench. The requirements of Section 300-5 shall not apply.

PANEL STATEMENT: The modifications to the submitter's recommendation are for compliance with the Manual of Style and to provide for additional safety.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

NEGATIVE: 2

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

KLEIN: My objection to the Panel Action focuses on the revision which states:

"Flexible cords or cables, where accessible to the public, placed on soft dirt or grass shall be dressed so as to be uncrossed, in a direct line, and separated by one cable diameter. Matting shall not be used to cover cables or cords placed in soft dirt or grass."

I am an avid carnival/festival/fair/Demolition Derby/Circus attendee (particularly food and garlic festivals). For the most part all such events are well attended. Crowds in various degrees of compression are a reality.

I believe this Panel revision will contribute to an increased probability of tripping hazards. Access to parking, concessions, rides and such always use makeshift paths on soft dirt or grass. When attendees arrive early to an event, before crowds can mass, the density of attendees can be around 100 square ft per person - adequate enough space to identify obstacles in ones walking path.

When people gather around a popular booth, exit an entertainment program or leave the event at its closing, the density of attendees can be as little as 4 square ft per person. This density allows for little or no ability to identify obstacles in the "egress" path.

Loose cables or cords on the ground constitute an obstacle.

I trip on cords at events all the time and I am sure others do as well.

The code is charged with the "practical safeguarding of persons...from hazards arising from the use of electricity" (90-1).

TRIPPING IS A HAZARD!

I am also concerned about the permission to bury cables in a shallow trench. (Although I think it is a good idea).

I believe a qualification to ensure the trench surface is flat and compressed is appropriate in areas accessible to the public. I would be even more inclined to require (or at least allow) a nonconductive matting covering to ensure that trench irregularities and loose dirt do not contribute to a tripping hazard.

KRAMER: By not requiring Section 300-5 compliance we are opening a can of worms; how deep is a shallow trench? What happens when the cables pass under an access road, (concessions, rides, and other equipment are moved around the carnival or fairgrounds after the initial cabling is done)? There are no provisions concerning rocks in the backfill over the cables. There is also nothing about using cables suitable for direct burial.

This is a portable installation; how will the cables be removed? Will they be dug up by someone with a pick ax and shovel or will someone stand at the end of the cable and pull it out of the ground? Both of these ways could damage the insulation. A few days later these possibly damaged cables may be used where accessible to the public and, where placed on pavement or other hard and smooth surfaces, may not be covered with a nonconductive mat, presenting a possible shock hazard.

Thus, in order to alleviate a possible tripping hazard, we have increased the hazards of potential electrocution.

(Log #3695)

15- 48 - (525-13(g)): Accept

SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.

RECOMMENDATION: Delete the two usages of the word, "temporary."

SUBSTANTIATION: This section, 525, applies to portable, not temporary wiring. The word, "temporary", as used here are not necessary anyway.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #934)

15- 49 - (525-15(b), (c)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(b) Busbars and Terminals. Busbars shall have an ampere rating not less than the ~~overcurrent device~~ ampacity of the feeder supplying the box. Where the conductors terminate directly on busbars, busbar connectors shall be provided.

(c) Receptacles and Overcurrent Protection. Receptacles shall have overcurrent protection installed within the box. The overcurrent protection shall not exceed the ampere rating of the receptacle except as permitted in Section 210-21(b)(3). ~~Article 430 for motors.~~

SUBSTANTIATION: If the portable distribution box supplies a motor(s), the feeder overcurrent device could exceed the ampacity of the feeder, per Article 430. Since the busbars are an extension of the feeder, it need only have an ampacity not less than the feeder. Where there is a main overcurrent device in the box busbar rating not less than the main rating should be sufficient. Present wording could require 70 ampere rated busbars if a 70 ampere rated feeder supplying the box terminates at a 50 ampere rated main overcurrent device in the box with 50 ampere rated busbars.

Present text of (c) does not allow for a duplex 15 ampere rated receptacle supplied by a 20 ampere overcurrent device. Article 430 doesn't have a provision for overcurrent protection to exceed a receptacle rating.

PANEL ACTION: Reject.

PANEL STATEMENT: The present wording provides the correct protection required for a safe installation. The size of the feeder conductors may be oversized for other reasons, such as voltage drop.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #CP1502)

15- 50a - (525-18): Accept

Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 15

RECOMMENDATION: Revise existing Section 525-18 to read as follows:

525-18. Ground-Fault Circuit-Interrupter Protection.

(a) Receptacles Requiring GFCI Protection.

(1) General-Use 15- and 20-Ampere, 125-Volt Receptacles. All 125-volt, single-phase, 15- and 20-ampere, NEMA configuration 5-15 and 5-20 receptacles shall have listed ground-fault circuit-interrupter (GFCI) protection. Only those receptacles used during disassembly and reassembly or readily accessible to the general public shall be required to comply.

(2) Other applicable sections. Receptacles which require GFCI protection under other sections, including, but not limited to:

a. 551-40(c)

b. 551-41(c)

c. 680-6

d. 680-41(a)

e. 680-42
f. 680-51(a)
g. 680-56(a)
h. 680-57(b)

(b) Where GFCI protection is not required.

(1) Egress Lighting. Egress lighting shall not be connected to the load side terminals of a ground-fault circuit-interrupter receptacle. Branch circuits which supply egress lighting shall not be protected by a GFCI circuit breaker.

(2) Other Receptacles. Receptacles other than NEMA 5-15 or 5-20 which only facilitate quick and safe disconnecting and reconnecting of electrical equipment shall not be required to have GFCI protection. These receptacle outlets shall be permitted to have GFCI protection.

SUBSTANTIATION: The wording of Section 525-18, in the 1999 NEC, which describes which receptacles are to be protected, is so vague that all receptacles at a carnival, circus, or fair are required to have GFCI protection. However, it is not necessary to have every receptacle outlet GFCI protected to ensure electrical safety at these locations.

Other articles already require sufficient GFCI protection. GFCI protection which is specified in these other articles is important enough to warrant listing those articles herein.

Carnivals, circuses, and fairs have a lot of receptacles to facilitate quick and safe disconnecting and reconnecting of electrical equipment. One large modern ride typically contains 100 receptacles. Some use as many as 300.

Recreational vehicles are used extensively as living quarters. Current requirements for RV's, Section 551-41(c), including GFCI protection for the outlets in the bathroom and outside. Section 525-18 now requires that all outlets in RV's at these locations be GFCI protected. This also applies to all other trailers in use such as office trailers, shop trailer, etc. Requiring that only NEMA configuration 5-15 and 5-20 receptacles require GFCI protection, and by requiring other receptacles, which only facilitate the quick and safe disconnecting and reconnecting of electrical equipment, to be of a different configuration will provide protection for persons utilizing hand held tools, appliances, or luminaires.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #3696)

15- 50 - (525-18): Accept in Principle in Part

SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.

RECOMMENDATION: Replace existing Section 525-18 with the following:

525-18. Ground-Fault Circuit-Interrupter Protection.

(a) Receptacle outlets requiring GFCI protection.

(1) General-Use 15- and 20-Ampere, 125-volt receptacles. All 125-volt, single-phase, 15- and 20-ampere, NEMA configuration 5-15 and 5-20 receptacle outlets shall have listed ground-fault circuit-interrupter (GFCI) protection.

(2) Receptacles which require GFCI protection under other sections, including, but not limited to, Sections: 551-40(c); 551-41(c); 680-6; 680-51(a); and 680-56(c).

(4) Listed Cord Sets. For the purposes of this section, listed cord sets incorporating GFCI protection for personnel shall be permitted. the GFCI shall be permitted to be an integral part of the attachment plug or located in the power-supply cord, within 12 in. (305 mm) of the attachment plug.

(b) Where GFCI protection is not required.

(1) Appliance Receptacles. Receptacles supplying items, such as cooking and refrigeration equipment, which are incompatible with ground-fault circuit-interrupter devices shall not be required to have ground-fault circuit-interrupter protection.

(2) Egress Lighting. Egress lighting shall not be connected to the load side terminals of a ground-fault circuit-interrupter receptacle. Branch circuits which supply egress lighting shall not be protected by a GFCI circuit breaker.

(3) Other Receptacles. Receptacle outlets other than NEMA 5-15 or 5-20 which only facilitate quick and safe disconnecting and reconnecting of electrical equipment shall not be required to have GFCI protection. These receptacle outlets shall be permitted to have GFCI protection.

525-19. Grounding conductor continuity assurance. The effectiveness of the grounding conductor(s) to reduce electrical shock hazards as required by Sections 210-7(c); 250-114; 250-138; and 305-4(d) shall be determined each time that portable electrical equipment is reconnected as follows:

All conductive surfaces which people are able to contact shall be tested by the application of a "Tic Tracer". Any indication of voltage present shall be investigated to determine the cause. And, the continuity of the grounding conductor(s) which should be effectively grounding that surface shall be restored.

Examples of places to test: frames of rides, trailers, light fixtures which are within reach, appliances, electrically powered games, counters of ticket booths and concession trailers, coin slots of coin operated amusements, and, metal frames of flea-market booths which contain electrical equipment.

SUBSTANTIATION: The wording of Section 525-18, in the 1999 NEC, which describes which receptacles are to be protected, is so vague that all receptacles at a carnival, circus, or fair are required to have GFCI protection. However, it is not necessary to have every receptacle outlet GFCI protected to ensure electrical safety at these locations.

Other articles already require sufficient GFCI protection. GFCI protection which is specified in these other articles is important enough to warrant listing those articles herein.

Carnivals, circuses, and fairs have a lot of receptacles to facilitate quick and safe disconnecting and reconnecting of electrical equipment. One large modern ride typically contains 100 receptacles. Some use as many as 300.

Recreational vehicles are used extensively as living quarters. Current requirements for RV's, Section 551-41(c), including GFCI protection for the outlets in the bathroom and outside. Section 525-18 now requires that all outlets in RV's at these locations be GFCI protected. This also applies to all other trailers in use such as office trailers, shop trailer, etc.

Requiring that only NEMA configuration 5-15 and 5-20 receptacles require GFCI protection, and by requiring other receptacles, which only facilitate the quick and safe disconnecting and reconnecting of electrical equipment, to be of a different configuration will provide protection for persons utilizing hand held tools, appliances, or light fixtures.

The grounding conductor assurance should be considered in it's own section, 525-19. This new procedure will contribute more to electrical safety at a carnival, circus, or faire than GFCI protection, and should be done whether GFCI protection is provided or not.

We have used the "Tic Tracer", procedure for the last 10 years, effectively reducing the number of alleged electrical socks from approximately one-per-weeks to about two per season. Additionally, all of our electricians carry a "Tic tracer" with them to continuously monitor the effectiveness of the grounding conductor.

It will be more effective in providing electrical safety at a carnival, circus, or fair if authorities having jurisdiction use the "Tic tracer" method of determining the effectiveness of the grounding conductor(s) rather than merely enforcing that a procedure has been documented.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: Refer to panel action and statement on Proposals 15-50a and 15-50b.

The term "Tic Tracer" is not code appropriate term.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #3905)

15- 51 - (525-18(a)(1) (New)): Accept in Principle in Part

SUBMITTER: Ronald E. Gnotke, Rep. Minnesota Board of Electricity

RECOMMENDATION: Add the following text:

525-18(a)(1) All 125-volt and 250-volt single-phase, 15- and 20-ampere receptacle outlets installed inside of concession trailers, games trailers, amusement rides, or other self-contained units supplied by permanent wiring methods and complying with Section 525-22 shall be permitted to be of the nonground-fault type where an assured grounding program is documented in compliance with Section 525-18(c).

SUBSTANTIATION: Ten years of annual inspections of transient projects covered by this Code article lead me to believe that the requirements for GFCI protection for personnel could be limited to receptacle outlets fed from portable wiring methods within the type of units described above, where the units and portable wiring methods are assembled on site. The use of listed cord sets with GFCI protection would be required for personnel using receptacle outlets fed from fixed wiring methods, outside of the self-contained units described above.

PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: By panel action on Proposal 15-50a and 15-50b the submitter's concerns have been addressed. Receptacles supplied by permanent wiring methods are not within the scope of Article 525 and are rejected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #336)

15- 52 - (525-18(b)): Reject
SUBMITTER: Mike Theisen, St. Cloud, MN
RECOMMENDATION: Delete this section.
SUBSTANTIATION: My experience from inspecting carnivals and the like leads me to believe that any appliance which cannot operate on a GFCI protected outlet represents the very hazard which we are trying to eliminate by requiring GFCI protection. All appliances must be subject to the requirement for GFCI protection, and those that are not in good enough repair to operate on a GFCI protected outlet should be repaired or replaced.
PANEL ACTION: Reject.
PANEL STATEMENT: Not all appliances should be protected. Refer to panel action and statement on Proposal 15-50a. All 15- and 20-ampere appliance receptacles are required to have GFCI protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
KLEIN: All 15 and 20 ampere appliance receptacles should be required to be GFCI protected.
Panel response to 15-50a only requires those receptacles used during disassembly and reassembly, or readily accessible to the public to have GFCI protection. Most appliances at the concerned venues are readily accessible, but their receptacles are not.
In the comfort, familiarity and pace of life in our own homes, we are required to be GFCI protected from all our portable appliances. It is not unreasonable to impose the same safety requirements (if not exceed it) when we approach a temporary booth, set up with portable appliances for our hot dogs, popcorn or cotton candy.

(Log #CP1503)

15- 50b - (525-19 (New)): Accept
Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: CMP 15
RECOMMENDATION: Add new Section 525-19 as follows:
525-19. Grounding conductor continuity assurance.
The effectiveness of the grounding conductor(s) to reduce electrical shock hazards as required by Sections 210-7(c), 250-114, 250-138, and 305-4(d) shall be tested each time that portable electrical equipment is reconnected.
SUBSTANTIATION: The grounding conductor assurance should be considered in its own section, 525-19. This new requirement will contribute more to electrical safety at a carnival, circus, or fair than GFCI protection alone, and should be done whether GFCI protection is provided or not.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld
COMMENT ON AFFIRMATIVE:
JOHNSON: This is an excellent requirement, but a program such as in Section 305-6(b)2 should be included to assure that the test is done and recorded by qualified personnel each time the equipment is set up.
KRAMER: In order to help the users of this article, maintain an environment essentially safe and free from the hazards of electricity, we should offer some guidance as to the testing we are requiring in the new 525-19.
What we are doing here is requiring an assured equipment grounding conductor program. The code has already provided such a program. This existing program is better than 10 years old. By incorporating Article 305-6(b)(2), we offer this guidance and also include the record keeping requirement of having the results available for the authority having jurisdiction.
It has been said that a version of this testing is currently being performed at fairs and carnivals. This would formally incorporate it, and by having specific requirements, increase the level of safety at such venues, possibly eliminating the deadly accident discussed in Proposal 15-56 (Log #2793).

(Log #3746)

15- 53 - (525-21(3)): Accept in Part
SUBMITTER: John H. Schwab, Jr., City of Wauwatosa, WI
RECOMMENDATION: Revise as follows:
Metal frames and metal parts of rides, concessions, <u>tents,</u> trailers, trucks, or other equipment that contain or support electrical equipment <u>or raceways (nonmetallic).</u>
SUBSTANTIATION: Some carnival people say a metal tent used for something other than concessions does not have to be bonded. Also, if nonmetallic raceways are supported by metal pipe, they should be not only bonded but grounded.
PANEL ACTION: Accept in Part.
Revise as follows:
Metal frames and metal parts of rides, concessions, <u>tents,</u> trailers, trucks, or other equipment that contain or support electrical equipment
PANEL STATEMENT: The term "or raceways (nonmetallic)" is rejected because it is redundant to the balance of the requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3386)

15- 54 - (525-21(a)): Accept in Principle
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Revise 525-21(a) to read as follows:
(a) Type. Where flexible cords or cables are used to distribute power, they shall be listed for extra-hard usage. When used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant.
SUBSTANTIATION: When flexible cords or cables are used to distribute power, they will be subjected to sufficient abuse to require extra-hard usage. Hard-usage listing is not sufficient.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-43. The correct reference to the current code is 525-13(a) rather than 525-21(a). The additional text related to distributed power is not needed due to panel action on Proposal 15-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3706)

15- 55 - (525-21(a)): Accept in Principle
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Revise 525-21(a) to read as follows:
(a) Type. Where flexible cords or cables are used to distribute power, they shall be listed for extra-hard usage. When used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant.
SUBSTANTIATION: When flexible cords or cables are used to distribute power, they will be subjected to sufficient abuse to require extra-hard usasge. Hard usage listing is not sufficient.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-54.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #2793)

15- 56 - (525-23): Reject
SUBMITTER: Linda S. Aguiar, S. Dartmouth, MA
RECOMMENDATION: Reconsider A98 ROP 15-74 and accept.
SUBSTANTIATION: I have provided an article from the IAEI News Jan/Feb edition (page 46). This article describes the exact scenario depicted in Proposal 15-74 and Mr. Edwin S. Krammer's comments in A98 ROC 15-58. This 21-year old women would not have died if there had been a supplemental ground as proposed. Now you have a reported fatality to substantiate this requirement. Gentlemen, this code is about safety and "contains provisions that are considered necessary for safety."

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's substantiation does not provide adequate technical justification that the recommended change would resolve the concern. In the example cited, the unit may not have been properly grounded. A grounding electrode at this truck might not have prevented the tragic occurrence since there was no equipment grounding conductor. The submitter's concerns have been addressed to some extent in 15-50b.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:

JOHNSON: The hazard of ungrounded structures needs to be analyzed very carefully. If the equipment ground becomes interrupted, the frame of an ungrounded structure can accidentally be raised to ine to ground potential. The equipment ground is a very important and effective system, however, it unfortunately is not fail safe. It can be open without an indication. The new Section 225-19 approved by Proposal 15-50b is an excellet step, but it has no provision to assure that the testing is done each time the equipment is set up. GFCI is only effective on equipment connected to protected receptacles. Perhaps a redundant equipment ground system could be used in place of grounding the structure. Somehow, there should be "double" assurance that protection is in effect.

(Log #3697)

15- 57 - (525-23 (New)): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add a new Section 525-23 to read as follows:

525-23. Grounding Electrode. It shall not be necessary to provide grounding electrode(s) for generators used under this article.

Article 250-34 shall not apply to carnival generators.
SUBSTANTIATION: See related proposal to revise Section 250-34.

The requirements of Section 250-2 can be met without grounding electrodes and grounding-electrode conductors. Especially with the 1999 NEC requirement of, "Section 525-18. Ground-Fault Circuit-Interrupter Protection for Personnel."

A lot of authorities having jurisdiction's time and effort is wasted in enforcing the use of grounding electrodes and grounding-electrode conductors. This is followed by a lot of expense and effort on the part of carnivals.

The use of grounding electrodes and grounding-electrode conductors does not improve the safety of a carnival electrical system.
PANEL ACTION: Reject.
PANEL STATEMENT: The purpose of the a grounding electrode is the primary reference point in creating a grounded system. The requirements for grounding of generators are addressed in 250-30 and 250-34. System grounding requirements are addressed in 250-20.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:

DUNN: The concept of running carnival generators without connecting the generator frame to a grounding electrode is difficult to accept at first. I remember well my first experience where disconnecting the grounding electrode was safer.

I started working as a carnival electrician during my summer vacations from college. During the summer of 1964, we were playing a beautiful grassy, treed, park in Northern Indiana. The first evening we were there it started raining shortly after dark. I was in the generator trailer, to avoid the rain, when I noticed that the ammeters were reading higher than they had been reading before the rain started. This seemed unlikely because the rides had stopped running during the rain.

At this time, somebody called me out of the generator saying, "You better get over to the pony ride fast! The ponies are being shocked! and, nobody can touch the ride to get them off."

I immediately went to the "junction box", where the lights for the pony ride were connected, and disconnected the wires. There was no improvement in the situation at the pony ride. The ponies and people were still being shocked.

While I was pondering over what to do next, I was approached by an old man, Bill, who also worked on the show. He said, "Sonny, I used to be the electrician on this show before I got too old to do the job. If you intend to save those ponies, you better go to the generator and cut the wire going to the ground rod."

My reaction was that he was certainly too old to do the job if that was his solution to this problem. However, with the lights disconnected, I couldn't see how the pony ride was being energized. And, it was necessary to do something fast. Other people were also urging me to follow Bill's advice.

So, I went to the generator trailer, and I cut the wire to the ground wire. It was dark behind the trailer, and I noticed a substantial arc as I severed the wire.

When I returned to the pony ride we were able to touch the ride and get the ponies away. While we were doing this I noticed that the ponies still seemed to be receiving a slight shock when they moved past one side of the circle. This of course, was at the windward side where the ground was wet from the rain. This was also the side nearest to the electric distribution wires and box. Which were also exposed to the rain.

After considerable study over the next several weeks, it was discovered that the process which was used to install the solder-on lugs to the ends of the wires had caused the insulation to become conductive for about 15 in. from each end. This caused current to flow from the defective cables - through the water at the surface - through the ponies, their ride, and the steel stakes which held the ride to the ground, to earth - through the earth to the grounding electrode - through the "grounding electrode conductor" to the neutral of the generator. Disconnecting the "grounding electrode conductor" opened this path and consequently relieved the ponies and people from electric shocks.

This is one example of why it is not only unnecessary but, even undesirable to connect carnival generators to a "grounding electrode".

I can understand the Panel's first reaction to such a rash sounding proposal. Most of them have probably never even considered it. However, I have convinced many well educated and experienced electricians, electrical engineers, inspectors, and technicians that grounding electrodes are not necessary on carnival generators. None of these people were easy to convince either.

(Log #3387)

15- 58 - (525-25(e) (New)): Accept in Principle
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add paragraph (e) to read as follows:

(e) Flexible Cords or Cables. Where flexible cords or cables are used and are not subject to physical damage, they shall be permitted to be listed for hard usage. When used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant.
SUBSTANTIATION: Where flexible cords or cables are used as part of the wiring within a ride, concession, or attraction, hard-usage listing is sufficient.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-43. The correct reference to the current code is 525-13(a) rather than 525-25(e).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NOT RETURNED: 1 Kalbfeld

(Log #3707)

15- 59 - (525-25(e) (New)): Accept in Principle

SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.

RECOMMENDATION: Add paragraph (e) to read as follows:

(e) Flexible Cords or Cables. Where flexible cords or cables are used and are not subject to physical damage, they shall be permitted to be listed for hard usage. When used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant.

SUBSTANTIATION: Refer to proposal to change 525-13(a). Where flexible cords or cables are used as part of the wiring within a ride, concession, or attraction, hard-usage listing is sufficient.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-43. The correct reference to the current code is 525-13(a) rather than 525-25(e).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

(Log #4246)

15- 60 - (525-40): Reject

Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

"Wiring and Equipment for Contained Volumes of Water. Electrical installations for or adjacent to attractions using contained volumes of water shall comply with the provisions of Section 680-6."

SUBSTANTIATION: This proposal is the submitter's best guess as to the Article 680 requirements CMP 15 might have intended when this section went into the 1999 NEC. The reference to anything "applicable" in Article 680 is impermissibly vague. Does CMP 15 actually intend compliance with the 3-ft parameter in 680-7? Bonding rules in 680-22 for equipment that is repeatedly assembled and disassembled? Even storable pools don't require that. How about only cord- and plug-connected lighting assemblies; must they be used per 680-32? Enhanced panelboard grounding rules in 680-25(d)? All of these rules could arguably be applicable, or none of them. CMP 15 should revisit this issue and clarify just what it had in mind.

PANEL ACTION: Reject.

PANEL STATEMENT: The reference should not be restricted to just one section. The panel's intent for this section is for the applicable portions of Article 680 to be applied; i.e., grounding, bonding, distance from power lines. Refer also to Proposal 15-50a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NOT RETURNED: 1 Kalbfeld

ARTICLE 527 — TEMPORARY INSTALLATIONS

(Log #1485)

3- 141 - (527 (New)): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise the title of Article 527 (formerly Article 305) as follows:

Temporary ~~Wiring~~ Installations

Revise the scope of the article as follows:

527-1 ~~305-1.~~ Scope. The provisions of this article apply to temporary electrical power and lighting installations.

SUBSTANTIATION: It is recognized in this proposal that the TCC has relocated Article 305 to Article 527. As such, the modifications shown to the scope reflect that relocation.

The existing title of the article does not accurately reflect the contents of the article. There are many more requirements covered than simply the wiring methods and in fact, actual requirements for wiring methods are only briefly covered in 305-4(a), (b), and (c). There are installation requirements for receptacles, disconnecting means, lamp protection and GFCI protection for personnel. These are obviously more than simply wiring methods.

With the transfer of Article 305 out of Chapter 3, in the scope the modifying clause, "wiring methods that may be of a class less than would be required for a permanent installation," is not needed. Section 90-3 notes that requirements in Chapter 3 apply unless amended by Chapter 5.

PANEL ACTION: Accept.

PANEL STATEMENT: The panel understands the decision of the TCC in relocating Article 305 to new Article 527. The panel also understands that the responsibility of Article 527 will remain with CMP 3. In addition, the panel recognizes that scope statements as covered in Section 2.2.1 of the Style Manual are the responsibility of the TCC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

ARTICLE 530 — MOTION PICTURE AND TELEVISION STUDIOS AND SIMILAR LOCATIONS

(Log #483)

15- 61 - (530): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 530-13 - change "6 ft (1.83 m)" to "1.8 m (6 ft)" in two places.
530-73(a)(3) - change "6 ft (1.83 m)" to "1.8 m (6 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #484)

15- 62 - (530-1): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "7/8 in. (22 mm)" to "22 mm (7/8 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since the SI unit is standard industry practice.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1887)

15- 63 - (530-1, FPN (New)): Reject
SUBMITTER: Richard D. Thompson, Thompson Assoc.
RECOMMENDATION: Add the following fine print note:
FPN: Additional requirements for minimum set lighting power and installation of portable power cables is to be found in NFPA 140, "Standard for Motion Picture and Television Production Soundstages and Approved Production Facilities."
SUBSTANTIATION: This new NFPA Standard 140 was adopted at the May 1999 annual meeting. In this standard Article 3-5 Electrical Requirements incorporates the requirements of a minimum lighting load of 35 watts per square foot (377 w/m^2) for production lighting and power. Further, this standard prohibits the auxiliary power cables from portable generators from being run through fire rated windows and doors.
By referencing this new Fire Safety Standard, the provisions of this standard will be brought to the attention of the authority having jurisdiction, users and designers of sound stages and approved production facilities.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is using the FPN as a requirement, not as explanatory. NFPA 140 may not be adopted by all jurisdictions, and is therefore not enforceable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1889)

15- 64 - (530-2-Approved Production Facilities): Reject
SUBMITTER: Richard D. Thompson, Thompson Assoc.
RECOMMENDATION: Add the following definition:
Approved Production Facilities. A building or group of buildings where the occupancy has been changed to motion picture or television studio or soundstage, and meets the requirements of NFPA 140, "Motion Picture and Television Production Studio Soundstages and Approved Production Facilities."
SUBSTANTIATION: The addition of this definition, will provide the authority having jurisdiction with the language necessary to enforce the provisions of both NEC Article 530 as well as NFPA 140. Presently, Article 530's definitions refer to the traditional "Hollywood" motion picture studio and soundstage. Many film and television productions are produced in converted industrial buildings, (A.K.A. "warehouse studios"), aircraft hangers, former office buildings, former hospitals, and any other large open clear span structure. The intent of NFPA 140 is to apply a minimum fire safety code standard to all facilities used for motion picture and television production where the certificate of occupancy has been changed to this use.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "approved production facilities" is not used in the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1888)

15- 65 - (530-10): Reject
SUBMITTER: Richard D. Thompson, Thompson Assoc.
RECOMMENDATION: Add the following text to this sub-section:
Motion picture and television production soundstages and approved production facilities shall be provided with a minimum of 35 W/ft^2 (877 W/m^2) dedicated for production lighting and power.
SUBSTANTIATION: This statement is a repeat of the statement found in NFPA 140, "Standard for Motion Picture and Television Production Soundstages and Approved Production Facilities." Section 3-5, Electrical Requirements, which was adopted by the NFPA at their May 1999 annual meeting.
The NFPA Technical Committee that developed NFPA 140 consisted of representatives of the major film and television studios, fire departments, insurance underwriters, and knowledgeable industry personnel. In their deliberations, it was strongly urged to add to this fire code standard a minimum requirement for the electrical power used for set lighting. Typically, lighting fixtures in the 1000, 2000, 5000 and 10,000 watt sized are used in lighting motion picture and television productions. The committee found that many productions were and continue to be filmed in industrial buildings where the installed electrical service is woefully inadequate. Typically, portable generators are needed to augment the existing electrical service. This requirement in NFPA 140 does not preclude the use of portable generators, should the needs of the production exceed this minimum requirement.
It is the intent of this proposal to the 2002 NEC to incorporate this provision from NFPA 140 into the Electrical Code so as to facilitate the knowledge and information of this new requirement such that the AHJ, electrical engineers, building owners and studio operators can comply with this standard.
PANEL ACTION: Reject.
PANEL STATEMENT: The provisions of 35 W/ft^2 applies to the electrical service provision of a production facility and does not pertain to the unique installation requirements for motion picture and television studios. The production lighting loads calculation parameters are more appropriately placed in Article 220.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #3295)

15- 66 - (530-11): Accept
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: George W. Flach, Nat'l Armored Cable Mfrs' Assn.
RECOMMENDATION: Revise text to read as follows:
530-11. Permanent Wiring. The permanent wiring shall be Type MC cables, Type AC cable containing an insulated equipment grounding conductor sized in accordance with Table 250-122, Type MI cable, or in approved raceways.
SUBSTANTIATION: Type AC cable with an insulated equipment ground is equivalent to Type MC cable and should be included as a permitted wiring method.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
NOT RETURNED: 1 Kalbfeld
EXPLANATION OF NEGATIVE:
HIRSCHLER: There has been no substantiation introduced to show that AC cable exhibits the physical integrity that this panel has always required for wiring methods used in theaters. Moreover, AC cable has not been shown to have the same fire safety characteristics of MI cable, or MC cable, because of the insulated conductor, which do not have to meet sufficient fire safety requirements.

(Log #3029)

15- 67 - (530-12(b)): Reject
SUBMITTER: Richard D. Thompson, Thompson Assoc.
RECOMMENDATION: Revise text as follows:
530-12(b) Special Effects and Electrical Equipment Used as Stage Properties. The wiring for stage effects and electrical equipment used as stage properties shall be permitted to be wired with single-conductor or multi-conductor listed flexible cords or cables. ~~if~~ And, the conductors are protected from physical damage and secured to the scenery by approved cable ties or by insulated staples. Splices or taps shall be permitted where such are made with polarized and listed devices. ~~and the circuit is protected at not more than 20 amperes.~~ Circuits shall have overcurrent protection based on the conductor size ampacity rating in Table 400-5(a), and shall have a maximum length calculated to prevent a voltage drop exceeding 5 percent at full load and nominal applied voltage.
SUBSTANTIATION: This section was adopted new in the 1999 NEC. Since then, there have been misinterpretations and assumptions made that SPT-2 cord (aka "Zip Cord") is or is not permitted as a primary electrical distribution method on scenery. Most often this type wiring is for use on single small wattage lamps, typically 6 watt S-6 lamps used for signaling. One example we have seen is an elevator cab with the floor annunciator panel wired with individual lamp circuits using the 6 watt lamps and each circuit wired with SPT-2 cord terminating in back of the set to a switch box such that one or more lamps can be illuminated thereby showing the floors selected by the actors in the scene being filmed. This cable type is also used for low voltage applications.
The concern of the authorities having jurisdiction has been that often industry practice has been found where this type cable is used without proper overcurrent protection, polarization, or any limit to the length of the cable run.
This article as presently written, limits the maximum overcurrent protection to 20 amps. However, 18 gauge SPT-2 cord, which is the most commonly used in these applications, has a maximum ampacity rating of 10 amps. Using this wiring method also does not incorporate any grounding method and can only rely on polarization of the circuit to provide a level of safety. Wiring devices of the insulation piercing type, while listed, are not necessarily specified by the user with polarized male and female plugs and connectors. The primary manufacturer of this product (Eagle Electric) now offers these devices as listed and polarized in a NEMA 1-15 configuration.
Using the Fine Print Note No. 4 of Article 210-19, where the maximum voltage drop is limited to 5 percent. Calculations based on a #18 gauge wire having a circular mil area of 1620 with an applied voltage of 120 volts, and not exceeding the 5 percent voltage drop results in a maximum length is 45 ft (13.72 m). By incorporating a voltage drop limitation we can effectively control the length of a cable run.
The intent of this change is to limit the length and ampacity of SPT-2 cord to that shown in Table 400-4(a), meet the 5 percent voltage drop requirement, and that when splices or taps are used, the polarization of the circuit must be maintained.
PANEL ACTION: Reject.
PANEL STATEMENT: At present, SPT-2 is not accepted by the testing agencies. The reference should be to SPT-3. The new text proposed allows lower standards of wiring methods than already accepted. Overcurrent protection of flexible cords and cables is already covered in 240-4. Polarization requirements for lampholders is already covered in 410-47.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #935)

15- 68 - (530-18(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Feeders. In buildings used primarily for motion picture production, the feeders from the substations to the stages shall be protected by overcurrent devices (generally located in the substation) having suitable ampere ratings. The overcurrent devices shall be permitted to be multipole, or single-pole ~~gang operated~~ if provided with means for simultaneous disconnection from the supply source. ~~No pole or overcurrent device shall be required in the neutral conductor.~~ The overcurrent device setting for each feeder shall not exceed 400 percent of the ampacity of the feeder, as given in applicable tables of Article 310.
SUBSTANTIATION: Editorial. The first paragraph indicates devices are circuit breakers or fuses. The term "gang-operated" is not clear; as applied to single pole circuit breakers does it mean a handle tie? A single pole trip device does not necessarily gang operate other circuit breakers where a handle tie is used. The term is even more obscure as applied to fuses which are not normally gang operated, though a switch or contactor to disconnect them may be. This section infers a single pole device in the neutral is permissible. An open neutral can cause a hazard. The condition of an overcurrent device in the neutral (grounded) conductor is covered elsewhere in the code, for example Section 240-22(a) and Chapter 5 is seen to modify those requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text does not relate to the substantiation. The existing text properly states the intent. The proposed arrangement of the wording does not accomodate single pole gang operated switches which open the neutral with the phase conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1085)

15- 69 - (530-18(e)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 8" to "8 AWG".
SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #3428)

15- 70 - (530-52): Accept
SUBMITTER: Kenneth E. Vannice, NSI Corp./Rep. US Inst. for Theatre Tech. Engr. Comm.
RECOMMENDATION: Revise text to read as follows:
"~~Motors and Other~~ Electrical Equipment in Cellulose Nitrate Film Storage Vaults. Except as permitted in Section 530-51, no receptacles, outlets, ~~electrical motors,~~ heaters, portable lights, or other portable electrical equipment shall be located in cellulose nitrate film storage vaults. Electric motors shall be permitted provided they are listed for the application and comply with Article 500, Class I, Division 2."
SUBSTANTIATION: The current edition of NFPA 40, "Storage and Handling of Cellulose Nitrate Motion Picture Film" was revised during the 1997 Code cycle. Section 2-7.4 was added stating: "Extended term storage vaults shall be permitted to have refrigeration or air conditioning systems installed where necessary to provide temperature and humidity control." This provision was added to NFPA 40 to answer the concerns of the Nation's film archivists in their effort to preserve our motion picture film history and heritage. Investigations undertaken by the manufacturers of nitrate film, and various motion picture film repositories found that storage of nitrate film at temperatures between 72°F and 32°F (22.2°C and 0°C) was the best way to preserve the material and

image. Additionally, storage at these temperatures considerably reduces the decomposition of the nitrate film and the possibility of self-ignition.

In order to incorporate appropriately design and listed explosionproof air handlers in both new and existing nitrate motion picture film vaults, a fan motor is necessary. Under strict interpretation of the existing Section 530-52, no motors of any kind are permitted in cellulose nitrate film vaults. Therefore, acceptances of this proposal would permit the installation of small explosion proof motors that meet the requirements of NEC Article 500, Class 1, Division 2, and as specified for the electrical equipment in NFPA 40, Section 2-6.

Further, it should be pointed out to the CMP that the assumed transfer of nitrate motion picture film to a safety stock will not occur. There exists no methods that insure the complete transfer of all information, (i.e., image) from the original nitrate negative or print to any other media. Nitrate motion picture film vaults continue to exist, and be retrofitted for refrigeration. New film vaults will be constructed as private collections of nitrate motion picture films are being discovered and become part of our visual heritage.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #CP1507)

15- 70a - (530-64): Accept
SUBMITTER: CMP 15
RECOMMENDATION: Revise 530-64 to read as follows:

530-64. Direct-Current Switchboards.

(a) General. Switchboards not exceeding 250 volts dc between conductors, where located in substations or switchboard rooms accessible to qualified persons only, shall not be required to be dead-front.

(b) Circuit Breaker Frames. Frames of dc circuit breakers installed on switchboards shall not be required to be grounded.

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #238)

15- 71 - (530 Part G): Accept in Principle in Part

NOTE: The following proposal consists of Comment 15-74 on Proposal 15-94 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 15-94 was:

Revise as follows:

ARTICLE 530 -- MOTION PICTURE AND TELEVISION STUDIOS AND SIMILAR LOCATIONS

~~G. Separately Derived systems with 60 Volts to Ground~~

ARTICLE 647 -- SENSITIVE ELECTRONIC EQUIPMENT

647-1. Scope. The provisions of this article shall apply to all occupancies where the use of sensitive electronic equipment is connected to a separately derived system operating at 120 volts line-to-line and 60 volts to ground.

~~530-70.~~ 647-2. General. Use of a separately derived 120-volt single-phase 3-wire system with 60 volts on each of two ungrounded conductors to a grounded neutral conductor shall be permitted for the purpose of reducing objectionable noise in ~~audio/video production or other similar~~ sensitive electronic equipment locations provided that its use is restricted to electronic ~~equipment only and that~~ all of the requirements in Sections 647-3 through 647-7 are met.

~~530-71.~~ 647-3. Wiring Methods.

(a) Panelboards and Overcurrent Protection. Use of standard single-phase panelboards and distribution equipment with a higher voltage rating shall be permitted. The system shall be clearly marked on the face of the panel or on the inside of the panel doors. Common-trip two-pole circuit breakers that are identified for operation at the system voltage shall be provided for both ungrounded conductors in all feeders and branch circuits.

(b) Junction Boxes. All junction box covers shall be clearly marked to indicate the distribution panel and the system voltage.

(c) Color Coding. All feeders and branch-circuit conductors installed under this section shall be identified as to system at all splices and terminations by color, marking, tagging or equally effective means. The means of identification shall be posted at each branch-circuit panelboard and at the disconnecting means for the building.

(d) Voltage Drop. The voltage drop on any branch circuit shall not exceed 1.5 percent. The combined voltage drop of feeder and branch circuit conductors shall not exceed 2.5 percent.

647-4. 3-phase Systems. Where 3-phase power is supplied, a separately derived 6-phase "Wye" system with 60 volts to ground installed under this article shall be configured as three separately derived 120-volt single-phase systems having a combined total of no more than three main disconnects.

~~530-72.~~ 647-5. Grounding.

(a) General. The system shall be grounded as provided in Section 250-26 as a separately derived single-phase 3-wire system.

(b) Grounding Conductors Required. Permanently wired utilization equipment and receptacles shall be grounded by means of an equipment grounding conductor run with the circuit conductors to an equipment grounding bus prominently marked "Technical Equipment Ground" in the originating branch-circuit panelboard. The grounding bus shall be connected to the grounded conductor on the line side of the separately derived system's disconnecting means. The grounding conductor shall not be smaller than that specified in Table 250-95 and run with the feeder conductors. The technical equipment grounding bus need not be bonded to the panelboard enclosure.

Exception: Other grounding methods authorized elsewhere in this Code shall be permitted where the impedance of the grounding return path does not exceed the impedance of equipment grounding conductors sized and installed in accordance with ~~Part C of~~ this article.

(FPN No. 1): See Section 250-95 for equipment grounding conductor sizing requirements where circuit conductors are adjusted in size to compensate for voltage drop.

(FPN No. 2): These requirements limit the impedance of the ground fault path where only 60 volts applies to a fault condition instead of the usual 120 volts.

~~530-73.~~ 647-6. Receptacles.

(a) General. Where receptacles are used as a means of connecting equipment, the following conditions shall be met:

(1) All 15 and 20 Amp. receptacles shall be GFCI protected.

(2) All outlet strips, adapters, receptacle covers and faceplates shall be marked as follows:

WARNING - TECHNICAL POWER
Do not connect to lighting equipment.
For electronic equipment use only.
60/120 V.1~~-o-~~AC
GFCI protected

(3) A 125-volt, single-phase, 15- or 20-ampere rated receptacle outlet having on of its current carrying poles connected to a grounded circuit conductor shall be located within ~~6 ft. (1.83 m)~~ 2 ft. (.61 m) of all permanently installed 15- or 20-ampere rated 60/120-volt technical power-system receptacles.

(4) All 125-volt receptacles used for 60/120-volt technical power shall have a unique configuration and be identified for use with this class of system.

Exception: 125-Volt, single phase, 15- or 20-ampere rated receptacle outlets and attachment plugs that are identified for use with grounded circuit conductors shall be permitted on portable distribution equipment, and in machine rooms, control rooms, equipment rooms, equipment racks and other similar locations that are restricted to use by qualified personnel.

(b) Isolated ground receptacles Isolated ground receptacles shall be permitted as described in Section 250-74 Exception No. 4. However, the branch circuit equipment grounding conductor shall be terminated as required in Section ~~530-72(b)~~ 647-5(b).

647-7. Lighting Equipment. Lighting equipment installed under this article shall meet the following conditions (a-c):

(a) Disconnecting Means. All lighting equipment shall have a disconnecting means that simultaneously opens all ungrounded conductors, and shall be located within sight or be capable of being locked in the open position.

(b) Fixtures. All lighting fixtures shall be permanently installed.

Exception: Portable lighting equipment shall be permitted on sound stages and in theaters provided that the equipment is restricted to use by qualified personnel.

(c) Exposed Screw-shell. Lighting fixture installed under this section shall not have an exposed lamp screw-shell.

SUBMITTER: Martin Glasband, Equi-Tech Corp.

RECOMMENDATION: Proposal should have been accepted in principle and/or in part. The committee's concerns regarding the safety issues that were not included in the original proposal should have been considered and incorporated into a revised version of the proposed text.

~~ARTICLE 530 MOTION PICTURE AND TELEVISION STUDIOS AND SIMILAR LOCATIONS~~

~~C. Separately Derived Systems with 60 Volts to Ground~~

ARTICLE 647 - SENSITIVE ELECTRONIC EQUIPMENT

647-1. Scope. The provisions of this article shall apply to commercial and industrial occupancies where the use of sensitive electronic equipment is connected to a separately derived system operating at 120 volts line-to-line and 60 volts to ground.

~~530-70.~~ 647-2. General. Use of a separately derived 120-volt single-phase 3-wire system with 60 volts on each of two ungrounded conductors to a grounded neutral conductor shall be permitted for the purpose of reducing objectionable noise in ~~audio/video production or other similar~~ sensitive electronic equipment locations provided that its use is restricted to areas under close supervision by qualified personnel ~~electronic equipment only~~ and that all of the requirements in Sections 647-3 through 647-7 are met.

~~530-71.~~ 647-3. Wiring Methods.

(a) Panelboards and Overcurrent Protection. Use of standard single-phase panelboards and distribution equipment with a higher voltage rating shall be permitted. The system shall be clearly marked on the face of the panel or on the inside of the panel doors. Common-trip two-pole circuit breakers that are identified for operation at the system voltage shall be provided for both ungrounded conductors in all feeders and branch circuits.

(b) Junction Boxes. All junction box covers shall be clearly marked to indicate the distribution panel and the system voltage.

(c) Color Coding. All feeders and branch-circuit conductors installed under this section shall be identified as to system at all splices and terminations by color, marking, tagging or equally effective means. The means of identification shall be posted at each branch-circuit panelboard and at the disconnecting means for the building.

(d) Voltage Drop. The voltage drop on any branch circuit shall be limited as follows: ~~The voltage drop on any branch circuit shall not exceed 1.5 percent. The combined voltage drop of feeder and branch circuit conductors shall not exceed 2.5 percent.~~

(1) The voltage drop on branch circuits supplying equipment connected using wiring methods in Chapter 3 shall not exceed 1.5 percent.

(2) The voltage drop in branch circuits supplying receptacle outlets shall not exceed 1 percent. For the purposes of making this calculation, the load connected to the receptacle outlet shall be considered to be 50 percent of the branch circuit rating.

(FPN): The purpose of this provision is to limit voltage drop to 1.5 percent where portable cords may be used as a means of connecting equipment.

647-4. 3-phase Systems. Where 3-phase power is supplied, a separately derived 6-phase "Wye" system with 60 volts to ground installed under this article shall be configured as three separately derived 120-volt single-phase systems having a combined total of no more than six main disconnect.

~~530-72.~~ 647-5. Grounding.

(a) General. The system shall be grounded as provided in Section 250-26 as a separately derived single-phase 3-wire system.

(b) Grounding Conductors Required. Permanently wired utilization equipment and receptacles shall be grounded by means of an equipment grounding conductor run with the circuit conductors to an equipment grounding bus prominently marked "Technical Equipment Ground" in the originating branch-circuit panelboard. The grounding bus shall be connected to the grounded conductor on the line side of the separately derived system's disconnecting means. The grounding conductor shall not be smaller than that specified in Table 250-95 and run with the feeder conductors. The technical equipment grounding bus need not be bonded to the panelboard enclosure. Other grounding methods authorized elsewhere in this Code shall be permitted where the impedance of the grounding return path does not exceed the impedance of equipment grounding conductors sized and installed in accordance with this article.

~~Exception: Other grounding methods authorized elsewhere in this Code shall be permitted where the impedance of the grounding return path does not exceed the impedance of equipment grounding conductors sized and installed in accordance with Part C of this article.~~

(FPN No. 1): See Section 250-95 for equipment grounding conductor sizing requirements where circuit conductors are adjusted in size to compensate for voltage drop.

(FPN No. 2): These requirements limit the impedance of the ground fault path where only 60 volts applies to a fault condition instead of the usual 120 volts.

~~530-73.~~ 647-6. Receptacles.

(a) General. Where receptacles are used as a means of connecting equipment, the following conditions shall be met:

(1) All 15 and 20 Amp. receptacles shall be GFCI protected.

(2) All outlet strips, adapters, receptacle covers and faceplates shall be marked as follows:

WARNING - TECHNICAL POWER
Do not connect to lighting equipment.
For electronic equipment use only.
60/120 V.1Ø AC
GFCI protected

(3) A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet having one of its current carrying poles connected to a grounded circuit conductor shall be located within ~~6 ft. (1.83 m)~~ 2 ft. (.61 m) of all permanently installed 15- or 20-ampere-rated 60/120-volt technical power-system receptacles.

(4) All 125-volt receptacles used for 60/120 -volt technical power shall have a unique configuration and be identified for use with this class of system. All 125-Volt, single phase, 15- or 20-ampere-rated receptacle outlets and attachment plugs that are identified for use with grounded circuit conductors shall be permitted on portable distribution equipment, in machine rooms, control rooms, equipment rooms, equipment racks and other similar locations that are restricted to use by qualified personnel.

~~Exception: 125 Volt, single phase, 15 or 20 ampere-rated receptacle outlets and attachment plugs that are identified for use with grounded circuit conductors shall be permitted in machine rooms, control rooms, equipment rooms, equipment racks and other similar locations that are restricted to use by qualified personnel.~~

(b) Isolated ground receptacles. Isolated ground receptacles shall be permitted as described in Section 250-74 Exception No. 4, however, the branch circuit equipment grounding conductor shall be terminated as required in Section ~~530-72(b)~~ 647-5(b).

647-7. Lighting Equipment. Lighting equipment installed under this article shall meet the following conditions (a-c):

(a) Disconnecting Means. All lighting equipment shall have a disconnecting means that simultaneously opens all ungrounded conductors, and shall be located within sight or be capable of being locked in the open position.

(b) Fixtures. All lighting fixtures shall be permanently installed. Portable lighting equipment shall be permitted on sound stages and in theaters provided that the equipment is restricted to use by qualified personnel.

(c) Exposed Screw-shell. Lighting fixtures installed under this section shall not have an exposed lamp screw-shell.

The Panel's comments all seemed to concur that there were other venues where use of this class of system is appropriate, however, rejection of the proposal has limited the application only to locations where it is currently approved. I understand the Panel's concerns about safety issues, particularly ones where types of occupancies are involved and where high circuit impedance could present a problem. Herein, I have attempted to resolve these issues.

SUBSTANTIATION: In the original proposal under 647-1, the language that included "all occupancies" for this class of system overlooked several important issues regarding residential use. Change of occupants and the similarity between this system and the more familiar 120-volt neutral wired circuits presents an unusual set of problems, difficult to address in common residential occupancies. Therefore, I agree with the committee that this class of system should be limited to commercial and industrial occupancies until such time as the issues relating to safe residential applications are resolved. I have now revised the wording of proposed 647-1 to cover only commercial and industrial occupancies.

Another of the committee's concerns was the application of a 60-volt-to-ground system where a large circuit impedance could inhibit the actuation of overcurrent devices. To resolve this issue, I have added to 647-3(d), provisions which further restrict voltage drop particularly where cord-connected equipment is likely to be used with receptacle outlets. (A 40-ft branch circuit of 12 ga. THHN wire with 2 18 ga x 6 ft extension cords operating 5 PC's yields approximately a 1.6-volt drop or about 1.3 percent.)

I think that qualified installers and technicians need to be especially mindful of the importance of voltage drop, at least until there is more familiarity with this class of system. Insofar as including a FPN in 647-3(d) is concerned, I don't want to see the NEC expanded into a multivolume set anymore than anyone else, however I think that it is appropriate to approach each issue on a case per case basis, this being a case where clarity and understanding of the system's safe application is more important than brevity.

Regarding 647-7: It is widely known than many types of lighting equipment (fluorescent lighting, dimmer controls, etc.) in addition to electronic power supplies are the cause of much electrical interference in the form of reactive currents, grounding currents, etc. Furthermore, the propagation of these types of electrical interference are responsible for many instances of sensitive electronic equipment malfunction. Proposed Sections 647-3(d) and 647-7 have been modified and/or included with this comment to address relevant safety issues.

Regarding 647-7(b), Exception: The proposed 647-7(b) is specific as to where portable lighting equipment is allowed. I believe that the Committee's objection to the exception in proposed 647-7(b) focused mainly on the danger of high circuit impedance and voltage drop. However, I also believe that use of this class of system would be of great benefit in theaters and sound stages where noise from lighting controls often inhibits the performance of sensitive sound and videotaping equipment. With the additional provisions now added to proposed 647-3(d), I feel that the intent of the Code to limit voltage drop has been adequately stated. So, in light of these new provisions and the usefulness of this system as a means of reducing electrical interference originating in stage lighting equipment, I have not changed the language (of the exception) in proposed 647-7(b). However, if the Panel chooses to reject this provision and/or any other part of proposed 647-7, I feel that it would be appropriate for the Panel to accept this comment on the original proposal in principle and in part.

Note: With further regard to 647-7; recently I was approached by a manufacturer of power and lighting-control equipment, a company that produces solid-state controllers and dimmers. There is knowledge of this proposal among these companies. Many are watching this proposal carefully because a 2-pole disconnecting means for lighting-control equipment (required in 647-7(a)) is compatible with universally accepted standards. Should this provision be accepted, manufacturers will likely adapt their domestic equipment to meet a more internationally compatible design. This will also be helpful in international touring situations.

With respect to proposed 647-4: This provision is intended to provide an alternate method of single-phase distribution in environments where sensitive equipment is commonly connected to a 120/208-volt 3-phase system. This system has been applied in several locations with encouraging results. Two companies that are using this configuration are: AMS Productions, Dallas, Texas, a video post-production company; and Argyle Broadcasting, KITV, Honolulu, Hawaii, an ABC affiliate and notably the first TV station transmitting a full-time digital television signal. Both companies are using a 112.5 KVA 6-phase 60-volt-to-ground system as outlined in proposed 647-4.

Conclusion: Not only in sound and video applications, but in communications, EDP environments, medical, computer-assisted manufacturing and others, electrical noise is an ongoing problem. With appropriate safety measures included in a new Article 647, the benefits now realized by the industries under Article 530, Part G could be applied to other venues.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: Refer to the panel action and statement of Proposal 15-72.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

(Log #3963)

15- 72 - (530 Part G):

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action.

The Technical Correlating Committee directs that the Scope be revised to read as follows: "This article covers the installation and wiring of separately derived systems operating at 120 volts line-to-line and 60 volts to ground for sensitive electronic equipment."

The Technical Correlating Committee directs the Panel to place the limitation to commercial and industrial occupancies elsewhere in the article.

This action will be considered by the Panel as a Public Comment.

SUBMITTER: Martin Glasband, Equi-Tech Corp.

RECOMMENDATION: Revise text as follows:

~~Article 530 — Motion Picture and Television Studios and Similar Locations~~

~~G. Separately Derived Systems with 60 Volts to Ground~~

Article 647 — Sensitive Electronic Equipment

647-1. Scope. The provisions of this article shall apply to commercial and industrial occupancies where the use of sensitive electronic equipment is connected to a separately derived system operating at 120 volts line-to-line and 60 volts to ground.

~~530-70.~~ 647-2. General. Use of a separately derived 120-volt single-phase 3-wire system with 60 volts on each of two ungrounded conductors to a grounded neutral conductor shall be permitted for the purpose of reducing objectionable noise in ~~audio/video production or other similar~~ sensitive electronic equipment locations provided that its use is restricted to areas under close supervision by qualified personnel ~~electronic equipment only~~ and that all of the requirements in Sections 647-3 through 647-7 are met.

~~530-71.~~ 647-3. Wiring Methods.

(a) Panelboards and Overcurrent Protection. Use of standard single-phase panelboards and distribution equipment with a higher voltage rating shall be permitted. The system shall be clearly marked on the face of the panel or on the inside of the panel doors. Common-trip two-pole circuit breakers that are identified for operation at the system voltage shall be provided for both ungrounded conductors in all feeders and branch circuits.

(b) Junction Boxes. All junction box covers shall be clearly marked to indicate the distribution panel and the system voltage.

(c) Color Coding. All feeders and branch-circuit conductors installed under this section shall be identified as to system at all splices and terminations by color, marking, tagging, or equally effective means. The means of identification shall be posted at each branch-circuit panelboard and at the disconnecting means for the building.

(d) Voltage Drop. The voltage drop on any branch circuit shall be limited as follows: ~~The voltage drop on any branch circuit shall not exceed 1.5 percent. The combined voltage drop of feeder and branch circuit conductors shall not exceed 2.5 percent.~~

(1) The voltage drop on branch circuits supplying equipment connected using wiring methods in Chapter 3 shall not exceed 1.5 percent.

(2) The voltage drop on branch circuits supplying receptacle outlets shall not exceed 1 percent. For the purposes of making this calculation, the load connected to the receptacle outlet shall be considered to be 50 percent of the branch circuit rating.

FPN: The purpose of this provision is to limit voltage drop to 1.5 percent where portable cords may be used as a means of connecting equipment.

647-4. 3-phase Systems. Where 3-phase power is supplied, a separately derived 6-phase "Wye" system with 60 volts to ground installed under this article shall be configured as three separately derived 120-volt single-phase systems having a combined total of no more than six main disconnects.

~~530-72.~~ 647-5. Grounding.

(a) General. The system shall be grounded as provided in Section 250-26 as a separately derived single-phase 3-wire system.

(b) Grounding Conductors Required. Permanently wired utilization equipment and receptacles shall be grounded by means of an equipment grounding conductor run with the circuit conductors to an equipment grounding bus prominently marked "Technical Equipment Ground" in the originating branch-circuit panelboard. The grounding bus shall be connected to the grounded conductor on the line side of the separately derived system's disconnecting means. The grounding conductor shall not be smaller than that specified in Table 250-95 and run with the

feeder conductors. The technical equipment grounding bus need not be bonded to the panelboard enclosure. Other grounding methods authorized elsewhere in this Code shall be permitted where the impedance of the grounding return path does not exceed the impedance of equipment grounding conductors sized and installed in accordance with Part G of this article.

FPN No. 1: See Section 250-95 for equipment grounding conductor sizing requirements where circuit conductors are adjusted in size to compensate for voltage drop.

FPN No. 2: These requirements limit the impedance of the ground fault path where only 60 volts applies to a fault condition instead of the usual 120 volts.

~~530-73.~~ 647-6. Receptacles.

(a) General. Where receptacles are used as a means of connecting equipment, the following conditions shall be met:

(1) All 15 and 20 Amp. receptacles shall be GFCI protected.

(2) All outlet strips, adapters, receptacle covers, and faceplates shall be marked as follows:

WARNING - TECHNICAL POWER
Do not connect to lighting equipment.
For electronic equipment use only.
60/1120 V. 1øAC
GFCI protected

(3) A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet having one of its current carrying poles connected to a grounded circuit conductor shall be located within 6 ft (1.83 m) of all permanently installed 15- or 20-ampere-rated 60/120-volt technical power-system receptacles.

(4) All 125-volt receptacles used for 60/120-volt technical power shall have a unique configuration and be identified for use with this class of system. 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlets and attachment plugs that are identified for use with grounded circuit conductors shall be permitted in machine rooms, control rooms, equipment rooms, equipment racks, and other similar locations that are restricted to use by qualified personnel.

(b) Isolated Ground Receptacles. Isolated ground receptacles shall be permitted as described in Section 250-74, Exception No. 4; however, the branch circuit equipment grounding conductor shall be terminated as required in Section ~~530-72(b)~~ 647-5(b).

647-7. Lighting Equipment. Lighting equipment installed under this article for the purpose of reducing electrical noise originating from lighting equipment shall meet the following conditions (a-c):

(a) Disconnecting Means. All lighting equipment shall have a disconnecting means that simultaneously opens all ungrounded conductors, and shall be located within sight or be capable of being locked in the open position.

(b) Fixtures. All lighting fixtures shall be permanently installed.

(c) Exposed Screw-shell. Lighting fixtures installed under this section shall not have an exposed lamp screw-shell.

SUBSTANTIATION: Held over from the previous code cycle, the submitter has had time to accumulate much more information regarding the application of 120V "balanced power" as it has come to be known in the industries where it is being extensively used.

Most all of the findings relate to the use of balanced power in digitally based systems where a noted decrease in digital error rates and "digital jitter" have been noted. As is true with most all digitally based signal processing equipment, performance is often affected by power distortion and noise. We have noted a great improvement in data accuracy and bandwidth, both very encouraging specifications to consider.

There are no known cases where use of this system has resulted in injury or fire as a result of applying the wiring methods outlined in 530 "G." I have heard of no case where overcurrent devices failed to operate despite the comments of the few panel members who voiced their concerns. The voltage drop allowed in the proposal is only 1/2 that (or less) of common 120-volt branch circuits having a grounded conductor.

Here, I have made a few revisions to the previously submitted Proposal 15-94, largely based on the comments by Mr. Vannice. The exception language in proposed 647-7b has been removed entirely. I agree with Mr. Vannice that more study is required before 60-volt to ground power can be safely used with any type of portable lighting equipment in any given situation. The remaining parts of the proposal that deal with permanently installed lighting equipment should be sufficient to correct electrical noise problems associated with lighting equipment in most areas where sensitive electronics operates.

One of the previous comments made against the previous proposal regarding lighting dimmers (et. al.) suggested that there are no problems associated with noise from such equipment. I completely disagree with that comment. Lighting control equipment noise is notorious for causing problems with sound equipment in the live sound reinforcement industry. Having some means to address the issue will discourage sound technicians from lifting grounding conductors, a common but dangerous practice.

Another hidden advantage of this wiring method which is not immediately apparent is how the balanced architecture of the system keeps power factor high on the primary side of the transformer. This is based on the formula $kW^2 + kVAR^2 = kVA^2$. The balanced system nulls out reactive current at the center tap of the secondary winding. This common mode cancellation is a very effective way of reducing reactive currents, harmonic distortion, and other power related problems associated with the use of nonlinear reactive loads.

It was the opinion of every panel member that limiting this wiring method only to television, theater, etc. venues is a very narrow point of view. It would be wise for the electrical industry to keep pace with advancing technology in the many areas of industry that would benefit from such a system.

PANEL ACTION: Accept in Principle in Part.

Revise the submitter's recommendation to read as follows:

Revise text as follows:

Delete Part G of Article 530.

Provide a new Article 647 to read as follows: Article 647 — Sensitive Electronic Equipment

647-1. Scope. The provisions of this article shall apply to commercial and industrial occupancies where the use of sensitive electronic equipment is connected to a separately derived system operating at 120 volts line-to-line and 60 volts to ground.

530-70. 647-3 General. Use of a separately derived 120-volt single-phase 3-wire system with 60 volts on each of two ungrounded conductors to a grounded neutral conductor shall be permitted for the purpose of reducing objectionable noise in audio/video production or other similar sensitive electronic equipment locations provided that its use is restricted toareas under close supervision by qualified personnel electronic equipment only and that all of the requirements in Sections 647-4 through 647-8 are met.

530-71. 647-4. Wiring Methods.

(a) Panelboards and Overcurrent Protection. Use of standard single-phase panelboards and distribution equipment with a higher voltage rating shall be permitted. The system shall be clearly marked on the face of the panel or on the inside of the panel doors. Common-trip two-pole circuit breakers that are identified for operation at the system voltage shall be provided for both ungrounded conductors in all feeders and branch circuits.

(b) Junction Boxes. All junction box covers shall be clearly marked to indicate the distribution panel and the system voltage.

(c) Color Coding. All feeders and branch-circuit conductors installed under this section shall be identified as to system at all splices and terminations by color, marking, tagging, or equally effective means. The means of identification shall be posted at each branch-circuit panelboard and at the disconnecting means for the building.

(d) Voltage Drop. The voltage drop on any branch circuit shall be limited as follows: The voltage drop on any branch circuit shall not exceed 1.5 percent. The combined voltage drop of feeder and branch-circuit conductors shall not exceed 2.5 percent.

(1) Fixed Equipment. The voltage drop on branch circuits supplying equipment connected using wiring methods in Chapter 3 shall not exceed 1.5 percent. The combined voltage drop of feeder and branch-circuit conductors shall not exceed 2.5 percent.(2) Cord-connected Equipment. The voltage drop on branch circuits supplying receptacles shall not exceed 1 percent. For the purposes of making this calculation, the load connected to the receptacle outlet shall be considered to be 50 percent of the branch circuit rating. The combined voltage drop of feeder and branch-circuit conductors shall not exceed 2.0 perce

FPN: The purpose of this provision is to limit voltage drop to 1.5 percent where portable cords may be used as a means of connecting equipment.

647-5. 3-phase Systems. Where 3-phase power is supplied, a separately derived 6-phase "Wye" system with 60 volts to ground installed under this article shall be configured as three separately derived 120-volt single-phase systems having a combined total of no more than six main disconnects.

530-72. 647-6 Grounding.

(a) General. The system shall be grounded as provided in Section 250-30 as a separately derived single-phase 3-wire system.

(b) Grounding Conductors Required. Permanently wired utilization equipment and receptacles shall be grounded by means of an equipment grounding conductor run with the circuit conductors to an equipment grounding bus prominently marked "Technical Equipment Ground" in the originating branch-circuit panelboard. The grounding bus shall be connected to the grounded conductor on the line side of the separately derived system's disconnecting means. The grounding conductor shall not be smaller than that specified in Table 250-122 and run with the feeder conductors. The technical equipment grounding bus need not be bonded to the panelboard enclosure. Other grounding methods authorized elsewhere in this Code shall be permitted where the impedance of the grounding return path does not exceed the impedance of equipment grounding conductors sized and installed in accordance with this article.

FPN No. 1: See Section 250-122 for equipment grounding conductor sizing requirements where circuit conductors are adjusted in size to compensate for voltage drop.

FPN No. 2: These requirements limit the impedance of the ground fault path where only 60 volts applies to a fault condition instead of the usual 120 volts.

530-73. 647-7. Receptacles.

(a) General. Where receptacles are used as a means of connecting equipment, the following conditions shall be met:

(1) All 15 and 20 Amp. receptacles shall be GFCI protected.

(2) All outlet strips, adapters, receptacle covers, and faceplates shall be marked as follows:

WARNING - TECHNICAL POWER
Do not connect to lighting equipment.
For electronic equipment use only.
60/120 V. 1øAC
GFCI protected

(3) A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet having one of its current carrying poles connected to a grounded circuit conductor shall be located within 1.8 m (6 ft) of all permanently installed 15- or 20-ampere-rated 60/120-volt technical power-system receptacles.

(4) All 125-volt receptacles used for 60/120-volt technical power shall have a unique configuration and be identified for use with this class of system. All 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlets and attachment plugs that are identified for use with grounded circuit conductors shall be permitted in machine rooms, control rooms, equipment rooms, equipment racks, and other similar locations that are restricted to use by qualified personnel.

(b) Isolated Ground Receptacles. Isolated ground receptacles shall be permitted as described in Section 250-146(d); however, the branch circuit equipment grounding conductor shall be terminated as required in Section 530-72(b) 647-6(b) .

647-8. Lighting Equipment. Lighting equipment installed under this article for the purpose of reducing electrical noise originating from lighting equipment shall meet the following conditions (a-c):

(a) Disconnecting Means. All lighting equipment shall have a disconnecting means that simultaneously opens all ungrounded conductors, and shall be located within sight or be capable of being locked in the open position.

(b) Luminaires. All luminaires shall be permanently installed, listed and ballast operated.

(c) Screw-shell. Luminaires installed under this section shall not have an exposed lamp screw-shell.

PANEL STATEMENT: The revised text meets the intent of the submitter.

The part rejected is the deletion of Article 530.

The deletion of the voltage drop for feeders is also rejected.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

COMMENT ON AFFIRMATIVE:

GLENN: I am voting in favor of the panel action with the following comment:

The use of the term "Sensitive" in this new article is undefined and unclear. It would be better to drop the word "sensitive" and just have an article for "Electronic Equipment".

(Log #3276)

15- 73 - (530-73(a)(2)): Accept

Note: The Technical Correlating Committee understands that this action modifies the text accepted in Proposal 15-72.

SUBMITTER: Alan Manche, Square D Co.

RECOMMENDATION: Revise 530-73(a)(2) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

2. All outlet strips, adapters, receptacle covers, and faceplates shall be marked ~~as follows~~ with the following words or equivalent:

WARNING-TECHNICAL POWER
Do not connect to lighting equipment
For electronic equipment use only
60/120 volt 1ph ac
GFCI protected.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

NEGATIVE: 1

NOT RETURNED: 1 Kalbfeld

EXPLANATION OF NEGATIVE:

HIRSCHLER: A mandatory warning should not be permitted to have "OR EQUIVALENT" wording. This is unenforceable, as it cannot be decided what equivalent wording is. For example, it is unclear to me what wording would be "equivalent" to the mandated "WARNING - TECHNICAL POWER" without changing the meaning.

COMMENT ON AFFIRMATIVE:

VANNICE: Upon accepting Proposal 15-72, this proposal now refers to Section 647-7(a)(2).

ARTICLE 540 — MOTION PICTURE PROJECTORS

(Log #2188)

15- 74 - (540): Accept

Note: The Technical Correlating Committee advises that Article Titles are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

ARTICLE 540 — Motion Picture Projection Rooms ~~Projectors~~

SUBSTANTIATION: This change more accurately agrees with the title of Chapter 5. It now is an occupancy rather than just a piece of equipment. This is also the first item mentioned in Section 540-1 Scope, then the scope continues and defines the associated equipment, motion picture projectors being one, that is part of this article.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NOT RETURNED: 1 Kalbfeld

(Log #485)

15- 75 - (540-2, 540-12): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 540-2 - revise as follows:

"540-2. Professional Projector. A type of projector using 35- or 70-mm film that has a minimum width of 35 mm (1 3/8 in.) 1 ~~3/8~~

~~inch (35 mm)~~ and has on each edge 212 perforations per meter (5.4 perforations per inch), or a type using carbon arc, xenon, or other light source equipment that develops hazardous gases, dust, or radiation."

540-12 - change "30 in. (762 mm)" to "750 mm (30 in.)"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #486)

15- 76 - (540-11(a)(6)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise second sentence as follows:
"(6) Wire Screens or Perforated Metal. Have wire screens or perforated metal placed at the commutator of brush ends. No dimension of any opening in the wire screen or perforated metal shall exceed 1.27 mm (0.05 in.) ~~0.05 in. (1.27 mm)~~, regardless of the shape of the opening and of the material used."
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

(Log #1086)

15- 77 - (540-13): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 8" to "8 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NOT RETURNED: 1 Kalbfeld

ARTICLE 545 — MANUFACTURED BUILDING

(Log #2172)

19- 3 - (545): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Article 545 — Manufactured Buildings
~~A. General~~
SUBSTANTIATION: Parts should not be used in the article because there is only one part. The NEC Style Manual 2.1.4 states, "If an article is sufficiently large, it shall be permitted to be subdivided into parts...". The use of only one part does not subdivide the article.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #1087)

19- 4 - (545-4(b)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 10" to "10 AWG".
SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: The NEC Style Manual does not specify the language used one way or another. The NFPA Manual of Style, seems to prefer 10 AWG. Product standards use 10 AWG or 10 AWG 110-6 says that the conductor sizes are expressed in AWG or in circular mils so the AWG is implied The panel recognizes that the TCC may desire to take a different action to be consistent with the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #2447)

19- 5 - (545-4(c) (New)): Reject
SUBMITTER: Patrick S. Ouillette, Maine Dept. of Professional and Financial Regulation
RECOMMENDATION: Add new text to read as follows:
(c) Use of Notches in Wood. Where notches in accordance with Section 300-4(a)(2) are used on the exterior side of wood studs of outside walls of dwelling units, the manufacturer of the building shall provide a label with the structure that describes the notches and that shows the locations of the notches. The label provided shall be affixed to the electrical service or distribution equipment.
SUBSTANTIATION: Some manufacturers of modular homes (manufactured buildings) elect to cut notches in the exterior side of outside wall wood studs. This makes for ease of wiring within the manufacturing plant. The notches are covered with steel plates as required.

I inspected a modular home where nearly every steel plate covering the wiring notches in the structure had been bent inward (in some instances pushed tightly against the back side of the notch) as a result of the installation of an additional layer of structural sheathing, field installed with a power nailer. This custom work in the field is not the norm for modular housing. However, there is an increasing trend toward ordering a home without siding. Depending on the type of siding applied, power fastening of the siding could certainly be expected. The photos I have provided show serious damage to the NM cables by screws and nails, many of which first penetrated the steel plates. The number of cables passing through some of the notches allowed little chance for a cable to be shifted to one side or the other with the movement of the bending plates, as was the case in some of the notches containing only a single cable. This "bundling" of cables through some of the notches borders on a violation of 310-15(b)(2)(a), particularly when considering the wall insulation.

All manufacturers of modular housing that I am aware of ship installation/set-up instructions with their homes for field use. A label describing and locating any exterior wiring notches used could easily be included with these instructions. The wiring in the home was never energized. The problem was uncovered when an area of the exterior wall was open for the field installation of a deck. Nearly the entire home was gutted and rewired using new cables through bored studs. [See submitter's proposal with photos for Section 550-10(c), relating to manufactured (mobile) homes.]

Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The problem addressed in the recommendation should be addressed by enforcement of existing methods and installation standards. The proposed solution would not be effective. Steel plates have been shown to be effective protection for common fastening methods.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #937)

19- 6 - (545-5): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
~~Service Entrance Conductors.~~ Supply Conductors. ~~Service entrance conductors shall meet the requirements of Article 230.~~ Provisions shall be made to route the service-entrance, service-lateral, feeder, or branch-circuit supply conductors ~~from the service equipment to the point of attachment of the service drop or service lateral~~ to the service or building disconnecting means.
SUBSTANTIATION: A manufactured building may have supply conductors which are not service-entrance conductors, such as feeders or branch circuits as covered in Article 225, which may be overhead or underground. These conductors should warrant the same provisions. Service-laterals may terminate at service equipment, with no service-entrance conductors.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #938)

19- 7 - (545-6): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Installation of Service-Entrance Conductors. Service-entrance conductors shall meet the requirements of Article 230 and shall be installed after erection at the building site except where point of attachment to the service-drop or service-lateral is known prior to manufacture.
Delete exception.
SUBSTANTIATION: Editorial. Incorporates exception into the rule in sentence form and indicates what point of attachment is intended.
PANEL ACTION: Reject.
PANEL STATEMENT: Given the language of 90-3 , the reference to Artcle 230 is not needed. The existing exception provides sufficient clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #518)

19- 8 - (545-9(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In Section 545-9(b), replace "100 in.^{3} (1640 cm^3)" with "1650 cm^3 (100 in.^{3})" throughout.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #939)

19- 9 - (545-12): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Grounding Electrode Conductor. Provisions shall be made to route a grounding ~~electrode~~ conductor from the point of attachment to an alternating-current service or feeder or branch circuit supply to the point of attachment to the grounding electrode.
SUBSTANTIATION: Service equipment, per definition, limits the point of attachment whereas Section 250-24(a)(1) permits attachment at any point on the service. I believe some utilities require (or permit) attachment at the service head. If this provision is necessary should it not include a grounding conductor required by Section 250-32? Section 250-162 would govern dc services.
PANEL ACTION: Accept in Principle in Part.
Revise to read as follows:
"Grounding Electrode Conductor or Grounding Conductor. Provisions shall be made to route a grounding electrode conductor or grounding conductor from the service, feeder, or branch circuit supply to the point of attachment to the grounding electrode."
PANEL STATEMENT: The rejected phrase unneccesarily limits the Code user. The title and text were changed to be consistent with 250-32(f) and the concerns of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

ARTICLE 547 — AGRICULTURAL BUILDINGS

(Log #3678)

19- 10 - (547-1): Reject
SUBMITTER: Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL
RECOMMENDATION: Add new text to read as follows:
547-1. Scope. The provisions of this article shall apply to the following agricultural buildings of commercial use or that part of a building or adjacent areas of similar or like nature as specified in (a) and (b).
SUBSTANTIATION: The problem is that all to often we are asking people with a dog cage or a small barn in their back yard to provide an equipotential plane for such a structure when in fact we may be doing more harm than good. It is not unusual in some areas of the country for someone to build a barn to hold a few horses and because of the way the barn is constructed open dirt stalls and concrete walkways around the stall area that leads directly onto a dirt area outside the concrete to ask them to install up to 300 ground rods, bonding them all together. This certainly is an overkill and has the potential to cause harm to animals if the ground rods should become exposed over time.
PANEL ACTION: Reject.
PANEL STATEMENT: The scope statements are the responsibility of the TCC. Additionally, the term "commercial" is not defined and its undefined use would create confusion.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #4123)

19- 11 - (547-2): Accept
Note: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal regarding the renumbering of the sections, combining existing 547-2 with another section, or deleting 547-2. The Technical Correlating Committee directs the Panel to correlate the action on this Proposal with the actions on Proposals 19-21 and 19-28. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Jonathan R. Althouse, Michigan State University
RECOMMENDATION: Create a new section 547-2 Definitions. Renumber the present sections or combine it with another section. Move "Distribution Point" from the end of 547-8(c) to become 547-2(a) and move "Equipotential Plane" from 547-9(a) to 547-2(b).
SUBSTANTIATION: All definitions need to be at the beginning of the Article for ease of locating them and to be consistent with other articles.
PANEL ACTION: Accept.
PANEL STATEMENT: There will be editorial changes in the recommendation made to conform to the requirements of the style manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #940)

19- 12 - (547-4): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first sentence:
Multiconductor Type UF, copper Type SE, Article 344 or other cables or raceways suitable for the location, with approved termination fittings, shall be the wiring method employed.
SUBSTANTIATION: Editorial. Multiconductor cable should be specified, if intended. The reference to Article 320 covers the use of single-conductor Type UF cables and provides for specific installation requirements.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing Code is sufficiently clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2573)

19- 13 - (547-4(a)): Accept in Principle
SUBMITTER: J. Philip Simmons, Nat'l Armored Cable Manufacturers Assn.
RECOMMENDATION: Revise existing section as follows:
(a) Wiring Systems. Types UF, NMC, copper SE cables, Type MC cable, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, or other cables or raceways suitable for the location, with approved termination fittings, shall be the wiring methods employed. Article 320 and Article 502 wiring methods shall be permitted for areas described in Section 547-1(a).
SUBSTANTIATION: Listed Type MC cable is manufactured with an overall corrosion resistant, moisture impervious nonmetallic jacket. This product is suitable for installations in agricultural buildings. See Sections 334-4 and 334-22 for information on supplemental protection of Type MC cable.
PANEL ACTION: Accept in Principle.
Revise to add the text "jacketed" before "Type MC cable" in the recommendation.
PANEL STATEMENT: Adding the term jacketed would ensure that the cable is adequately protected.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #3723)

19- 14 - (547-4(a)): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 7-12. This action will be considered by the Panel as a Public Comment. The Technical Correlating Committee understands that the action on this Proposal further modifies the action on Proposal 19-13.
SUBMITTER: Barry Bauman, Alliante Energy/Rep. Alliant Energy/Rep. American Society of Agricultural Engineers
RECOMMENDATION: Revise text to read as follows:
(a) Wiring Systems. Types UF, NMC, copper SE cables, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, or other cables or raceways suitable for the location, with approved termination fittings, shall be the wiring methods employed. ~~Article 320 and~~ Article 502 wiring methods shall be permitted for areas described in Section 547-1(a).
SUBSTANTIATION: Open wiring on insulators is not appropriate in the interior of modern agricultural buildings. It is being used to avoid more appropriate wiring methods such as UF cable and nonmetallic conduit.
A similar proposal is being submitted for 320-3.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #519)

19- 15 - (547-4(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In Section 547-4(b), replace "8 in. (203 mm)" with "200 mm (8 in.)" and replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2412)

19- 16 - (547-4(c)): Accept in Principle in Part
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
547-4(c). Equipment Enclosures, Boxes, Conduit Bodies, and Fittings. All equipment enclosures, boxes, conduit bodies, and fittings shall comply with ~~Section 547-5~~ (1) through (3) below.
(1) Excessive Dust. Equipment enclosures, boxes, conduit bodies, and fittings installed in areas of buildings where excessive dust may be present shall be designed to minimize the entrance of dust and shall have no openings (such as holes for attachment screws) through which dust could enter the enclosure.
(2) Damp or Wet Locations. In damp or wet locations, equipment enclosures, boxes, conduit bodies, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the enclosure, box , conduit body, or fitting. In wet locations, including normally dry or damp locations where surfaces are periodically washed or sprayed with water, boxes, conduit bodies, and fittings and shall be listed for use in wet locations, and equipment enclosures shall be weatherproof.
(3) Corrosive Atmosphere. Where wet dust, excessive moisture, corrosive gases or vapors, or other corrosive conditions may be present, equipment enclosures, boxes, conduit bodies, and fittings shall have corrosion resistance properties suitable for the conditions.
FPN No. 1: See Table 430-91 for appropriate enclosure type designations.
FPN No. 2: Aluminum and magnetic ferrous materials may corrode in agricultural environments.
SUBSTANTIATION: This proposal relates to Section 547-5, and should be coordinated with submitter's proposal for that section.
The appropriate place for specifications for boxes and fittings would seem to be under the heading "(c) Boxes and Fittings" in this section, not Section 547-5(a) and (b), which must be forward-referenced. The corresponding existing requirements under 547-5(a) and (b) are proposed for deletion under a separate proposal.
Equipment enclosures and conduit bodies should be referred to in the headings and text because these requirements should apply to them.
Dust, moisture, and corrosive conditions are addressed separately, because, as persons familiar with these locations may have observed, some buildings or building areas may be subject to only dust or excessive moisture, not both.
It is not uncommon to find watertight enclosures (outlet or junction boxes with gasketed covers) partially filled with water due to condensation. Reiterating the requirement of Sections 370-15(a), which applies to boxes, conduit bodies and fittings and 373-2(a), which applies to cabinets and other enclosures provides consistency with those requirements.
Present 547-5(a) refers to "dustproof" enclosures. The term "dustproof" is not used in any other Code article, nor is it used in the UL electrical equipment directory in reference to boxes, fittings, or enclosures or NEMA enclosure type designations. The term "dusttight" could be used, but implies a box listed as dusttight under the Article 100 definition. The language proposed under (1) is similar to that of Section 502-4(b)(1), which addresses Class II, Division 2 locations, and therefore seems appropriate.
PANEL ACTION: Accept in Principle in Part.
Delete the first sentence of the recommendation.
Retain existing FPNs and move to 547-4(c).
Revise text as follows:
"(1) Excessive Dust. Equipment enclosures, boxes, conduit bodies, and fittings installed in areas of buildings where excessive dust may be present shall be dustproof.
(2) Damp or Wet Locations. In damp or wet locations, equipment enclosures, boxes, conduit bodies, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the enclosure, box , conduit body, or fitting. In wet

locations, including normally dry or damp locations where surfaces are periodically washed or sprayed with water, boxes, conduit bodies, and fittings shall be listed for use in wet locations and equipment enclosures shall be watertight.

(3) Corrosive Atmosphere. Where wet dust, excessive moisture, corrosive gases or vapors, or other corrosive conditions may be present, equipment enclosures, boxes, conduit bodies, and fittings shall be suitable for the conditions encountered in the application."

PANEL STATEMENT: Existing FPNs are clear. The text in (1) through (3) was changed to use existing text that was clear and more accurately describes the equipment enclosure types to be utilized. The first sentence of the proposal is redundant.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MCNEIVE: Moisture must be prevented from entering the enclosure. Furthermore, the submitter has introduced a requirement (2) that would prohibit a Type 3R enclosure in a wet location. According to product standards, 3R enclosures can allow moisture to enter, but not interfere with operation of equipment. See negative comment on Proposal 19-18.

(Log #1877)

19- 17 - (547-4(g) (New)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Add new paragraph (g) to read as follows:
(g) Electrical Terminations. All electrical terminations subject to corrosive vapor and moisture shall be protected with an electrical termination compound or approved grease.
SUBSTANTIATION: The problem with barn wiring is that metal terminations and connections rot away, especially steel and aluminum. Requiring products such as Penetrox, Noalox, Deox, Oxgard or Contax, or even white lithium grease or silicone grease (as in King connectors) would do more than anything else to stop problems.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2413)

19- 18 - (547-5): Accept
SUBMITTER: William E. Bickner, Stillwater, MN
RECOMMENDATION: Revise as shown below:
547-5. Switches, Receptacles, Circuit Breakers, Controllers, and Fuses. Switches, including pushbuttons, relays, and similar devices, receptacles, circuit breakers, controllers, and fuses, ~~including pushbuttons, relays, and similar devices,~~ shall be provided with enclosures as specified in ~~(a) and (b)~~ Section 547-4(c).
~~(a) Excessive Dust and Dust with Water. Buildings described in Section 547-1(a) shall utilize dustproof and weatherproof enclosures.~~
~~(b) Corrosive Atmosphere. Buildings described in Section 547-1(a) shall utilize enclosures suitable for the conditions encountered in the application.~~
~~FPN No. 1: See Table 430-91 for appropriate enclosure type designations.~~
~~FPN No. 2: Aluminum and magnetic ferrous materials may corrode in agricultural environments.~~
SUBSTANTIATION: Some material proposed to be deleted by this proposal is proposed to be modified and moved to Section 547-4(c) under submitter's proposal for that section, so the two proposals should be coordinated.
Receptacles should be included in the list of equipment covered by this section, as they are not covered elsewhere in Article 547. The phrase "including pushbuttons, relays, and similar devices" refers to switching devices and should follow "switches" in the list.
The appropriate place for specifications for boxes and fittings would seem to be under the heading "(c) Boxes and Fittings" in Section 547-4(c), not Section 545-5(a) and (b), which must be forward- referenced. The reference here is changed to correspond with changes proposed for Section 547-4(c).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 7
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MCNEIVE: Relocating text from 547-5 to 547-4(c) does not contribute to usability of the Code, since 547-4(c) addresses wiring methods. See Proposal 19-16.

(Log #CP1902)

19- 18a - (547-8): Accept
Note: It was the action of the Technical Correlating Committee that further consideration be given to the affirmative comments expressed in the voting. This action will be considered by the panel as a public comment. The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual regarding references to entire articles.
SUBMITTER: CMP 19
RECOMMENDATION: Text to read as follows:
547-8. Electrical Supply to Building or Structures from a Distribution Point
(A) Main Disconnect. A disconnecting means shall be installed at the distribution point when two or more agricultural or associated farm dwelling(s) or other buildings are supplied from the distribution point. For the purposes of applying the rules of this Code, this disconnecting means, shall be classified as the service disconnecting means.
(1) Purpose. The disconnecting means shall simultaneously interrupt all ungrounded conductors for the purposes of isolation, system maintenance, emergency disconnection or connection of optional standby systems.
(2) Series Disconnects. Where the serving utility provides a disconnecting means as part of their service requirements and this disconnecting means is determined to meet the requirements of this section, an additional disconnecting means shall not be required.
(3) Rating. The disconnecting means shall be rated for the calculated load as determined by 220 Part D.
(4) Overcurrent. The disconnecting means shall not be required to contain overload protection.
(5) Accessibility. Where not readily accessible, the disconnecting means shall be capable of operation from a readily accessible point.
(6) Grounding. The grounded conductor of the system shall be grounded at the distribution means and be connected to a grounding electrode through a grounding conductor.
(B) Electrical Supply. The buildings shall be permitted to be supplied by either (1) or (2):
(1) Disconnecting Means and Overcurrent Protection Located at the Building(s) or Structure(s). Where the disconnecting means and overcurrent protection are located at the buildings or structures supplied by the conductors, the conductors shall be sized in accordance with Article 220 and installed in accordance with the requirements of Part B of Article 225. Conductors of the supply system shall meet the clearances specified in 225.18 and 230.24(b).
For each building or structure the conditions in either (a) or (b) shall be permitted.
(a) The grounded circuit conductor shall be permitted to be connected to the building disconnecting means and to the grounding electrode system of that building where all the requirements of Section 250-32(b)(2) are met.
(b) A separate equipment grounding conductor shall be run with the supply conductors to the building(s) or structure(s) and the following conditions shall be met:
1. The equipment grounding conductor shall be the same size as the largest supply conductor, if of the same material, or shall be adjusted in size in accordance with the equivalent size columns of Table 250-122 if of different materials.
2. The equipment grounding conductor is bonded to the grounded circuit conductor at the disconnecting means enclosure at the distribution point or at the source of a separately derived system.
3. A grounding electrode system shall be provided in accordance with Part C of Article 250 and connected to the equipment grounding conductor at the building (s) or structure(s) disconnecting means.
4. The grounded circuit conductor shall not be connected to a grounding electrode or to any equipment grounding conductor on the load side of the distribution point.
(2) Disconnecting Means and Overcurrent Protection at the Distribution Point. Where the disconnecting means and overcurrent

protection for each set of feeder conductors is located at the distribution point, feeders to building(s) or structure(s) shall meet the requirements of 250.32 and Article 225 Parts A and B.

FPN. Methods to reduce neutral-to-earth voltages in livestock structures include supplying buildings with four-wire single-phase services, sizing of three-wire service conductors to limit voltage drop to 2 percent, and connecting loads line-to-line.

(C) Underground Equipment Grounding Conductors. Where livestock is housed, any portion of the equipment grounding conductor run underground to the building or structure shall be insulated or covered copper.

SUBSTANTIATION: The purpose and requirements of the main disconnecting means required in the 1999 Code are more clearly defined. The methods of supplying power to buildings covered under this Article are reorganized and restated to more clearly state the requirements of the methods permitted for supplying power. Concepts from proposals 19-19, 19-20, 19-22, 19-23, 19-24 and 19-26 have been incorporated.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

MCNEIVE: The purpose and requirements of the main disconnecting means required in the 1999 Code are more clearly defined. The methods of supplying power to buildings covered under this Article are reorganized and restated to more clearly state the requirements of the methods permitted for supplying power. Concepts from Proposals 19-19, 19-20, 19-22, 19-23, 19-24, and 19-26 have been incorporated.

COMMENT ON AFFIRMATIVE:

MCCULLOUGH: In (A)(6), I believe the word "distribution" in the first sentence should be "disconnecting". The requirement if for grounding at the disconnecting means, which is the whole topic of (A).

(Log #2025)

19- 19 - (547-8): Accept in Principle

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

RECOMMENDATION: Revise text to read as follows:

547-8. Service Equipment, Separately Derived Systems, Feeders, Disconnecting Means, and Grounding. Where one or more agricultural buildings are supplied from a distribution point, the disconnecting means and grounding of services and feeders shall comply with both (a) and (c), or (b).

(a) Service Equipment at a Building(s). Where the service equipment is located at the load end of the service conductors, service equipment grounding shall meet the requirements of Section 250-24. A disconnecting means [see 547-8(c)] shall also be installed at the distribution point when two or more buildings are supplied from that distribution point.

(b) Service Equipment at Distribution Point. No change.

(c) Disconnecting Means Without Overcurrent Protection at the Distribution Point. Where the disconnecting means without overcurrent protection is located at the distribution point and service equipment is located at the building(s), the grounded circuit conductor connection to the grounding electrode shall not be permitted at the building service equipment at each building and all of the following conditions shall be met.

(1) All buildings and premises wiring are under single management.

(2) Listed disconnecting means is provided at the distribution point.

(3) A wire equipment grounding conductor is run with the supply conductors, sized in accordance with Table 250-66.

(4) and (5) No change.

Distribution Point. Also known as yard service or meter pole. No change.

SUBSTANTIATION: (a) and (c) must clearly be used together; (b) is separate. The title of (a) should be "service equipment". Service equipment is defined elsewhere in the code and does not need a confusing restatement in Article 547.

547-8(c)(2) seems to require nonexistent equipment. Service equipment always contains overcurrent protection. What is needed is a listed outdoor disconnect switch.

547-8(c)(3) is crazy. I don't think there is any other place in the code where equipment grounding conductors are required to be the same size as ungrounded conductors. Metal conduit is not reliable. The EGC has to be a wire. The problem with barn wiring is not microvolts or millivolts arising on the wire; it is macrovolts caused by rotted out terminations. Insanely oversized wire will not solve the problem. The solution is a dry location whenever possible and some sort of protective grease. I have often seen tin plating peel right off like a layer of sunburned skin and aluminum and steel rot and break.

The code should use ordinary English words when possible. Normal people refer to yard service as yard service or the meter pole. This should at least be acknowledged in the definition. It's like whirlpool bathtubs in Article 680.

PANEL ACTION: Accept in Principle.

See action on Proposal 19-18a and proposal 19-21.

PANEL STATEMENT: Submitter's concerns regarding distribution point, services, and disconnecting means are covered in Proposal 19-18a and Proposal 19-21.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #3719)

19- 20 - (547-8): Accept in Principle

SUBMITTER: Barry Bauman, Alliante Energy/Rep. Alliant Energy/Rep. American Society of Agricultural Engineers

RECOMMENDATION: Revise text to read as follows:

547-8. Service Equipment, Separately Derived Systems, Feeders, Disconnecting Means, and Grounding.

General. A disconnecting means shall be installed at the distribution point when two or more buildings are supplied from the distribution point.

Where one or more ~~agricultural (b), or (c). A disconnecting means shall also be installed at the distribution when two or more buildings are supplied from that distribution point~~ buildings are supplied from a distribution point, the disconnection means and grounding of services and feeders shall comply with (a), (b), or (c).

(a) Disconnecting Means and Overcurrent Protection at a Building(s). Where the service disconnecting means and overcurrent protection are located at the ~~load end of the service conductors~~ buildings served, service equipment grounding shall meet the requirements of Section ~~250-24~~ 250-32.

(b) Disconnecting Means and Overcurrent Protection at Distribution Point. Where the service disconnecting means and overcurrent protection are located at the distribution point, feeders to buildings shall meet the requirements of Section 250-32 and Article 225, Part B.

(c) Disconnecting Means Without Overcurrent Protection at Distribution Point. Where the disconnecting means without overcurrent protection is located at the distribution point and a ~~disconnecting means and overcurrent~~ single-phase 4-wire or three-phase 5-wire service is installed ~~protection is located at the building(s), the grounded circuit conductor connection to the grounding electrode shall not be permitted at the building disconnecting means at each building and~~ all of the following conditions shall be met.

1. All buildings and premises wiring are under single management.

~~2. Disconnecting means suitable for use as service equipment is provided at the distribution point.~~

~~3.~~ 2. An equipment grounding conductor is run with the supply conductors and is of the same size as the largest supply conductor, if of the same material, or is adjusted in size in accordance with the equivalent size columns of Table 250-122 if or different materials.

~~4~~ 3. The equipment grounding conductor is bonded to the grounded circuit conductor at the distribution point or at the source of a separately derived system.

4. The connection of the grounded circuit conductors to the grounding electrode at a separate building(s) or structure(s) shall not be made.

5. A grounding electrode system is provided and connected to the equipment grounding conductor at ~~the~~ each building disconnecting means.

~~Distribution Point. A centrally located electrical supply structure from which services or feeders to agricultural buildings and other buildings, including the associated farm dwelling, are normally supplied.~~

Exception: The farm dwelling shall meet the conditions of 547-8(a) if the existing wiring in the dwelling has the grounded and grounding conductors bonded at the range or clothes dryer outlets.

SUBSTANTIATION: The proposed revisions to 547-8 are made to more clearly present the intent of the changes made to the 1999 NEC. Those who developed analyses of the 1999 NEC all described the requirements in the section differently. The disconnecting means should apply to (a), (b), and (c) not just (a). The term "load end of the service conductors" in part (a) needed clarifying as it was intended to be at the building served. This paragraph should have referenced to 250-32 as there is obviously more than one building served. Listed disconnecting means "suitable for use as service equipment" required in the rules for part (c) are not manufactured. It was not clear what should be the wiring method for service to the dwelling when part (c) was selected. The definition of distribution point could have been interpreted to apply to only (c).
PANEL ACTION: Accept in Principle.
See action on Proposal 19-18a
PANEL STATEMENT: Submitter's concerns regarding distribution point, services, and disconnecting means are covered in Proposal 19-18a and Proposal 19-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #3725)

19- 21 - (547-8): Accept in Principle
Note: The Technical Correlating Committee understands that the action on this Proposal further modifies the action on Proposal 19-18a.
SUBMITTER: Barry Bauman, Alliante Energy/Rep. Alliant Energy/Rep. American Society of Agricultural Engineers
RECOMMENDATION: Move "Distribution Point" definition to a point immediately after "547-1" and revise as follows:
547-2 Definition.
Distribution Point. A centrally located electrical supply structure from which service~~s or~~ drops, service laterals, feeders or branch circuits to agricultural buildings and other buildings, including the associated farm dwelling, are normally supplied.
Renumber subsequent sections.
SUBSTANTIATION: The Style Manual calls for definitions that apply to a specific article to be located in the second sentence of that article. The updated language results in a clearer understanding of 547-8.
PANEL ACTION: Accept in Principle.
Revise text to read as follows:
"547-2 Distribution Point
An electrical supply point from which service drops, service laterals, feeders or branch circuits to agricultural buildings, associated farm dwelling(s) and associated buildings under single management are supplied. The Service Point as described in Article 100 is typically at the Distribution Point.
FPN 1. Distribution Points are also known as the Center Yard Pole, Yard Pole, Meter Pole, or the Common Distribution Point."
PANEL STATEMENT: The revisions further clarify the term distribution point.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #3849)

19- 22 - (547-8): Accept in Principle
SUBMITTER: J. Philip Simmons, Simmons Electrical Services
RECOMMENDATION: Make the following changes or additions:
547-8. Service Equipment, ~~Separately Derived Systems,~~ Feeders, Disconnecting Means, and Grounding. Where one or more agricultural or associated farm dwelling buildings are supplied from a distribution point, the disconnection means and grounding of services and feeders shall comply with either (a), or (b). Installations shall also comply with (c), and (d).
(a) Service Disconnecting Means and overcurrent Protection at a Building(s). Where the service disconnecting means and overcurrent protection are located at the load end of the service conductors, service equipment grounding shall meet the requirements of Article 250. ~~Section 250-32. A disconnecting means shall also be installed at the distribution point when two or more buildings are supplied from that distribution point.~~
(b) Service Disconnecting Means and Overcurrent Protection at Distribution Point. Where the service disconnecting means and overcurrent protection are located at the distribution point, feeders to buildings shall meet the requirements of ~~Section 250-32 and~~ Article 225, Part B. An equipment grounding conductor shall be installed from the distribution point to each agricultural building or structure served. The grounding installation shall comply with Section 250-32(b)(1).
~~(c) Disconnecting Means Without Overcurrent Protection at the Distribution Point. Where the disconnecting means without overcurrent protection is located at the distribution point ad a disconnecting means and overcurrent protection is located at the building(s), the grounded circuit conductor connection to the grounding electrode shall not be permitted at the building disconnecting means at each building and all of the following conditions shall be met.~~
~~1. All buildings and premises wiring are under single management.~~
~~2. Disconnection means suitable for use as service equipment is provided at the distribution point.~~
~~3. An equipment grounding conductor is run with the supply conductors and is of the same size as the largest supply conductor, if of the same material, or is adjusted in size in accordance with the equivalent size columns of Table 250-122 if of different materials.~~
~~4. The equipment grounding conductor is bonded to the grounded circuit conductor at the distribution point or at the source of a separately derived system.~~
~~5. A grounding electrode system is provided and connected to the equipment grounding conductor at the building disconnecting means.~~
(c) Supplying Loads. To the extent practicable, equipment in agricultural buildings shall be supplied line-to-line.
(d) Underground Equipment Grounding Conductors. Where livestock is housed, any portion of the equipment grounding conductor run underground to the building or structure disconnecting means shall be insulated or covered copper.
Distribution Point. A centrally located electrical supply structure from which services or feeders to agricultural buildings and other buildings, including the associated farm dwelling, are normally supplied.
SUBSTANTIATION: The words "Separately Derived System" in the section title should be deleted as this section makes no reference to them.
The words "or associated farm dwelling" are being added to the opening paragraph as some buildings such as dwellings are supplied from the distribution point. These "associated" buildings should be permitted to comply with the ordinary rules for disconnecting means and grounding requirements independent of their association with wiring for agricultural buildings.
Proposed changes to (a) and (b) and deletion of (c). Several years ago, a joint task group of CMP-5 and 19 met to discuss the grounding requirements of agricultural buildings. As I recall the conclusions reached, the task group recommended that the grounded circuit conductor (often a neutral) not be grounded again at the agricultural where it was grounded at the service. Doing so addresses the tingle voltage situation. Changes proposed to these subsections will permit the service to be grounded at the individual building but will not allow the feeder grounded conductor to be grounded at the individual buildings where the service is installed at the distribution point.
(a) There is no justification for requiring that service disconnecting means be provided at the distribution point where the service conductors extend to the building or structure. In this case, perhaps metering only is installed at the distribution point.
(b) Where the service disconnecting means and system are grounded at the distribution point, the conductors to the buildings are feeders. As such, the feeder should contain an equipment grounding conductor and be grounded in accordance with Section 250-32(b). This will help reduce the tingle voltage problem.
(c) The introduction of a service disconnecting means without overcurrent protection either inside the service disconnecting means or immediately adjacent thereto in the 1999 NEC was done so without proper substantiation or coordination with Section 230-91. In addition, the definition of "Service Conductors" in Article 100 makes it clear that the service conductors end at the service disconnecting means. That means the conductors on the load side of the service disconnecting means are feeder conductors. Overcurrent protection of feeders is required to comply with Section 240-3.
New (c) Connecting loads in a line-to-line manner should reduce voltage drop in the neutral agricultural buildings, it should be located in Article 547 to assist the user of the NEC.

New (d) This requirement presently exists in Section 250-32(e). Since it relates only to agricultural buildings, it should be located in Article 547 to assist the user of the NEC.
PANEL ACTION: Accept in Principle.
See action on Proposal 19-18a and 19-21.
PANEL STATEMENT: Submitter's concerns regarding distribution point, services, underground copper grounding conductors, and disconnecting means are covered in Proposal 19-18a and Proposal 19-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #4086)

19- 23 - (547-8): Accept in Principle
SUBMITTER: Truman C. Surbrook, Michigan State University
RECOMMENDATION: Revise text to read as follows:
547-8. Electrical Supply to Buildings or Structures from a Distribution Point. Where one or more ~~agricultural~~ buildings or structures are supplied from a distribution point, the conductors supplying the buildings or structures ~~disconnecting means and grounding of services and feeders~~ shall comply with (a) or (b).
(a) Disconnecting Means and Overcurrent Protection Located at the Building(s) or Structure(s). Where the disconnecting means and overcurrent protection are located at the building(s) or structure(s) supplied by the conductors, a disconnecting means suitable for use as service equipment and grounded in accordance with the requirements of Section 250-24 is installed at the distribution point, the conductors are sized in accordance with Article 225, installed in accordance with the requirements of Parts B and C of Article 220, and the conditions in either (1) or (2) are met:
(1) The grounded conductor shall serve as the equipment grounding conductor for the building(s) or structure(s) and the service equipment at the building(s) or structure(s) shall be grounded in accordance with the requirements Section 250-24.
(2) A separate equipment grounding conductor is run with the supply conductors to the building(s) or structure(s).
a. all building(s) and structure(s) supplied from the distribution point are under single management.
b. The equipment grounding conductor is of the same size as the largest supply conductor, if of the same material, or is adjusted in size in accordance with the equivalent size columns of Table 250-122 of different materials.
c. The equipment grounding conductor is bonded to the grounded circuit conductor at the disconnecting means enclosure at the distribution point or at the source of a separately derived system.
d. A grounding electrode system is provided in accordance with part C of Article 250 and connected to the equipment grounding conductor at the building(s) or structure(s) disconnecting means.
(b) Disconnecting Means and Overcurrent Protection at Distribution Point. Where the disconnecting means and overcurrent protection for each set of feeder conductors is located at the distribution point, feeders to building(s) or structure(s) shall meet the requirements of Section 250-32 and Article 225, Part B.
(c) Distribution Point. An ~~centrally located~~ electrical supply point ~~structure~~ from which services, laterals, or feeders to agricultural building(s) or structure(s) and other buildings, including the associated farm dwelling, are normally supplied.
SUBSTANTIATION: The section as written in the 1999 NEC is difficult to read and understand. The suggested change arranges the requirements in an order that is easier to understand. Some new language was added and is underlined. Some of the sections were reworded, but not underlined but are believed to be of the same intent. There is no actual change of intent in the proposal, but some new references were added to make the meaning clear. The definition of distribution point was altered because it may not necessarily be a pole and it may not be centrally located.
PANEL ACTION: Accept in Principle.
See Proposals 19-18a and 19-21.
PANEL STATEMENT: Submitter's concerns regarding distribution point, services, and disconnecting means are covered in Proposal 19-18a and Pproposal 19-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #4247)

19- 24 - (547-8): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Identify the definition of "distribution point" as (d) and revise (c) to read as follows:
(c) Disconnecting Means Without Overcurrent Protection at the Distribution Point. Where a service disconnecting means is located at the distribution point, overcurrent protection shall be permitted to be omitted for the feeder(s) originating at that point provided all the following conditions are met:
(1) Single Management. All buildings and premises wiring shall be under single management.
(2) Disconnecting Means. The disconnecting means at the distribution point shall simultaneously disconnect all ungrounded conductors it controls, and it shall be approved as suitable to disconnect the load served at the system voltage. It shall be permitted to be accessible by portable means. Where it is not readily accessible, it shall be capable of operation from a readily accessible point.
(3) Wiring Methods. The feeder conductors shall be wired as service conductors in accordance with the applicable requirements of Parts A, B, C, and D of Article 230.
(4) Building Disconnects and Overcurrent Protection. The feeder(s) running to each building served shall terminate in one or more building disconnecting means meeting the requirements of Part B of Article 225. The feeder(s) shall have overload protection sized and located in accordance with the requirements in Section 230-90 and 230-91 for service conductors.
(5) System Grounding. The grounded conductor of the system shall be grounded at the distribution point. It shall be connected to a grounding electrode through a grounding electrode conductor in accordance with the requirements of Part C of Article 250. The grounded circuit conductor shall not be connected to a grounding electrode or to any equipment grounding conductor on the load side of the distribution point.
(6) Equipment Grounding. An equipment grounding conductor shall be run with each feeder. It shall be of the same size as the largest feeder conductor, if of the same material, or adjusted in size in accordance with the equivalent size columns of Table 250-122 if of different materials. The equipment grounding conductors shall be bonded to the grounded circuit conductor at the distribution point, or at the source of a separately derived system.
(7) Building Electrodes. A grounding electrode system meeting the requirements of Part C of Article 250 shall be provided at each building. It shall be connected to the equipment grounding conductor running with the feeder conductors to the building.
Exception to (5), (6), and (7) above: The grounded circuit conductor shall be permitted to be connected to the building disconnecting means and to the grounding electrode system of that building where all the requirements of Section 250-32(b)(2) are met.
SUBSTANTIATION: These systems use utility-style pole-top switches that aren't being listed as suitable for service equipment and that are unlikely to be so listed in the immediate future. Nevertheless the 1999 NEC has changed "service disconnecting means" to "disconnecting means suitable for use as service equipment." This proposal allows jurisdictional approval instead as a transition period until listed equipment becomes generally available. In addition, the 1999 NEC rewrite fails to adequately address the fact that this provision is intended to amend Section 230-91(a). This provision is unique in the NEC, and recognizes feeders that have no overcurrent protection. This needs to be carefully clarified. This proposal preserves the intent of the 1999 NEC rewrite, while providing clear editorial guidance as to what the system is supposed to be and how it is to be connected. In addition, the NEC fails to provide language that recognizes that these feeder conductors are equivalent to service conductors in hazard, since they are unprotected; this proposal addresses that issue.
This proposal also changes the 1999 NEC provision, far-reaching and unsubstantiated, that will now require that if one agricultural building makes use of this wiring procedure, then all fed from the same distribution point must do so, including the farmhouse. In discussions with some panel members, it appears that this was inadvertent and unintended. If enforced as written, it would probably change the wiring procedure for the power supply to almost any farmhouse from the present three-wire custom.
Separating the distribution point definition out as its own subsection is an editorial change to clarify that it is not part of Section 547-8(c). The intent is that it apply to the entire section.
PANEL ACTION: Accept in Principle.
See Proposals 19-18a and 19-21.

PANEL STATEMENT: Submitter's concerns regarding services and disconnecting means are covered in Proposal 19-18a and Proposal 19-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #936)

19- 25 - (547-8, Distribution Point): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Service~~s equipment,~~ Separately Derived Systems, Feeders, Branch Circuits, Disconnecting Means, and Grounding. Where one or more agricultural buildings are supplied from a distribution point, the disconnecting means and grounding of services and feeders shall comply with (a), (b), or (c).
(a) Disconnecting Means and Overcurrent Device(s) at a Building(s). Where the ~~disconnecting means and overcurrent protection are~~ service equipment is located at the building served ~~load end of the service conductors,~~ service ~~equipment~~ grounding shall meet the requirements of Section 250-24. Where the disconnecting means for feeder or branch circuit supply conductors is located at the building served grounding shall meet the requirements of Section 250-32. A disconnecting means for each circuit shall also be installed at the distribution point where two or more buildings are supplied from that distribution point.
(b) Disconnecting Means and Overcurrent Protection at Distribution Point. Where the disconnecting means ~~and overcurrent protection~~ for a feeder(s) or a branch circuit(s) is ~~are~~ located at the distribution point the feeder(s) and branch circuit(s) to buildings shall meet the requirements of Section 250-32 and Article 225, Part B.
(c) No change.
(d) Definition. Distribution Point. For the purposes of this section ~~A.~~ a distribution point is a centrifically located electrical supply structure from which service~~s, or~~ feeder~~s~~, or branch circuit conductors to agricultural buildings covered in this article ~~and other buildings, including the associated farm dwelling,~~ are normally supplied, and that may also supply other buildings, including the associated farm dwelling.
SUBSTANTIATION: Editorial. Branch circuits should be noted as they may supply buildings.
"Service equipment" in (a) is disconnecting means and overcurrent devices and is always at the load end of service conductors since conductors "downstream" from this point are not service conductors. Overcurrent protection at the load end is overload protection. All portions of a service should comply with Section 250-24, not just service equipment, and grounding requirements for feeders and branch circuits should be included. A disconnecting means is specified for each circuit (at the distribution point) since if only one building is supplied by two or more circuits as permitted by Sections 230-2(a) and 225-30(a) no disconnect is required, but if one feeder supplies more than one building a disconnect is required.
In (b) the disconnecting means is clarified as applying to a feeder or branch circuit and omits the overcurrent protection reference since the overcurrent protection is normally at the point of supply, except under some tap rules.
The "definition" of distribution point is revised to include branch circuits and specifically limit it to agricultural buildings covered in this article.
PANEL ACTION: Accept in Principle.
See Proposals 19-18a and 19-21.
PANEL STATEMENT: Submitter's concerns regarding distribution point, services, and disconnecting means are covered in Proposal 19-18a and Proposal 19-21.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #4377)

19- 26 - (547-8(a)): Accept in Principle
SUBMITTER: Donald Offerdahl, Bismarck, ND
RECOMMENDATION: Revise text to read as follows:
"...a discount means shall be permitted ~~also~~ to be installed at the distribution point when two or more buildings are supplied from that distribution point."
SUBSTANTIATION: Most electrical utility companies generally provide disconnects for their rural customer. Being exempted from this standard equipment does not have suitable for use as service equipment rating. Thus resulting in duplication of disconnects. Inserting the words "shall be permitted" will allow local jurisdictions to cover the situation as need arises.
PANEL ACTION: Accept in Principle.
See action on Proposal 19-18a.
PANEL STATEMENT: The submitter's concern regarding series disconnects are covered in Proposal 19-18a. "discount" meant "disconnect" in the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #CP1901)

19- 26a - (547-9): Accept
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBMITTER: CMP 19
RECOMMENDATION: Revise text to read:
547-9 Equipotential Planes and Bonding of Equipotential Planes.
(A) Buildings Requiring Equipotential Planes. Equipotential planes shall be installed in concrete floors of livestock confinement buildings that contain metal equipment accessible to livestock that is likely to become energized.
(B) Areas Requiring Equipotential Planes. Outdoor dirt and concrete surface confinement areas such as feedlots, and indoor or outdoor dirt surface areas such as horse stalls and feedlots shall have equipotential planes installed around metallic equipment that is accessible to animals and likely to become energized. The equipotential plane shall encompass the area around the equipment were the animal will stand while accessing the equipment.
(C) Bonding. Equipotential planes shall be bonded to the building or structure electrical grounding system. The bonding conductor shall be copper, insulated, covered or bare, and not smaller than 8 AWG. The means of bonding to wire mesh or conductive elements shall be by pressure connectors or clamps of brass, copper, copper alloy, or an equally substantial approved means.
Slatted floors that are supported by structures that are a part of an equipotential plane shall not require bonding.
FPN No. 1: Methods to establish equipotential planes are described in Equipotential Planes in Animal Containment Areas, American Society of Agricultural Engineers (ASAE) EP473-1997.
FPN No. 2: Low grounding electrode system resistances may reduce potential differences in livestock facilities.
SUBSTANTIATION: This Code Panel proposal is a combination of existing requirements and proposals 19-27, 19-30, and 19-31. The requirements for equipotential planes has been reorganized to remove exceptions and clarify the area where equipotential planes are necessary. Bonding requirements for equipotential planes were moved to an identified section. The conditional language for voltage gradients was completely removed. See supporting data submitted for proposal 19-31.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8
COMMENT ON AFFIRMATIVE:
MCCULLOUGH: Add the following sentence directly under the title and before (A):
For the purposes of this section, the term livestock does not include poultry.
This is language from the definition of an equipotential plane what was added for the 1999 cycle to indicate that the requirements for an equipotential plane were not applicable to poultry areas. The Panel Action on Proposal 19-28 moved the definition to 547-2 and modified the language to state "for the purposes of this article livestock does not include poultry." I believe that we did not intend to exempt poultry areas from the requirements of this entire article. Refer to 547-1(A) and (B)(1), poultry areas are part of the scope of this article. See also my comment on Proposal 19-28.

(Log #4248)

19- 27 - (547-9): Accept in Principle in Part

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

547-9. Bonding and Equipotential Plane.

(a) Definition of Equipotential Plane. An area accessible to livestock where a wire mesh or other conductive elements are embedded in concrete, are bonded to all metal structures and fixed nonelectrical metal equipment that may become energized and are connected to the electrical grounding system to prevent a difference in voltage from developing within the plane. For this section, livestock does not include poultry.

(b) General. Wire mesh or other conductive elements shall be installed in the concrete floor of livestock confinement areas and be bonded to the building grounding electrode system to provide an equipotential plane. ~~that may have voltage gradient ramps at entrances and exits that are traversed daily by the same livestock~~. The bonding conductor shall be copper, insulated, covered or bare, and not smaller than No. 8. The means of bonding to wire mesh or conductive elements shall be by pressure connectors or clamps of brass, copper, copper alloy, or an equally substantial approved means.

Exception No. 1: An equipotential plane shall not be required where there is no electric service to the building nor metal equipment accessible to livestock that is likely to become energized.

Exception No. 2: Slatted floors that are supported by structures that are a part of an equipotential plane shall not be required to be bonded.

(c) Voltage Gradient Ramps. Where voltage gradients at entrances and exits that are traversed daily by the same livestock exceed 1 volt per foot at the edge of an equipotential plane, a voltage gradient ramp shall be installed.

FPN No. 1: A natural voltage gradient exists at the edge of an equipotential plane. ~~Typically, voltage gradients exceeding 1 volt per foot at the edge of the equipotential plane will require a voltage gradient ramp.~~

FPN No. 2: Methods to establish equipotential planes and voltage gradient ramps are described in Equipotential Planes in Animal Containment Areas, American Society of Agricultural Engineers (ASAE) EP473-1997.

FPN No. 3: Low grounding electrode system resistances may reduce potential differences in livestock facilities.

(d) Receptacles. All 125-volt, single-phase, 15- and 20- ampere general purpose receptacles in areas having an equipotential plane shall have ground-fault circuit-interrupter protection for personnel.

SUBSTANTIATION: This proposal addresses major style manual violations in the 1999 NEC. This part of the Code has a "rule" in code language that uses the word "may" and not in its accepted usage of a discretionary finding on the part of an AHJ. Then a fine print note following uses mandatory language ("require") which also isn't permitted. When we put the FPN with mandatory language together with the rule with permissive language, I suppose we are left with what might be a requirement.

The proposal addresses these style issues. The submitter makes no claim as to technical authority over the substance of these rules, but the panel may find this format constructive in terms of proper editorial formatting as it continues to wrestle with the technical questions. If there is to be an enforceable requirement for voltage gradient ramps, this editorial structure will accomplish that goal.

PANEL ACTION: Accept in Principle in Part.

The panel accepts the deletion of (b) of the recommendation. The added text in (c) is rejected by the panel. The entire FPN 1 is deleted.

PANEL STATEMENT: See panel action in Proposal 19-26a. This panel action covers parts of the recommendation not accepted by the panel.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #3724)

19- 28 - (547-9(a)): Accept

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBMITTER: Barry Bauman, Alliante Energy/Rep. Alliant Energy/Rep. American Society of Agricultural Engineers

RECOMMENDATION: Move "547-9(a)" to a point immediately after "547-1" and revise as follows:

547-2 Definition.

~~(a) Definition of~~ Equipotential Plane. An area accessible to livestock where a wire mesh or other conductive elements are embedded in concrete, are bonded to all metal structures and fixed nonelectrical metal equipment that may become energized and are connected to the electrical grounding system to prevent a difference in voltage from developing within the plane. For this ~~section~~ article, livestock does not include poultry.

Renumber subsequent sections.

SUBSTANTIATION: The Style Manual calls for definition that apply to a specific article to be located in the second section of that article. The updated language results in a clearer understanding of 547-8.

PANEL ACTION: Accept.

PANEL STATEMENT: There will be editorial changes in the recommendation made to conform to the requirements of the style manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 7

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

BAUMAN: The last sentence "For this section, livestock does not include poultry." should not be moved to the definitions section. It should remain in 547-8. All sections of 547 except 547-8 pertain to buildings containing poultry. Moving this sentence to the definitions section even though it is the Equipotential Plane Definition may be interpreted to be in conflict with the scope of 547.

COMMENT ON AFFIRMATIVE:

MCCULLOUGH: Panel Action should be changed to Accept in Principle and in addition to the editorial revisions in the first sentence, the last sentence dealing with poultry should be deleted. This sentence would then be added to 547-9. See also my comment on Proposal 19-26a.

(Log #1088)

19- 29 - (547-9(b)): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change "No. 8" to "8 AWG".

SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

PANEL STATEMENT: The NEC Style of Manual does not specify the language used one way or another. The NFPA Manual of Style seems to prefer 10 AWG. Product standards use 10 AWG or 10 AWG 110-6 says that the conductor sizes are expressed in AWG or in circular mils so the AWG is implied The panel recognizes that the TCC may desire to take a different action to be consistent with the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #3720)

19- 30 - (547-9(b)): Accept in Principle

SUBMITTER: Barry Bauman, Alliante Energy/Rep. Alliant Energy/Rep. American Society of Agricultural Engineers

RECOMMENDATION: Revise text to read as follows:

(b) General. Wire mesh or other conductive elements shall be installed in the concrete floor of livestock confinement areas and be bonded to the building grounding electrode system to provide an equipotential plane ~~that may have voltage gradient ramps as entrances and exists that are traversed daily by the same livestock~~. The bonding conductor shall be copper, insulated, covered or bare, and not smaller than No. 8. The means of bonding to wire mesh or conductive elements shall be by pressure connectors or clamps of brass, copper, copper alloy, or an equally substantial approved means. In dirt confinement areas such as feedlots and horse stalls, equipotential planes shall only be required around electrical equipment that is accessible to animals, such as electrically heated waterers, or metal equipment that is likely to become energized.

Exception No. 1: An equipotential plane shall not be required where ~~there is no electric service to the building nor~~ metal

equipment accessible to livestock ~~that~~ is not likely to become energized.

Exception No. 2: Slatted floors that are supported by structures that are a part of an equipotential plane shall not ~~be required to be bonded.~~ require bonding.

FPN No. 1: Methods to establish equipotential planes and voltage gradient ramps are described in Equipotential Planes in Animal Containment Areas, American Society of Agricultural Engineers (ASAE) ~~FPN No. 1:~~ EP473-1997. A natural voltage gradient exists at the edge of an equipotential plane. ~~Typically, voltage gradients exceeding 1 volt per foot at the edge of the equipotential plane will require a voltage gradient ramp. FPN No. 2: Methods to establish equipotential planes and voltage gradient ramps are described in Equipotential Planes in Animal Containment Areas, American Society of Agricultural Engineers (ASAE) EP473-1997.~~

FPN No. ~~3.~~ 2: Low grounding electrode system resistance's may reduce potential differences in livestock facilities.

SUBSTANTIATION: Cattle feeders have asked for guidance if dirt feedlots with concrete at the feed bunks require equipotential planes. The change to only require equipotential planes in the areas containing electrical equipment is proposed to clarify the intent for such applications.

Exception No. 1 is modified to clarify the intent as in the present text, "nor" could mean both conditions are required.

Change FPN No. 2 to FPN No. 1 and add the cautionary note about the possible need for gradient ramps.

Change FPN No. 3 to FPN No. 1.

FPN No. 1 is deleted because it contains mandatory language and it coincides with the change in the proposed text.

PANEL ACTION: Accept in Principle.

See Proposal 19-26a. This action addresses this recommendation.

PANEL STATEMENT: See Proposal 19-26a. The requirements for equipotential planes has been reorganized to remove exceptions and clarify the area where equipotential planes are necessary. Bonding requirements for equipotential planes were moved to an identified section. The conditional language for voltage gradients was completely removed. See supporting data submitted for Proposal 19-31.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #4124)

19- 31 - (547-9(b)): Accept in Principle

SUBMITTER: Robert Fick, Michigan State University

RECOMMENDATION: Rewrite (b) of the section and separate the requirements for an equipotential plane and gradient transition from the methods of installation. Put the requirements or an equipotential plane in 547-9(b) and the requirements for a gradient transition in 547-9(c). Renumber the present 547-9(c) as paragraph (d). The exceptions are incorporated into the new sections. Fine print note No. 1: is incorporated into the new sections. Add new material underlined that addresses shortcomings in the present working so the sections will read as follows:

547-9. Equipotential Planes and Transitions.

(a) [no change in definition]

(b) Wire mesh or other conductive elements shall be installed in the concrete floor of livestock confinement areas where:

(1) the building or area is served with electric power and there is metal equipment accessible to livestock that is likely to become energized.

(2) the floor is not constructed of slats that are supported by a structure that is a part of an equipotential plane.

(c) A voltage gradient transition shall be installed where livestock traverse daily:

(1) the edge of concrete floors.

(2) entrances to buildings.

(3) areas where the exposure to the metal gradient elements does not create a hazard greater than the low level voltage such as with a concrete aisle and earth floor stalls.

(d) [former (c) with no changes]

547-10. Equipotential Plane Bonding and Transitions.

(a) Equipotential Plane Bonding. The equipotential plane shall be bonded to the building grounding electrode system with a copper conductor, insulated, covered or bare, and not smaller than No. 8. The means of bonding to wire mesh or conductive elements shall be by pressure connectors or clamps of brass, copper, copper alloy, or an equally substantial approved means. The bonding conductor shall be protected by suitable raceway as it emerges from the concrete.

(b) Transition Installation. The equipotential plane transition shall be provided by one of the following means when the gradient is more than one volt per linear foot measured at the edge of the equipotential plane: (1) sloping the wire mesh or other conductive element to a greater depth at the edge of the concrete so the mesh or metal element is not less than 12 in. below grade, (2) driving ground rods into the earth at an angle of no more than 45 degrees from the horizontal and spaced not more than 18 in. center to center, or (3) by some other effective means. The voltage gradient may be determined by measuring under expected loading conditions.

SUBSTANTIATION: The section is rewritten to eliminate the exceptions and include all rules in one comprehensive statement. The rules for installation of gradient ramps was not specific and left to wide interpretation by persons with little experience in such matters. The changes are the result of dealing with equipotential plane issues in several states and based upon research conducted at Michigan State University on equipotential planes and transitions.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle.

See Panel action on Proposal 19-26a. This action addresses the principle of this recommendation.

PANEL STATEMENT: See Panel statement on Proposal 19-26a. The requirements for equipotential planes has been reorganized to remove exceptions and clarify the area where equipotential planes are necessary. Bonding requirements for equipotential planes were moved to an identified section. The conditional language for voltage gradients was completely removed. See supporting data submitted for Proposal 19-31.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #2450)

19- 32 - (547-9(c)): Reject

SUBMITTER: John A. Hoffman, Centre Region Code Admin.

RECOMMENDATION: Revise as follows:

(c) Receptacles. All receptacles in areas where livestock is confined shall have ground fault circuit interrupter protection for personnel.

SUBSTANTIATION: This change affects installation of receptacles in areas of agricultural buildings which are typically wet locations. The risk of shock or electrocution exists without regard to the equipotential plane. The proposal provides an equal degree of safety to that required by 305-6(a) and 305-6(b).

PANEL ACTION: Reject.

PANEL STATEMENT: See Panel action on Proposal 19-34. GFCI protection for all receptacles is not the intent of the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #3053)

19- 33 - (547-9(c)): Reject

SUBMITTER: Dwayne A. Gunnels, Clio, MI

RECOMMENDATION: Delete this paragraph.

SUBSTANTIATION: In agricultural buildings most times, especially around livestock, there are increased amounts of moisture that would cause nuisance tripping which could lead to tampering with the receptacle causing an unsafe condition.

PANEL ACTION: Reject.

PANEL STATEMENT: GFCI is required only on general purpose outlets, not on dedicated use outlets where nuisance tripping would cause a problem.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

Log #3721)

19- 34 - (547-9(c)): Accept in Principle

Note: The Technical Correlating Committee understands that the action on this Proposal modifies the action on Proposal 19-26a.

SUBMITTER: Barry Bauman, Alliante Energy/Rep. Alliant Energy/Rep. American Society of Agricultural Engineers

RECOMMENDATION: Move 547-9(c) to 547-4(g) and revise as follows:

(~~c~~ g) Receptacles. All 125-volt, single-phase, 15- and 20-ampere general purpose receptacles installed in the locations specified belo

~~in areas having an equipotential plane~~ shall have ground-fault circuit-interrupter protection for personnel.
(1) In areas having an equipotential plane.
(2) Outdoors.
(3) Wet areas.
SUBSTANTIATION: This will provide the same level of personnel protection outdoors and in wet areas of the farmstead that is now required in equipotential planes and in the farm dwelling.
PANEL ACTION: Accept in Principle.
Change "wet areas" to "wet locations" under (3).
PANEL STATEMENT: The change would keep Code terminology consistent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #4125)

19- 35 - (547-9(c)): Accept in Principle
SUBMITTER: Robert Fick, Michigan State University
RECOMMENDATION: Move 547-9(c) to 547-11.
SUBSTANTIATION: The requirement is located in the wrong place and not easily found. It needs its own identify. See my other proposal dealing with 547-9(c).
PANEL ACTION: Accept in Principle.
See panel action on Proposal 19-34. This action addresses the principle of this recommendation.
PANEL STATEMENT: Text was moved to the appropriate location.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #4126)

19- 36 - (547-9(c)): Reject
SUBMITTER: Jonathan R. Althouse, Michigan State University
RECOMMENDATION: Delete the entire paragraph.
SUBSTANTIATION: With the special grounding conductors of a copper equipment grounding conductor in 547-4(f) safety of equipment at receptacles is covered. No accident statistics were presented when the section was first introduced that justified steps beyond the copper equipment grounding conductor required. The high humidity conditions in many agricultural areas result in nuisance tripping to the point that circuits are being tampered to keep them working. This introduces an even greater safety hazard. If grounding is proper, the requirement is not needed.
PANEL ACTION: Reject.
PANEL STATEMENT: GFCI is required only on general purpose outlets, not on dedicated use outlets where nuisance tripping would cause a problem.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

ARTICLE 550 — MOBILE HOMES, MANUFACTURED HOMES, AND MOBILE HOME PARKS

(Log #441)

19- 37 - (550): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee directs that the Panel clarify the Panel action on this Proposal as expressed in the Affirmative Comment and to clarify in 550-13(d)(9) if the inclusion of the word "or" between "lighting" and "fixture" in the third sentence was the Panel's intent. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise Article 550 to read as follows:
ARTICLE 550 -- Mobile Homes, Manufactured Homes, and Mobile Home Parks
I General
550.1 Scope. The provisions of this article cover the electrical conductors and equipment installed within or on mobile and manufactured homes, the conductors that connect mobile and manufactured homes to a supply of electricity, and the installation of electrical wiring, fixtures, equipment, and appurtenances related to electrical installations within a mobile home park up to the mobile home service-entrance conductors or, if none, the mobile home service equipment.
FPN: For additional information on manufactured housing see *Standard for Manufactured Housing*, NFPA 501-2000 and Part 3280, Manufactured Home Construction and Safety Standards of the federal Department of Housing and Urban Development.
550.2 Definitions.
Appliance, Fixed. An appliance that is fastened or otherwise secured at a specific location.
Appliance, Portable. An appliance that is actually moved or can easily be moved from one place to another in normal use.
FPN: For the purpose of this article, the following major appliances, other than built-in, are considered portable if cord connected: refrigerators, range equipment, clothes washers, dishwashers without booster heaters, or other similar appliances.
Appliance, Stationary. An appliance that is not easily moved from one place to another in normal use.
Distribution Panelboard. See definition of panelboard in Article 100.
Feeder Assembly. The overhead or under-chassis feeder conductors, including the grounding conductor, together with the necessary fittings and equipment or a power-supply cord listed for mobile home use, designed for the purpose of delivering energy from the source of electrical supply to the distribution panelboard within the mobile home.
Laundry Area. An area containing or designed to contain a laundry tray, clothes washer, or a clothes dryer.
Manufactured Home. A factory-assembled structure or structures that bears a label identifying it as a manufactured home that is transportable in one or more sections, that is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation where connected to the required utilities, and that includes the plumbing, heating, air-conditioning, and electrical systems contained therein.
For the purpose of this Code and unless otherwise indicated, the term mobile home includes manufactured homes.
FPN No. 1: See the applicable building code for definition of the term permanent foundation.
FPN No. 2: See Part 3280, Manufactured Home Construction and Safety Standards, of the federal Department of Housing and Urban Development for additional information on the definition.
Mobile Home. A factory-assembled structure or structures transportable in one or more sections that is built on a permanent chassis and designed to be used as a dwelling without a permanent foundation where connected to the required utilities, and includes the plumbing, heating, air-conditioning, and electric systems contained therein.
For the purpose of this Code and unless otherwise indicated, the term mobile home includes manufactured homes.
Mobile Home Accessory Building or Structure. Any awning, cabana, ramada, storage cabinet, carport, fence, windbreak, or porch established for the use of the occupant of the mobile home on a mobile home lot.
Mobile Home Lot. A designated portion of a mobile home park designed for the accommodation of one mobile home and its accessory buildings or structures for the exclusive use of its occupants.
Mobile Home Park. A contiguous parcel of land that is used for the accommodation of occupied mobile homes.
Mobile Home Service Equipment. The equipment containing the disconnecting means, overcurrent protective devices, and receptacles or other means for connecting a mobile home feeder assembly.
Park Electrical Wiring Systems. All of the electrical wiring, fixtures, equipment, and appurtenances related to electrical installations within a mobile home park, including the mobile home service equipment.
550.3 Other Articles. Wherever the requirements of other articles of this Code and Article 550 differ, the requirements of Article 550 shall apply.
550.4 General Requirements.
(A) Mobile Home Not Intended as a Dwelling Unit. A mobile home not intended as a dwelling unit, for example, those equipped for sleeping purposes only, contractor's on-site offices, construction job dormitories, mobile studio dressing rooms, banks, clinics, mobile stores, or intended for the display or demonstration of merchandise or machinery, shall not be required to meet the provisions of this article pertaining to the number or capacity of circuits required. It shall, however, meet all other applicable requirements of this article if provided with an electrical installation intended to be energized from a 120-volt or 120/240-volt ac power supply system. Where different voltage is required by either design or available power supply system, adjustment shall be

made in accordance with other articles and sections for the voltage used.

(B) In Other than Mobile Home Parks. Mobile homes installed in other than mobile home parks shall comply with the provisions of this article.

(C) Connection to Wiring System. The provisions of this article apply to mobile homes intended for connection to a wiring system rated 120/240 volts, nominal, 3-wire ac, with grounded neutral.

(D) Listed or Labeled. All electrical materials, devices, appliances, fittings, and other equipment shall be listed or labeled by a qualified testing agency and shall be connected in an approved manner when installed.

II Mobile and Manufactured Homes

550.~~5~~ 10 Power Supply.

(A) Feeder. The power supply to the mobile home shall be a feeder assembly consisting of not more than one listed 50-ampere mobile home power-supply cord with an integrally molded or securely attached plug cap, or a permanently installed feeder.

Exception No. 1: A mobile home that is factory equipped with gas or oil fired central heating equipment and cooking appliances shall be permitted to be provided with a listed mobile home power-supply cord rated 40 amperes.

Exception No. 2: Manufactured homes constructed in accordance with Section 550.~~23~~32(B).

(B) Power-Supply Cord. If the mobile home has a power-supply cord, it shall be permanently attached to the distribution panelboard or to a junction box permanently connected to the distribution panelboard, with the free end terminating in an attachment plug cap.

Cords with adapters and pigtail ends, extension cords, and similar items shall not be attached to, or shipped with, a mobile home.

A suitable clamp or the equivalent shall be provided at the distribution panelboard knockout to afford strain relief for the cord to prevent strain from being transmitted to the terminals when the power-supply cord is handled in its intended manner.

The cord shall be a listed type with four conductors, one of which shall be identified by a continuous green color or a continuous green color with one or more yellow stripes for use as the grounding conductor.

(C) Attachment Plug Cap. The attachment plug cap shall be a 3-pole, 4-wire, grounding type, rated 50 amperes, 125/250 volts with a configuration as shown in Figure 550.~~5~~ 10(c) and intended for use with the 50-ampere, 125/250-volt receptacle configuration shown in Figure 550.~~5~~ 10(c). It shall be listed, by itself or as part of a power-supply cord assembly, for the purpose, and shall be molded to or installed on the flexible cord so that it is secured tightly to the cord at the point where the cord enters the attachment plug cap. If a right-angle cap is used, the configuration shall be oriented so that the grounding member is farthest from the cord.

FPN: Complete details of the 50-ampere plug and receptacle configuration can be found in the National Electrical Manufacturers Association Standard for Dimensions of Attachment Plugs and Receptacles, ANSI/NEMA WD6-1989, Figure 14-50.

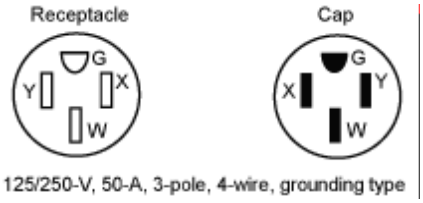


Figure 550.~~5~~ 10(c) 50-ampere, 125/250-volt receptacle and attachment plug cap configurations, 3-pole, 4-wire, grounding-types, used for mobile home supply cords and mobile home parks.

(D) Overall Length of a Power-Supply Cord. The overall length of a power-supply cord, measured from the end of the cord, including bared leads, to the face of the attachment plug cap shall not be less than 21 ft (6.4 m) and shall not exceed 36 1/2 ft (11.13 m). The length of the cord from the face of the attachment plug cap to the point where the cord enters the mobile home shall not be less than 20 ft (6.1 m).

(E) Marking. The power-supply cord shall bear the following marking:

FOR USE WITH MOBILE HOMES — 40 AMPERES.

or

FOR USE WITH MOBILE HOMES — 50 AMPERES.

(F) Point of Entrance. The point of entrance of the feeder assembly to the mobile home shall be in the exterior wall, floor, or roof.

(G) Protected. Where the cord passes through walls or floors, it shall be protected by means of conduits and bushings or equivalent. The cord shall be permitted to be installed within the mobile home walls, provided a continuous raceway having a maximum size of 1 1/4 in. (31.8 mm) is installed from the branch-circuit panelboard to the underside of the mobile home floor.

(H) Protection Against Corrosion and Mechanical Damage. Permanent provisions shall be made for the protection of the attachment plug cap of the power-supply cord and any connector cord assembly or receptacle against corrosion and mechanical damage if such devices are in an exterior location while the mobile home is in transit.

(I) Mast Weatherhead or Raceway. Where the calculated load exceeds 50 amperes or where a permanent feeder is used, the supply shall be by means of the following:

(1) One mast weatherhead installation, installed in accordance with Article 230, containing four continuous, insulated, color-coded feeder conductors, one of which shall be an equipment grounding conductor; or

(2) A metal raceway or rigid nonmetallic conduit from the disconnecting means in the mobile home to the underside of the mobile home, with provisions for the attachment to a suitable junction box or fitting to the raceway on the underside of the mobile home [with or without conductors as in Section 550.~~5~~ 10(I)(1)]. The manufacturer shall provide written installation instructions stating the proper feeder conductor sizes for the raceway and the size of the junction box to be used.

550.~~6~~ 11 Disconnecting Means and Branch-Circuit Protective Equipment.

The branch-circuit equipment shall be permitted to be combined with the disconnecting means as a single assembly. Such a combination shall be permitted to be designated as a distribution panelboard. If a fused distribution panelboard is used, the maximum fuse size for the mains shall be plainly marked with lettering at least 1/4 in. (6.4 mm) high and visible when fuses are changed.

Where plug fuses and fuseholders are used, they shall be tamper-resistant Type S, enclosed in dead-front fuse panelboards. Electrical distribution panelboards containing circuit breakers shall also be dead-front type.

FPN: See ~~Section~~ 110.22 concerning identification of each disconnecting means and each service, feeder, or branch circuit at the point where it originated and the type marking needed.

(A) Disconnecting Means. A single disconnecting means shall be provided in each mobile home consisting of a circuit breaker, or a switch and fuses and its accessories installed in a readily accessible location near the point of entrance of the supply cord or conductors into the mobile home. The main circuit breakers or fuses shall be plainly marked "Main." This equipment shall contain a solderless type of grounding connector or bar for the purposes of grounding, with sufficient terminals for all grounding conductors. The neutral bar termination of the grounded circuit conductors shall be insulated in accordance with Section 550.~~11~~ 16(A). The disconnecting equipment shall have a rating suitable for the connected load. The distribution equipment, either circuit breaker or fused type, shall be located a minimum of 24 in. (610 mm) from the bottom of such equipment to the floor level of the mobile home.

FPN: See Section 550.~~15~~ 20(B) for information on disconnecting means for branch circuits designed to energize heating or air-conditioning equipment, or both, located outside the mobile home, other than room air conditioners.

A distribution panelboard shall be rated not less than 50 amperes and employ a 2-pole circuit breaker rated 40 amperes for a 40-ampere supply cord, or 50 amperes for a 50-ampere supply cord. A distribution panelboard employing a disconnect switch and fuses shall be rated 60 amperes and shall employ a single 2-pole, 60-ampere fuseholder with 40- or 50-ampere main fuses for 40- or 50-ampere supply cords, respectively. The outside of the distribution panelboard shall be plainly marked with the fuse size.

The distribution panelboard shall ~~be located in an accessible location but shall not be located in a bathroom or a clothes closet.~~ not be located in a bathroom or any inaccessible location, but shall be permitted just inside a closet entry if the location is such that a clear space of 6 in. (152 mm) is maintained in front of the distribution panelboard and the distribution panelboard can be extended to its full open position (at least 90 degrees). A clear working space at least 30 in. (762 mm) wide and 30 in. (762 mm) in front of the distribution panelboard shall be provided. This

space shall extend from the floor to the top of the distribution panelboard.

(B) Branch-Circuit Protective Equipment. Branch-circuit distribution equipment shall be installed in each mobile home and shall include overcurrent protection for each branch circuit consisting of either circuit breakers or fuses.

The branch-circuit overcurrent devices shall be rated as follows:

(1) Not more than the circuit conductors; and

(2) Not more than 150 percent of the rating of a single appliance rated 13.3 amperes or more that is supplied by an individual branch circuit; but

(3) Not more than the overcurrent protection size and of the type marked on the air conditioner or other motor-operated appliance.

~~A 15-ampere multiple receptacle shall be permitted where connected to a 20-ampere laundry circuit.~~

(C) Two-Pole Circuit Breakers. Where circuit breakers are provided for branch-circuit protection, 240-volt circuits shall be protected by a 2-pole common or companion trip, or handle-tied paired circuit breakers.

(D) Electrical Nameplates. A metal nameplate on the outside adjacent to the feeder assembly entrance shall read:

THIS CONNECTION FOR 120/240-VOLT,
3-POLE, 4-WIRE, 60 HERTZ, _____ AMPERE
SUPPLY

The correct ampere rating shall be marked in the blank space.

Exception: For manufactured homes, the manufacturer shall provide in its written installation instructions the minimum ampere rating of the feeder assembly or, where provided, the service entrance conductors intended for connection to the manufactured home. The rating provided shall not be less than the minimum load calculated in accordance with 550.18.

550.~~7~~ 12 Branch Circuits.

The number of branch circuits required shall be determined in accordance with (a) through ~~(c).~~ (e).

(A) Lighting. Based on 3 volt-amperes/ft^2 (32.26 VA/m^2) times outside dimensions of the mobile home (coupler excluded) divided by 120 volts to determine the number of 15- or 20-ampere lighting area circuits, e.g.,

$$\frac{3 \times \text{length} \times \text{width}}{120 \times 15 \text{ (or } 20)} = \text{No. of 15- (or 20-) ampere circuits}$$

The lighting circuits shall be permitted to serve built-in gas ovens with electric service only for lights, clocks or timers, or listed cord-connected garbage disposal units.

(B) Small Appliances. ~~Small appliance branch circuits shall be installed in accordance with Section 210 52(b).~~ For the small appliance load in kitchens, pantries, dining rooms, and breakfast rooms, two or more 20-ampere appliance branch circuits, in addition to the number of branch circuits required by other parts of this section shall be provided for all receptacle outlets required by 550.13(D) in these rooms. Such circuits shall have no other outlets.

Exception No. 1: A receptacle installed solely for the electrical supply to and support of an electric clock in any of the rooms specified above.

Exception No. 2: Receptacles installed to provide power for supplemental equipment and lighting on gas-fired ranges, ovens, or counter-mounted cooking units

Countertop receptacle outlets installed in the kitchen shall be supplied by not less than two small appliance branch circuits, either or both of which shall be permitted to supply receptacle outlets in the kitchen and other rooms specified above.

(C) Laundry Area. Where a laundry area is provided, a 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s).

~~(c)~~ **(D) General Appliances.** (Including furnace, water heater, range, and central or room air conditioner, etc.) There shall be one or more circuits of adequate rating in accordance with the following.

~~FPN No. 1: For the laundry branch circuit, see Section 210-11(c)(2).~~

FPN ~~No. 2~~: For central air conditioning, see Article 440.

(1) Ampere rating of fixed appliances not over 50 percent of circuit rating if lighting outlets (receptacles, other than kitchen, dining area, and laundry, considered as lighting outlets) are on the same circuit.

(2) For fixed appliances on a circuit without lighting outlets, the sum of rated amperes shall not exceed the branch-circuit rating. Motor loads or other continuous duty loads shall not exceed 80 percent of the branch-circuit rating.

(3) The rating of a single cord- and plug-connected appliance on a circuit having no other outlets shall not exceed 80 percent of the circuit rating.

(4) The rating of a range branch circuit shall be based on the range demand as specified for ranges in ~~Section~~ 550.~~13~~ 18(B)(5).

(E) Bathrooms. Bathroom receptacle outlets shall be supplied by at least one 20-ampere branch circuit. Such circuits shall have no other outlets other than as provided for in 550.13(E)(2).

550.~~8~~ 13 Receptacle Outlets.

(A) Grounding-Type Receptacle Outlets. All receptacle outlets shall:

(1) ~~shall~~ B~~b~~e of grounding type.

(2) ~~shall~~ B~~b~~e installed according to ~~Section~~ 210.7.

(3) E~~e~~xcept where supplying specific appliances, ~~receptacles shall~~ be 15- or 20-ampere, 125-volt, either single or duplex, and ~~shall~~ accept parallel-blade attachment plugs.

(B) Ground-Fault Circuit Interrupters (GFCI). All ~~120~~ 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed outdoors or in compartments accessible from outside the unit, and in bathrooms, including receptacles in light fixtures, shall have ~~ground-fault circuit interrupter~~ GFCI protection for personnel. ~~Ground-fault circuit interrupter~~ GFCI protection for personnel shall be provided for receptacle outlets ~~located within 6 ft (1.83 m) of any lavatory or sink~~. serving countertops in kitchens, and receptacle outlets located within 6 ft (1.83 m) of a wet bar sink.

Exception: Receptacles installed for appliances in dedicated spaces, such as for dishwashers, disposals, refrigerators, freezers, and laundry equipment.

~~No receptacle shall be required in the area occupied by a toilet, shower, tub, or any combination thereof. If a receptacle is installed in such an area, it shall have ground-fault circuit-interrupter protection for personnel.~~

Feeders supplying branch circuits shall be permitted to be protected by a ground-fault circuit-interrupter in lieu of the provision for such interrupters specified herein.

(C) Cord-Connected Fixed Appliance. A grounding-type receptacle outlet shall be provided for each cord-connected fixed appliance installed.

~~(d) Required Receptacle Outlets. Receptacle outlets shall be provided in all rooms other than the bath, closet, and hall areas, and shall be installed so that no point along the floor line is more than 6 ft (1.83 m) measured horizontally from an outlet in that space. Countertops shall have receptacles located every 6 ft (1.83 m). The contiguous measurement of countertop and floor line shall be permitted where measured from the required receptacle in rooms requiring small appliance circuits. Receptacle outlets on small appliance circuits shall not be included in determining the spacing for receptacle outlets of other circuits.~~

~~Exception No. 1: Where the measured distance is interrupted by an interior doorway, sink, refrigerator, range, oven, or cooktop, an additional receptacle outlet shall be provided where the interrupted space is at least 2 ft (610 mm) wide at the floor line and at least 12 in. (305 mm) wide at the countertop.~~

~~Exception No. 2: Receptacles rendered not readily accessible by stationary appliances shall not be considered as the required outlets.~~

~~Exception No. 3: The distance along a floor line occupied by a door opened fully against that space shall not be required to be included in establishing the horizontal measurement if the door swing is limited to 90 degrees nominal by that wall space.~~

~~Exception No. 4: Receptacle requirements for bar-type counters and for fixed room dividers shall be permitted to be provided by a receptacle outlet in the wall at the nearest point where the counter or room divider attaches to the wall provided the following:~~

~~a. The divider does not exceed 8 ft (2.44 m) in length; and~~

~~b. The divider does not exceed 4 ft (1.22 m) in height; and~~

~~c. The divider is attached to a wall at one end only.~~

(D) Receptacle Outlets Required. Except in the bath, closet, and hall areas, receptacle outlets shall be installed at wall spaces 2 ft (610 mm) wide or more so that no point along the floor line is more than 6 ft (1.83 m) measured horizontally from an outlet in that space. In addition, a receptacle outlet shall be installed in the following locations:

(1) Over or adjacent to countertops in the kitchen [at least one on each side of the sink if countertops are on each side and are 12 in. (305 mm) or over in width].

(2) Adjacent to the refrigerator and freestanding gas-range space. A duplex receptacle shall be permitted to serve as the outlet for a countertop and a refrigerator.
(3) At countertop spaces for built-in vanities.
(4) At countertop spaces under wall-mounted cabinets.
(5) In the wall at the nearest point to where a bar-type counter attaches to the wall.
(6) In the wall at the nearest point to where a fixed room divider attaches to the wall
(7) In laundry areas within 6 ft (1.83 m) of the intended location of the laundry appliance(s).
(8) At least one receptacle outlet outdoors accessible at grade level and not more than 6 1/2 ft (1.98 m) above grade. A receptacle outlet located in a compartment accessible from the outside of the unit shall be considered an outdoor receptacle.
(9) At least one wall receptacle outlet shall be installed in bathrooms within 36 in. (914 mm) of the outside edge of the basin. The receptacle outlet shall be located on a wall that is adjacent to the basin location.

(E) Pipe Heating Cable(s) Outlet For the connection of pipe heating cable(s), a receptacle outlet shall be located on the underside of the unit as follows:
(1) Within 2 ft (610 mm) of the cold water inlet.
(2) Connected to an interior branch circuit, other than a small appliance branch circuit. It shall be permitted to utilize a bathroom receptacle circuit for this purpose.
(3) On a circuit where all of the outlets are on the load side of the ground-fault circuit-interrupter.
(4) This outlet shall not be considered as the receptacle required by 550.~~8~~13(D)(8).

~~(e) Outdoor Receptacle Outlets. At least one receptacle outlet shall be installed outdoors. A receptacle outlet located in a compartment accessible from the outside of the mobile home shall be considered an outdoor receptacle. Outdoor receptacle outlets shall be protected as required in Section 550 8(b).~~

(F) Receptacle Outlets Not Permitted. Receptacle outlets shall not be permitted in the following locations:
(1) Shower or Bathtub Space. Receptacle outlets shall not be installed in or within reach [30 in. (762 mm)] of a shower or bathtub space.
(2) Face-Up Position. A receptacle shall not be installed in a face-up position in any countertop.
(3) Receptacle outlets shall not be installed above electric baseboard heaters, unless provided for in the listing or manufacturers instructions.

(G) Receptacle Outlets not Required. Receptacle outlets shall not be located in the following locations:
(1) In the wall space occupied by built-in kitchen or wardrobe cabinets.
(2) In the wall space behind doors that can be opened fully against a wall surface.
(3) In room dividers of the lattice type that are less than 8 ft (2.44 m) long, not solid, and within 6 in. (152 mm) of the floor.
(4) In the wall space afforded by bar-type counters.

~~(g) Pipe Heating Cable Outlet. Where a pipe heating cable outlet is installed, the outlet shall be as follows:~~
~~1. Located within 2 ft (610 mm) of the cold water inlet.~~
~~2. Connected to an interior branch circuit, other than a small appliance branch circuit. It shall be permitted to utilize a bathroom receptacle circuit for this purpose.~~
~~3. On a circuit where all of the outlets are on the load side of the ground fault circuit interrupter protection for personnel.~~
~~4. Mounted on the underside of the mobile home and shall not be considered to be the outdoor receptacle outlet required in Section 550 8(e).~~

550.~~9~~14 Fixtures and Appliances.

(A) Fasten Appliances in Transit. Means shall be provided to securely fasten appliances when the mobile home is in transit. (See ~~Section~~ 550.~~11~~ 16 for provisions on grounding.)

(B) Accessibility. Every appliance shall be accessible for inspection, service, repair, or replacement without removal of permanent construction.

~~(c) Pendants. Pendant-type fixtures or pendant cords shall be listed and identified for the interconnection of building components.~~

(C) Pendants. Listed pendant-type fixtures or pendant cords shall be permitted.

(D) Bathtub and Shower Fixtures. Where a lighting fixture is installed over a bathtub or in a shower stall, it shall be of the enclosed and gasketed type listed for wet locations.

~~(e) Location of Switches. The switch for shower lighting fixtures and exhaust fans located over a tub or in a shower stall shall be located outside the tub or shower space.~~

550.~~10~~ 15 Wiring Methods and Materials.

Except as specifically limited in this section, the wiring methods and materials included in this Code shall be used in mobile homes. Aluminum conductors, aluminum alloy conductors, and aluminum core conductors such as copper-clad aluminum shall not be acceptable for use as branch-circuit wiring.

(A) Nonmetallic Boxes. Nonmetallic boxes shall be permitted only with nonmetallic cable or nonmetallic raceways.

(B) Nonmetallic Cable Protection. Nonmetallic cable located 15 in. (381 mm) or less above the floor, if exposed, shall be protected from physical damage by covering boards, guard strips, or raceways. Cable likely to be damaged by stowage shall be so protected in all cases.

(C) Metal-Covered and Nonmetallic Cable Protection. Metal-covered and nonmetallic cables shall be permitted to pass through the centers of the wide side of 2 in. by 4 in. (50 mm x 100 mm) studs. However, they shall be protected where they pass through 2 in. by 2 in. (50 mm x 50 mm) studs or at other studs or frames where the cable or armor would be less than 1 1/4 in. (31.8 mm) from the inside or outside surface of the studs where the wall covering materials are in contact with the studs. Steel plates on each side of the cable, or a tube, with not less than No. 16 MSG wall thickness shall be required to protect the cable. These plates or tubes shall be securely held in place.

(D) Metal Faceplates. Where metal faceplates are used, they shall be effectively grounded.

(E) Installation Requirements. If a range, clothes dryer, or similar appliance is connected by metal-covered cable or flexible metal conduit, a length of not less than 3 ft (914 mm) of free cable or conduit shall be provided to permit moving the appliance. The cable or flexible metal conduit shall be secured to the wall. Type NM or Type SE cable shall not be used to connect a range or dryer. This shall not prohibit the use of Type NM or Type SE cable between the branch-circuit overcurrent-protective device and a junction box or range or dryer receptacle.

(F) Raceways. Where rigid metal conduit or intermediate metal conduit is terminated at an enclosure with a locknut and bushing connection, two locknuts shall be provided, one inside and one outside of the enclosure. Rigid nonmetallic conduit, or electrical nonmetallic tubing, or surface raceway shall be permitted. All cut ends of conduit and tubing shall be reamed or otherwise finished to remove rough edges.

(G) Switches. Switches shall be rated as follows:
(1) For lighting circuits, switches shall be rated not less than 10 amperes, 120 to 125 volts, and in no case less than the connected load.
(2) For motors or other loads, switches shall have ampere or horsepower ratings, or both, adequate for loads controlled. (An ac general-use snap switch shall be permitted to control a motor 2 hp or less with full-load current not over 80 percent of the switch ampere rating.)

(H) Under-Chassis Wiring (Exposed to Weather).
~~1.~~ Where outdoor or under-chassis line-voltage (120 volts, nominal, or higher) wiring is exposed to moisture or physical damage, it shall be protected by rigid metal conduit or intermediate metal conduit. The conductors shall be suitable for wet locations.
Exception: Electrical metallic tubing or rigid nonmetallic conduit shall be permitted where closely routed against frames and equipment enclosures.
~~2. The cables or conductors shall be Type NMC, Type TW, or equivalent.~~

(I) Boxes, Fittings, and Cabinets. Boxes, fittings, and cabinets shall be securely fastened in place and shall be supported from a structural member of the home, either directly or by using a substantial brace.
Exception: Snap-in-type boxes. Boxes provided with special wall or ceiling brackets and wiring devices with integral enclosures that securely fasten to walls or ceilings and are identified for the use shall be permitted without support from a structural member or brace. The testing and approval shall include the wall and ceiling construction systems for which the boxes and devices are intended to be used.

(J) Appliance Terminal Connections. Appliances having branch-circuit terminal connections that operate at temperatures higher

than 60ºC (140ºF) shall have circuit conductors as described in ~~(1) or (2).~~ the following:

(1) Branch-circuit conductors having an insulation suitable for the temperature encountered shall be permitted to be run directly to the appliance.

(2) Conductors having an insulation suitable for the temperature encountered shall be run from the appliance terminal connection to a readily accessible outlet box placed at least 1 ft (305 mm) from the appliance. These conductors shall be in a suitable raceway or Type AC or MC cable of at least 18 in. (450 mm) but not more than 6 ft (1.83 m) in length. ~~that shall extend for at least 4 ft (1.22 m).~~

(K) Component Interconnections. Fittings and connectors that are intended to be concealed at the time of assembly shall be listed and identified for the interconnection of building components. Such fittings and connectors shall be equal to the wiring method employed in insulation, temperature rise, and fault-current withstanding and shall be capable of enduring the vibration and shock occurring in mobile home transportation.

FPN: See 550.19 for interconnection of multiple section units.

550.~~11~~16 Grounding.

Grounding of both electrical and nonelectrical metal parts in a mobile home shall be through connection to a grounding bus in the mobile home distribution panelboard. The grounding bus shall be grounded through the green-colored insulated conductor in the supply cord or the feeder wiring to the service ground in the service-entrance equipment located adjacent to the mobile home location. Neither the frame of the mobile home nor the frame of any appliance shall be connected to the grounded circuit conductor (neutral) in the mobile home. Where service equipment is installed in or on a manufactured home as permitted in 550.32(B), the neutral conductors and the ground bus shall be permitted to be connected in the distribution panel.

(A) Grounded (Neutral) Conductor. ~~Insulated Neutral.~~

(1) Insulated. The grounded circuit conductor (neutral) shall be insulated from the grounding conductors and from equipment enclosures and other grounded parts. The grounded (neutral) circuit terminals in the distribution panelboard and in ranges, clothes dryers, counter-mounted cooking units, and wall-mounted ovens shall be insulated from the equipment enclosure. Bonding screws, straps, or buses in the distribution panelboard or in appliances shall be removed and discarded. Where service equipment is installed in or on a manufactured home as permitted in 550.32(B), the neutral conductors and the ground bus shall be permitted to be connected in the distribution panel.

(2) Connections of Ranges and Clothes Dryers. Connections of ranges and clothes dryers with 120/240-volt, 3-wire ratings shall be made with 4-conductor cord and 3-pole, 4-wire, grounding-type plugs or by Type AC cable, Type MC cable, or conductors enclosed in flexible metal conduit.

(B) Equipment Grounding Means.

(1) Supply Cord or Permanent Feeder. The green-colored insulated grounding wire in the supply cord or permanent feeder wiring shall be connected to the grounding bus in the distribution panelboard or disconnecting means.

(2) Electrical System. In the electrical system, all exposed metal parts, enclosures, frames, lamp fixture canopies, etc., shall be effectively bonded to the grounding terminal or enclosure of the distribution panelboard.

(3) Cord-Connected Appliances. Cord-connected appliances, such as washing machines, clothes dryers, refrigerators, and the electrical system of gas ranges, etc., shall be grounded by means of a cord with grounding conductor and grounding-type attachment plug.

(C) Bonding of Noncurrent-Carrying Metal Parts.

(1) Exposed Noncurrent-Carrying Metal Parts. All exposed noncurrent-carrying metal parts that may become energized shall be effectively bonded to the grounding terminal or enclosure of the distribution panelboard. A bonding conductor shall be connected between the distribution panelboard and accessible terminal on the chassis.

(2) Grounding Terminals. Grounding terminals shall be of the solderless type and listed as pressure-terminal connectors recognized for the wire size used. The bonding conductor shall be solid or stranded, insulated or bare, and shall be No. 8 copper minimum, or equivalent. The bonding conductor shall be routed so as not to be exposed to physical damage.

(3) Metallic Piping and Ducts. Metallic gas, water, and waste pipes and metallic air-circulating ducts shall be considered bonded if they are connected to the terminal on the chassis [see ~~Section~~ 550.~~11~~16(C)(1)] by clamps, solderless connectors, or by suitable grounding-type straps.

(4) Metallic Roof and Exterior Coverings. Any metallic roof and exterior covering shall be considered bonded if the following conditions are met:

(1) T~~t~~he metal panels overlap one another and are securely attached to the wood or metal frame parts by metallic fasteners ~~and~~

(2) I~~i~~f the lower panel of the metallic exterior covering is secured by metallic fasteners at a cross member of the chassis by two metal straps per mobile home unit or section at opposite ends.

The bonding strap material shall be a minimum of 4 in. (102 mm) in width of material equivalent to the skin or a material of equal or better electrical conductivity. The straps shall be fastened with paint-penetrating fittings such as screws and starwashers or equivalent.

550.~~12~~17 Testing.

(a) Dielectric Strength Test. The wiring of each mobile home shall be subjected to a 1-minute, 900-volt, dielectric strength test (with all switches closed) between live parts (including neutral) and the mobile home ground. Alternatively, the test shall be permitted to be performed at 1080 volts for 1 second. This test shall be performed after branch circuits are complete and after fixtures or appliances are installed.

Exception: Listed fixtures or appliances shall not be required to withstand the dielectric strength test.

(B) Continuity and Operational Tests and Polarity Checks. Each mobile home shall be subjected to all of the following:

(1) An electrical continuity test to ensure that all exposed electrically conductive parts are properly bonded.

(2) An electrical operational test to demonstrate that all equipment, except water heaters and electric furnaces, is connected and in working order~~.; and~~

(3) Electrical polarity checks of permanently wired equipment and receptacle outlets to determine that connections have been properly made.

550.~~13~~ 18 Calculations. The following method shall be employed in computing the supply-cord and distribution-panelboard load for each feeder assembly for each mobile home in lieu of the procedure shown in Article 220 and shall be based on a 3-wire, 120/240-volt supply with 120-volt loads balanced between the two legs of the 3-wire system.

(A) Lighting ~~and~~, Small Appliance, and Laundry Load.

(1) Lighting Volt-Amperes~~:~~. Length times width of mobile home floor (outside dimensions) times 3 volt-amperes/ft^2 (32.26 VA/m^2), e.g., Length x width x 3 = lighting volt-amperes

(2) Small Appliance Volt-Amperes~~:~~. Number of circuits times 1500 volt-amperes for each 20-ampere appliance receptacle circuit (see definition of Appliance, Portable with note~~) including 1500 volt-amperes for laundry circuit~~, e.g., No. of circuits x 1500 = small appliance volt-amperes.

(3) Laundry Area Circuit Volt-Amperes. 1500 volt-amperes

(4) Total Volt-Amperes~~:~~. Lighting volt-amperes plus small appliance volt-amperes plus laundry area volt-amperes = total volt-amperes.

(5) Net Volt-Amperes. First 3000 total volt-amperes at 100 percent plus remainder at 35 percent = volt-amperes to be divided by 240 volts to obtain current (amperes) per leg.

(B) Total Load for Determining Power Supply. Total load for determining power supply is the sum of the following~~:~~.

(1) Lighting and small appliance load as calculated in ~~Section~~ 550.~~13~~18(A)(5).

(2) Nameplate amperes for motors and heater loads (exhaust fans, air conditioners, electric, gas, or oil heating). Omit smaller of the heating and cooling loads, except include blower motor if used as air-conditioner evaporator motor. Where an air conditioner is not installed and a 40-ampere power-supply cord is provided, allow 15 amperes per leg for air conditioning.

(3) Twenty-five percent of current of largest motor in (2).

(4) Total of nameplate amperes for waste disposer, dishwasher, water heater, clothes dryer, wall mounted oven, cooking units. Where the number of these appliances exceeds three, use 75 percent of total.

(5) Derive amperes for freestanding range (as distinguished from separate ovens and cooking units) by dividing the following values by 240 volts.

Nameplate Rating (watts)	Use (volt-amperes)
0 – 10,000	80 percent of rating
Over 10,000 – 12,500	8,000
Over 12,500 – 13,500	8,400
Over 13,500 – 14,500	8,800
Over 14,500 – 15,500	9,200
Over 15,500 – 16,500	9,600
Over 16,500 – 17,500	10,000

(6) If outlets or circuits are provided for other than factory-installed appliances, include the anticipated load.
FPN: Refer to Appendix D, Example D11, for an illustration of the application of this calculation.

(C) Optional Method of Calculation for Lighting and Appliance Load. ~~For mobile homes,~~ T~~t~~he optional method for calculating lighting and appliance load shown in ~~Section~~ 220.30 shall be permitted.

550.~~14~~19 Interconnection of Multiple Section Mobile or Manufactured Home Units.

(A) Wiring Methods. Approved and listed fixed-type wiring methods shall be used to join portions of a circuit that must be electrically joined that are located in adjacent sections ~~of mobile homes~~ after the home is installed on its support foundation. The circuit's junction shall be accessible for disassembly when the home is prepared for relocation.

FPN: See 550.15(K) for component interconnections.

(B) Disconnecting Means. Expandable or multi-unit manufactured homes not having permanently installed feeders that are to be moved from one location to another shall be permitted to have disconnecting means with branch-circuit protective equipment in each unit when so located that after assembly or joining together of units, the requirements of 550.5 will be met.

550.~~15~~20 Outdoor Outlets, Fixtures, Air-Cooling Equipment, etc.

(A) Listed for Outdoor Use. Outdoor fixtures and equipment shall be listed for outdoor use. Outdoor receptacle or convenience outlets shall be of a gasketed-cover type for use in wet locations. Where located on the underside of the home or located under roof extensions or similarly protected locations, outdoor fixtures and equipment shall be listed for use in damp locations.

(B) Outside Heating Equipment, Air-Conditioning Equipment, or Both. A mobile home provided with a branch circuit designed to energize outside heating equipment or air-conditioning equipment, or both, located outside the mobile home, other than room air conditioners, shall have such branch-circuit conductors terminate in a listed outlet box, or disconnecting means, located on the outside of the mobile home. A label shall be permanently affixed adjacent to the outlet box and shall contain the following information:

THIS CONNECTION IS FOR HEATING AND/OR AIR-CONDITIONING EQUIPMENT. THE BRANCH CIRCUIT IS RATED AT NOT MORE THAN _____ AMPERES, AT _____ VOLTS, 60-HERTZ, _____ CONDUCTOR AMPACITY. A DISCONNECTING MEANS SHALL BE LOCATED WITHIN SIGHT OF THE EQUIPMENT.

The correct voltage and ampere rating shall be given. The tag shall be not less than 0.020-in. (508-µm) thick etched brass, stainless steel, anodized or alclad aluminum, or equivalent. The tag shall not be less than 3 in. (76 mm) by 1 3/4 in. (44.5 mm) minimum size.

Exception: For manufactured homes, the manufacturer shall provide in its written installation instructions the location of the outlet box or disconnecting means, the ampere rating of the branch circuit conductors provided, and the voltage rating of the circuit (e.g., 120,240, or 120/240 volts).

III Services and Feeders

550.~~21~~30 Distribution System.

The mobile home park secondary electrical distribution system to mobile home lots shall be single-phase, 120/240 volts, nominal. For the purpose of Part ~~C~~ III, where the park service exceeds 240 volts, nominal, transformers and secondary distribution panelboards shall be treated as services.

550.~~22~~31 Minimum Allowable Demand Factors.

Park electrical wiring systems shall be calculated (at 120/240 volts) on the larger of the following:

(1) 16,000 volt-amperes for each mobile home lot ~~or.~~

(2) T~~t~~he load calculated in accordance with Section 550.~~13~~ 18 for the largest typical mobile home that each lot will accept.

It shall be permissible to compute the feeder or service load in accordance with Table 550.~~22~~ 31. No demand factor shall be allowed for any other load, except as provided in this Code.

Service and feeder conductors to a mobile home in compliance with ~~Section~~ 310.15(B)(6) shall be permitted.

Table 550.~~22~~ 31. Demand Factors for Feeders and Service-Entrance Conductors

Number of Mobile Homes	Demand Factor (percent)
	1100
2	55
3	44
4	39
5	33
6	29
7–9	28
10–12	27
13–15	26
16–21	25
22–40	24
41–60	23
61 and over	22

550.~~23~~32 Service Equipment.

(A) Mobile Home Service Equipment. The mobile home service equipment shall be located adjacent to the mobile home and not mounted in or on the mobile home. The service equipment shall be located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves. The service equipment shall be permitted to be located elsewhere on the premises, provided that a disconnecting means suitable for service equipment is located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves. Grounding at the disconnecting means shall be in accordance with ~~Section~~ 250.32.

(B) Manufactured Home Service Equipment. The manufactured home service equipment shall be permitted to be installed in or on a manufactured home, provided that all of the following conditions are met:~~.~~

~~1. The manufactured home is secured to a permanent foundation that complies with applicable building codes.~~

~~2. The service equipment is installed in a manner acceptable to the authority having jurisdiction.~~

~~3. The installation of the service equipment complies with Article 230.~~

~~4. Means are provided for the connection of a grounding electrode conductor to the service equipment and routing it outside the structure.~~

(1) The manufacturer shall include in its written installation instructions information indicating that the home shall be installed on and secured to a permanent foundation or anchoring system.

(2) The installation of the service equipment complies with Article 230.

(3) Means are provided for the connection of a grounding electrode conductor to the service equipment and routing it outside the structure.

(4) Bonding and grounding of the service shall be in accordance with Article 250.

(5) The manufacturer shall include in its written installation instructions one method of grounding the service equipment at the installation site. The instructions shall clearly state that other methods of grounding are found in Article 250.

(6) The minimum size grounding electrode conductor shall be specified in the instructions.

(7) A red warning label shall be mounted on or adjacent to the service equipment. The label shall state the following:
WARNING – DO NOT PROVIDE ELECTRICAL POWER UNTIL THE GROUNDING ELECTRODE(S) IS INSTALLED AND CONNECTED (SEE INSTALLATION INSTRUCTIONS).

Where the service equipment is not installed in or on the unit, the installation shall comply with the other provisions of this Section.

(C) Rating. Mobile home service equipment shall be rated at not less than 100 amperes at 120/240 volts, and provisions shall be made for connecting a mobile home feeder assembly by a permanent wiring method. Power outlets used as mobile home service equipment shall also be permitted to contain receptacles rated up to 50 amperes with appropriate overcurrent protection. Fifty-ampere receptacles shall conform to the configuration shown in Figure 550.~~5~~ 10(C).

FPN: Complete details of the 50-ampere plug and receptacle configuration can be found in National Electrical Manufacturers Association Standard for Wiring Devices — Dimensional Requirements, ANSI/NEMA WD 6-1988, Figure 14-50.

(D) Additional Outside Electrical Equipment Mobile home service equipment shall also contain a means for connecting a mobile home accessory building or structure, or additional electrical equipment located outside a mobile home by a fixed wiring method.

(E) Additional Receptacles. Additional receptacles shall be permitted for connection of electrical equipment located outside the mobile home, and all such 125-volt, single-phase, 15- and 20-ampere receptacles shall be protected by a listed ground-fault circuit interrupter.

(F) Mounting Height. Outdoor mobile home disconnecting means shall be installed so the bottom of the enclosure containing the disconnecting means is not less than 2 ft (610 mm) above finished grade or working platform. The disconnecting means shall be installed so that the center of the grip of the operating handle, when in the highest position, will not be more than 6 ft 7 in. (2.0 m) above the finished grade or working platform.

(G) Marking. Where a 125/250-volt receptacle is used in mobile home service equipment, the service equipment shall be marked as follows.

TURN DISCONNECTING SWITCH OR CIRCUIT BREAKER OFF BEFORE INSERTING OR REMOVING PLUG. PLUG MUST BE FULLY INSERTED OR REMOVED.

The marking shall be located on the service equipment adjacent to the receptacle outlet.

550.~~24~~ 33 Feeder.

(A) Feeder Conductors. ~~Mobile home~~ Ffeeder conductors shall consist of either a listed cord, factory-installed in accordance with Section 550.~~5~~ 10(B), or a permanently installed feeder consisting of four, insulated, color-coded conductors that shall be identified by the factory or field marking of the conductors in compliance with ~~Section~~ 310.12. Equipment grounding conductors shall not be identified by stripping the insulation.

Exception: Where a ~~mobile home~~ feeder is installed between service equipment and a ~~mobile home~~ disconnecting means as covered in ~~Section~~ 550.~~23~~ 32(A), it shall be permitted to omit the equipment grounding conductor where the grounded circuit conductor is grounded at the disconnecting means as required in ~~Section~~ 250.32(B).

(B) Adequate Feeder Capacity. Mobile home and manufactured home lot feeder circuit conductors shall have adequate capacity for the loads supplied and shall be rated at not less than 100 amperes at 120/240 volts.

SUBSTANTIATION:

This rewrite includes a general renumbering and other editorial changes such as adding section titles to comply with the new NEC Style Manual. These changes do not alter the technical content of the Article. There are other changes proposed that do change the technical content and they are listed below. Many of these changes are proposed to have the language of the NEC read the same as NFPA 501 and the HUD Part 3280 rules. There is a strong possibility that NFPA 501 will become the basis for the new HUD rules on manufactured housing either by reference or direct incorporation and since the federal rules are pre-emptive of the NEC rules, having a different set of requirements in the NEC serves no purpose. Many of the NFPA 501 and HUD rules were, and are derived from the NEC rules but there are several differences that have been deemed necessary to comply with federal mandates for manufactured housing.

Specific technical changes are as follows:

(Section numbers are based on the new numbering format of the Style Manual as shown in the proposal)

550.1 - The term "manufactured homes is added to the scope. This term appears in the title but is not directly mentioned in the existing scope. The only way to reference manufactured homes now is in the definitions in 550.2 and a few specific references elsewhere. It is felt that including them in the scope will help clarify what the article covers. A FPN is proposed to provide a reference directly in the scope to NFPA 501 and the HUD Part 3280 rules. The submitter understands that the Technical Correlating Committee has responsibility for "scope" sections.

550.2 - In the definition of Manufactured Home, the last line of text was moved above the FPN's for clarity.

Part B. title – renumbered as II and added the words Manufactured Homes to the title again to clarify that these units are indeed covered by this part.

Section numbers and internal references to other sections have been renumbered to comply with the new Style Manual.

550.10(I)(2) - New last sentence added to require the manufacturers instructions to state the proper conductor sizes and size of the junction box to be used. This is to be consistent with NFPA 501 and federal standards.

550.11(A) - Change in the second paragraph uses the language from NFPA 501 and HUD Part 3280 rules.

These documents allow a panelboard to be located in a closet with certain restrictions. It is intended that the six inch clear space be maintained by some physical means such as the design of the closet or closet rod.

550-11(B)(3) - Last sentence deleted as unnecessary. The issue is adequately covered in 210.21(B) and did not really belong in this section dealing with branch-circuit protective devices.

550-11(D) - Exception added for manufactured homes to be consistent with NFPA 501 and federal standards.

550-12(A) - Last sentence deleted. The subject is more clearly covered by other parts of this section. See 550-12(B) and 550.12(D).

550.12(B) - Section rewritten to use language from NFPA 501, federal standards, 210.11(C)(1), and 210.52(B) for consistency and clarity.

550.12(C) – New section added, old section (c) now designated as (D). Section added to state the requirement for laundry circuit rather than having to use FPN No. 1 from old section.

550.12(D) - FPN No. 1 deleted. Addition of new section makes it unnecessary. Existing FPN No. 2 now unnumbered.

550.12(E) - New section added to be consistent with NFPA 501 and federal standards. Reference to 550.13(E)(2) deals with specific permission for a pipe heating cable outlet to be installed on a bathroom receptacle circuit.

550.13(A) - Editorial changes to write in list format for clarity and comply with Style Manual.

550.13(B) - Change uses the acronym GFCI and incorporates language from 210.8(A) for GFCI requirements. Adds language from NFPA 501 and federal standards for consistency. Last sentence deleted so the rules would revert to 410.57(C) with regards to receptacles in tub and shower spaces.

550.13(D) - Section rewritten using language from NFPA 501 and federal standards for consistency and clarity. Removes confusing language and exceptions from current text. Basic text of new (8) is relocated from old section (e) which is deleted.

550.13(E) - Text relocated from old section (g)

550.13(F) - Rewritten in list format to comply with new Style Manual. Adds new section (3) from NFPA 501 which restates the FPN in 210.52 as text for clarity.

550.13(G) - New text from NFPA 501 and federal standards.

550.14(C) - Requirement restated. Original language was in error and had never been corrected, pendant fixtures or cords had nothing to do with interconnection of building components

550.14(e) - Old section deleted. Subject is adequately covered in 380.4.

550.15 - Text added from NFPA 501 and federal standards. Aluminum conductors have not been permitted in these units for some time.

550.15(C) - Metric equivalents added.

550.15(G) - editorial change to put into list format to comply with new Style Manual.

550.15(H) - Old section 2. deleted. Language is unnecessary as basic rule requires conductors be suitable for wet locations and other code rules in Chapter 1-4 require suitability for the location. Change is consistent with language from NFPA 501 and federal standards.

550.15(J) - Rewritten in list format to comply with new Style Manual. Changes in (2) reflect current NEC and NFPA 501 rules.

550.15(K) - FPN added to call users attention to related section for interconnections.

550.16 - New last sentence to correlate with existing provisions of 550.32(B) [old 550.23(b)] and to be consistent with NFPA 501 and federal standards.

550.16(A)(1) & (2) - Titles added to comply with new Style Manual. New last sentence added for consistency with NFPA 501, federal standards and existing provisions of 550.32(B) [old 550.23(b)].

550.16(B) - Titles added to sections to comply with new Style Manual

550.16(C) - Titles added to sections to comply with new Style Manual. (4) rewritten into list format to comply with new Style Manual.

550.17(B) - Rewritten into list format to comply with new Style Manual.

550.18 - Language "or manufactured" inserted to clarify that the calculation is applicable to either type of unit.

550.18(A) - Changes add specific reference to laundry load for clarity and to match the sample calculation shown in example D-11 and improve the usability of this section. Rewritten into format to comply with new Style Manual. Metric equivalent added. New title of (5) clarifies that this is a net value after applying the demand factor indicated.
550.18(C) - Specific reference to Mobile Homes is deleted to clarify that the optional calculation may be used for either type of unit.
550.19 - Manufactured homes added to title and specific reference to mobile homes is deleted in (A) to clarify the application of the requirement. FPN added to call users attention to related section on interconnections. Section Titles added to comply with new Style Manual. New section (B) added for consistency with NFPA 501 and federal standards.
550.20(A) - New last sentence added for consistency with NFPA 501 and federal standards.
550.20(B) - Exception added to be consistent with NFPA 501 and federal standards.
550.31 - Rewritten in list format to comply with new Style Manual.
550.32(B) - Revision uses text from the previous edition and add requirements from NFPA 501 and federal standards for consistency. New last sentence added to clarify that where the service equipment is not installed on the unit, it must comply with the remaining rules such as location, height, provisions for other equipment, and location of the service disconnecting means.
550.33(A) - Specific references to mobile homes are deleted to clarify that these provisions apply to both mobile and manufactured homes. There has been confusion in the past due to the wording contained in the definitions in 550.2.
550.33(B) - Manufactured homes added to clarify the applicability of the requirement.
PANEL ACTION: Accept in Principle.
Change the proposal as follows:
1. 550.11 (A) last paragraph - The distribution panelboard shall be located in an accessible location but shall not be located in a bathroom or clothes closet. Remainder of proposal text remains unchanged.
2. 550.11 (d) exception after "written installation instructions" add "or on the data plate"
Revise the proposal as follows:
3. 550.13 (D) (9) At least one receptacle outlet shall be installed in bathrooms within 36 in. (914mm) of the outside edge of each basin. The receptacle outlet shall be located above or adjacent to the basin location. This receptacle shall be in addition to any receptacle that is a part of a lighting or fixture or appliance. The receptacle shall not be enclosed within a bathroom cabinet or vanity.
4. 550.20 (B) Delete the exception.
5. 550.32 (b) (1) after existing text "be secured in place by an anchoring system or installed on and secured to a permanent foundation."
PANEL STATEMENT: The changes were made to ensure consistency with NFPA 501.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
MCCULLOUGH: The Panel Action in 5, should state:
550.32(B)(1) delete the text after the word "shall" and replace with "be secured in place by an anchoring system or installed on and secured to a permanent foundation."
The Panel Action does not indicate that the wording shown is to replace the text in the proposal and this was the Panel's intent.

(Log #520)

19- 38 - (550): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 550-5,(d) replace "21 ft (6.4 m)" with "6.4 m (21 ft)"; "36 1/2 ft (11.13 m)" with "11 m (36 1/2 ft)"; and "20 ft (6.1 m)" with "6.0 m (20 ft)".
2. In Section 550-5(g), replace "1 1/4 in. (31.8 mm)" with "32 mm (1 1/4 in.)".
3. In Section 550-6, replace "1/4 in. (6.4 mm)" with "6 mm (1/4 in.)".
4. In Section 550-6(a) first paragraph, replace "24 in. (610 mm)" with "600 mm (24 in.)".
5. In Section 550-6(a) last paragraph, replace "30 in. (762 mm)" with "750 mm (30 in.)" throughout.
6. In Section 550-7(a), replace "3 volt-amperes/ft^2 (32.26 VA/m^2)" with "33 VA/m^2 (3 volt-amperes/ft^2)".
7. In Section 550-8(b), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
8. In Section 550-8(d), replace "6 ft (1.83 m)" with "1.8 m (6 ft)" throughout.
9. In Section 550-8(d) Exception No. 1, replace "2 ft (610 mm)" with "600 mm (2 ft)" and replace "12 in. (305 mm)" with "300 mm (12 in.)".
10. In Section 550-8(d) Exception No. 4, replace "8 ft (2.44 m)" with "2.5 m (8 ft)" in (a) and replace "4 ft (1.22 m)" with "1.2 m (4 ft)" in (b).
11. In Section 550-8(f)(1), replace "30 in. (762 mm)" with "750 mm (30 in.)".
12. In Section 550-8(g)(1), replace "2 ft (610 mm)" with "600 mm (2 ft)".
13. In Section 550-10(b), replace "15 in. (381 mm)" with "380 mm (15 in.)".
14. In Section 550-10(c), replace "2 in. by 4 in." with "2-by-4"; "2 in. by 2 in." with "2-by-2"; "1 1/4 in. (31.8 mm)" with "32 mm (1 1/4 in.)"; and "No. 16 MSG" with "1.35 mm (0.053 in.)".
15. In Section 550-10(e), replace "3 ft (914 mm)" with "900 mm (3 ft)".
16. In Section 550-10(j)(2), replace "1 ft (305 mm)" with "300 mm (1 ft)" and replace "4 ft (1.22 mm)" with "1.2 m (4 ft)".
17. In Section 550-11(c)(4), replace "4 in. (102 mm)" with "100 mm (4 in.)".
18. In Section 550-13(a), replace "3 volt-amperes/ft^2" with "33 VA/m^2 (3 volt-amperes/ft^2)".
19. In Section 550-15(b), replace "0.020-in. (508-µm)" with "0.51 mm (0.020 in.)"; "3 in. (76 mm)" with "75 mm (3 in.)"; and "1 3/4 in. (44.5 mm)" with "45 mm (1 3/4 in.)".
20. In Section 550-23(a), replace "30 ft (9.14 m)" with "9.0 m (30 ft.)" throughout.
21. In Section 550-23(f), replace "2 ft (610 mm)" with "600 mm (2 ft)" and replace "6 ft 7 in. (2.0 m)" with "2.0 m (6 ft 7 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following. The SI units and inch-pound numbers in parenthesis are not shown for Item 14's stud sizes since they are not a direct conversion and a Trade Size is provided. Also in Item 14, No. 16 MSG is considered to represent a nominal metal thickness, corresponding to a thickness value not commonly known or available to the users of the NEC. The equivalent nominal decimal thickness is 0.060 in., based on material standards and handbooks. However, since this value is nominal, a tolerance must be applied to achieve a minimum allowable thickness. The accepted industry practice is to apply a minus tolerance of 0.007 in. for 16 MSG, resulting in a minimum thickness of 0.053 in. (1.35 mm).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #402)

19- 39 - (550-2-Manufactured Home): Accept
Note: The Technical Correlating Committee understands that the action on this proposal further modifies the action on Proposal 19-37. The Technical Correlating Committee further directs the Panel to clarify the use of "sq ft" relative to the use of SI units. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Charles N. Cook, Dept. of Housing & Community Dev./Codes Admin., MD
RECOMMENDATION: Revise definition of manufactured home to read as follows:
Manufactured Home. A structure, transportable in one or more sections, that is 8 body-ft (24.4 cm) or more in width or 40 body-ft (1219 cm) or more in length in the traveling mode or, when erected on site, is 320 ft^2 (28 m^2) or more; which is built on a chassis and designed to be used as a dwelling, with or without a permanent foundation, when connected to the required utilities, including the plumbing, heating, air conditioning, and electrical systems contained therein. Calculations used to determine the number of sq ft in a structure will be based on the structure's exterior dimensions, measured at the largest horizontal projections when erected on site. These dimensions include all expandable rooms, cabinets, and other projections containing interior space, but do not include inside bay windows.

SUBSTANTIATION: Standardization of definition.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #941)

19- 40 - (550-5(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Feeder. The power supply to the mobile home shall be a feeder assembly consisting of not more than one listed 50-ampere mobile home power supply cord with an integrally or securely attached plug cap, or a permanently installed feeder with an ampacity of not less than 50-amperes.
Exception No. 1: A mobile home that is factory-equipped with gas or oil-fired central heating equipment and cooking appliances shall be permitted to be provided with a listed mobile home power-supply cord rated 40 amperes, or a permanently installed feeder with an ampacity not less than 40 amperes.
SUBSTANTIATION: There is no specific minimum rating for a permanent feeder nor is a permanent feeder option indicated in Exception No. 1.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation does not further clarify requirements and existing text consistent with Federal installation standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #942)

19- 41 - (550-6(a), (b)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Disconnecting Means. A single main disconnecting means shall be provided in each mobile home, consisting of a circuit breaker or a switch and fuses and its their accessories, installed in a readily accessible location near the point of entrance of the supply cord or permanently installed feeder conductors into the mobile home. The main circuit breaker or switch and fuse enclosure shall be plainly and durably marked "main". A switch and fuse enclosure shall be plainly and durably marked with fuse rating. The equipment shall contain a solderless type grounding connector or bar for the purpose of grounding, with sufficient terminals for all grounding conductors. The neutral bar terminations of the grounded circuit conductors shall be insulated in accordance with Section 550-11(a). The main disconnecting equipment and overcurrent protection and distribution panelboard shall have an ampere rating not less than the rating of the mobile home feeder conductors. The bottom of the distribution equipment, either circuit breaker or fused type shall be located a minimum of 24 in. (610 mm) ~~from the bottom of such equipment~~ above the floor level of the mobile home.
(FPN): No change.
A distribution panelboard shall be rated not less than ~~50 amperes and employ a 2-pole circuit breaker rated 40 amperes for a 40 ampere rated supply cord, or 50 amperes for a 50 ampere supply cord~~ the ampere rating of the main circuit breaker or fuses. ~~A distribution panelboard employing a disconnect switch and fuses shall be rated 60 amperes and shall employ a single 2-pole 60 ampere fuseholder with 40- or 50 ampere main fuses for 40 or 50 ampere supply cords, respectively. The outside of the distribution panelboard shall be plainly marked with the fuse size.~~
The distribution equipment ~~panelboard~~ shall be located in a readily accessible location but shall not be located in a bathroom or clothes closet. A clear working space at least 30 in. (762 mm) wide and 30 in. (762 mm) in front of the distribution equipment ~~panelboard~~ shall be provided. This space shall extend from the floor to the top of the distribution equipment. ~~panelboard.~~
(b) Delete last paragraph: ~~A 15 ampere multiple receptacle shall be permitted where connected to a 20 ampere laundry circuit.~~
SUBSTANTIATION: Editorial. This section doesn't apply disconnecting means requirements to permanent feeders. The marking for "main" should be durable; felt pens and markers may not be suitable. Present wording literally requires the fuses to be marked. The suitable ratings for the disconnecting equipment should also apply to the main overcurrent device rating and the distribution panelboard which may be a separate device. Connected load is not necessarily the same as computed load. A circuit supplying general use receptacles or small appliance circuit receptacles is a computed load. The last sentence of the first paragraph is revised for improved syntax.
The proposal simplifies requirements and eliminates unnecessary text re: ratings and type of main disconnect overcurrent protection and type panelboard by relating these items to the feeder rating. Present text appears to require the main disconnect and overcurrent protection as part of the panelboard and doesn't address ratings where a permanent feeder is installed. The proposal uses "distribution equipment" in lieu of "distribution panelboard" to apply the requirements to a separate circuit breaker or fusible switch where installed, in addition to the panelboard. The present limitation of panelboard ratings would preclude using a 100-ampere rated panelboard to provide more circuit spaces, where supplied by a 50 ampere rated cord that has 50-ampere rated protection. Such application does not appear to violate other code rules.
The proposal to delete the last paragraph of (b) is because this is already permitted by Section 210-21 and it infers this is not permitted for other 20-ampere circuits supplying multiple receptacles or a single receptacle on a laundry circuit with other receptacles.
PANEL ACTION: Accept in Part.
Accept the delete in the last paragraph of 550-6(b).
PANEL STATEMENT: See panel action on proposal 19-37. The remainder of the existing text in (a) is sufficiently clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2033)

19- 42 - (550-6(a)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Add to the end of final paragraph:
"The wall finish above and below the distribution panelboard shall be removable to provide access to the branch circuit conductors."
SUBSTANTIATION: Branch circuits always get added to trailers. They are usually a hodgepodge. The wall finish needs to be held down with screws, the same as for water heaters, so that people can get to the wiring spaces.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation addresses a design issue not a safety issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2034)

19- 43 - (550-6(b)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Add to the end of the first paragraph:
"Branch circuit distribution equipment shall have a minimum of four unused spaces for the later installation of branch circuits."
SUBSTANTIATION: Branch circuits always get added. It is the rule, not the exception. The most common are water pumps, dishwashers and cellar lights. These spaces are desperately needed to avoid messes.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation addresses a design issue not a safety issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1453)

19- 44 - (550-6(e)): Reject
SUBMITTER: Barry F. Tower, Patten, ME
RECOMMENDATION: Please add the following new text:
(e) Overcurrent protection of branch circuit grounded conductors and equipment grounding conductors. Overcurrent protection of branch circuit grounded conductors and equipment grounding conductors of the panelboard shall be provided for mobile homes. The overcurrent protection shall interrupt ungrounded conductors, but never interrupt the continuity of any

grounding conductor. Overcurrent shall be detected and interrupted by use of one of the following means:

1. Ground-fault type circuit breakers located on each branch circuit of the panelboard.
2. A single ground-fault device installed as the main circuit breaker in the panelboard.
3. A single ground-fault device installed within the service equipment that supplies this panelboard.

Where a single ground-fault type device is used as permitted in 1 or 2 above, it shall be designed so that the ground-fault trip setting does not exceed 1 ampere.

SUBSTANTIATION: The purpose of this change is to prevent fires caused by "open neutrals" in mobile homes and buildings with subpanels. We all know about the dangers of short circuits, but we have been ignoring a much more serious problem. An open neutral feeding a four-wire 240/120V subpanel can start a fire if there is an interconnection between any branch circuit grounded neutral conductor and a grounding conductor. Open neutrals are a very common problem on mobile homes and buildings with subpanels, and accidental interconnections between a grounded conductor and a grounding conductor are even more common. Any such interconnection causes the grounded conductor and the grounding conductor to be in parallel with each other. A typical overload occurs as follows: The neutral conductor (may be rated at 100 amperes) becomes open, but instead of disconnecting the power, there is an alternate path for the circuit because the grounding conductor is accidentally connected in parallel with it. The neutral bus for the entire panelboard will be backfed through that alternate path (perhaps through no. 14 conductors in a device box). There is no overcurrent protection on the grounded conductor or the grounding conductor, so there is no warning until the fire starts. There are several ways in which a grounded neutral conductor can be made parallel with an equipment grounding conductor. The equipment grounding conductor may be in contact with the grounded conductor inside a device box. Any deflective appliance in which the neutral conductor is grounded to the case can burn down a building (if the neutral becomes open). Someone could have an appliance with a grounded neutral plugged in for many year and not know that they have any problem. Then one day their neutral becomes open and a fire starts. They had no warning and they had no way of knowing that the appliance was defective. Of course, this is only a problem on 4-wire subpanels and mobile homes. Now we have changed the requirements for ranges and dryers to require a 4-wire plug on all new homes. I agree that this is the proper wiring method. Unfortunately we have increased the fire hazard while decreasing the electrocution hazard. I think that more people die from house fires than from electrocution - thousands more each year. With a 3-wire range, there was a shock hazard if the neutral became open. A person complete the 120V path to ground by touching the case of the range. With a 4-wire range fed from a subpanel or mobile home, there is a fire hazard if the neutral becomes open and the bonding jumper on the back of the range is still attached. Most pigtails on ranges and dryers are installed by appliance delivery persons - not electricians. This proposal is the only way to protect the grounded circuit conductors and the equipment grounding conductors from overload where they are supplied from subpanels. Whenever I do any electrical work on a mobile home, I always shut off the power at the pole, disconnect the neutral, and test the neutral with an ohm meter to see if it is grounded - many of them were. It is not practical to expect people to do this once a month. Manufacturers could develop 2-pole GFCIs with a 1 ampere ground fault trip setting for this purpose.

PANEL ACTION: Reject.

PANEL STATEMENT: The recommendation is not supported by a technical substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #943)

19- 45 - (550-7): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete present wording and substitute:

Branch Circuits. Branch circuits shall be installed in accordance with (a) and (b) below.

(a) General Lighting. The minimum number of branch circuits to supply lighting and general-use receptacles shall be determined on the basis of 3 volt-amperes per sq ft (32.76 vA/sq m) of floor area computed from the outside dimensions of the mobile home (coupler excluded), divided by 120-volts, to determine the number of 15- or 20-ampere circuits, e.g.,

$$\frac{3 \times \text{length} \times \text{width}}{120 \times 15 \text{ (or } 20)} = \text{No. of 15- (or 20-) ampere circuits}$$

(b) Other Circuits. Installation of branch circuits shall be:

(1) In accordance with applicable requirements of Article 210,

(2) In accordance with Article 422 for appliances,

(3) Based on the range demand load specified in Section 550-13 (b)(5) for freestanding ranges.

SUBSTANTIATION: Mobile homes are dwelling units, per definition of dwelling unit, and merit the requirements for other type dwellings. The requirements of this section are much less comprehensive than Articles 210 and 422 and raise the question - how much of those articles are intended to apply? Are occupants of mobile homes second class citizens for which less stringent requirements are suitable?

A reference to Article 210 would encompass Section 210-2 which covers specific purpose branch circuits such as air-conditioning of FPN No. 2. A reference to Article 422 would clearly require a separate circuit for central heating equipment, not clearly defined by present (c), which also doesn't define adequate ampacity for a water heater as specified in Section 422-13. Subsection (c)(2) specifies a motor load (single or multiple) shall not exceed 80 percent of circuit rating; Section 430-24 only requires the multiplier for the largest motor. Continuous loads are not indicated.

Subsection (c)(3) negates Section 210-23 which permits an individual branch circuit to supply any load for which it is rated. The wording is flawed since it does not apply to an appliance on a circuit with one "outlet" containing multiple receptacles. Section 210-23 only applies the 80 percent restriction where other loads are also served.

The proposal is intended to clarify and correlate this section with other code rules.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirements in 550-7 have been developed to address the particular installations of mobile and manufactured homes. No technical substantiation was submitted to indicate that the present requirements are inadequate for these installations. See panel action on Proposal 19-37 which incorporates the language from the federal installation requirements for manufactured housing.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #944)

19- 46 - (550-8): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete present wording and substitute:

Receptacle Outlets. Receptacle outlets shall be installed in accordance with applicable provisions of Article 210 Part C and Article 410 Part L. A 15- or 20-ampere 125-volt receptacle located in a compartment and directly accessible from the outside of the mobile home shall be provided with ground-fault circuit-interruptor protection.

An outdoor outlet for a pipe heating cable shall be (1) located within 2 ft (610 mm) of the pipe; (2) supplied by an individual or multioutlet branch circuit (other than a small appliance laundry, bathroom, or central heating equipment branch circuit); (3) protected by a ground-fault circuit-interruptor device located within the mobile home; (4) not considered to be one of the outdoor receptacles required by Section 210-52(e).

SUBSTANTIATION: The proposal eliminates unnecessary text and correlates receptacle requirements with those for other type dwelling units.

The literal wording of (a) infers that 15- or 20-ampere 125-volt receptacles cannot supply specific appliances (washer, dryer, disposal, etc.)

Subsection (b) requires all 120-volt (should be 125-volt) receptacles in bathrooms to have GFCI protection; the last sentence limits this to receptacles within 6 ft of a sink or lavatory, which are not statements of clear intent.

The proposed second paragraph specifies "directly" accessible since any compartment is literally accessible from the outside simply by entering the mobile home.

The requirements for a heating cable outlet go beyond electrical safety requirements and apply design considerations. The requirement for all outlets on the supply circuit to have GFCI protection in effect requires a GFCI type circuit breaker at the panelboard or a GFCI type receptacle as the first outlet on the circuit. This is obviously for the purpose of alerting occupants of a tripped condition, and not required elsewhere in the code. Why not require a similar "alarm" for the furnace circuit? Loss of

heating in the middle of the night in subzero weather may present a greater safety concur for elderly or infirm occupants. Additionally, a deenergized circuit may not be noticed if no lighting or appliances are in use, and many persons may not be aware of how or where to reset a GFCI device. The likelihood of a tripped GFCI is greater with multiple outlet circuits. If reliability of operation is the goal, requirements for an individual circuit, direct or single-receptacle connection, location under the mobile home (ala 1996 code), and no GFCI protection appears to be a better approach.

In essence, the provisions of this section appear to discriminate against mobile home occupants by providing less stringent requirements for a dwelling unit than provided in Article 210.

For example, Section 210-8(a) requires GFCI protection for all counter-top receptacles, not just those within 6 ft of sinks. Section 410-57(c) prohibits a receptacle in a tub or shower space; (b) indicates one may be installed, yet (f) states it is not permitted. Section 210-52(a) includes wall space behind doors for receptacle placement which is excluded by (d) Exception No. 3. Section 210-52(c) requires receptacles at a minimum of every 4 ft; (d) requires receptacles every 6 ft. (closer spacing not permitted?). Sections 210-52(d)(e) and (h) require two receptacles outdoors, at least one in each bathroom, and includes hallways and (e) only requires one outdoor receptacle. Section 210-11(c)(3) requires bathroom branch circuits; (d) does not require a receptacle for such circuit. Section 210-52(f) requires a laundry receptacle; no such requirement in this section.

While the requirements of this article are primarily used by manufacturers there does not appear to be justification for rules which vary from those applicable to other type dwelling units.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirements have been developed to address the particular installations of mobile and manufactured homes. No technical substantiation was submitted to indicate that the present requirements are inadequate for these installations. See panel action on Proposal 19-37 which incorporates the language from the federal installation requirements for manufactured housing.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #945)

19- 47 - (550-10(c), (f), (h)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(c) Delete present text and substitute: Raceway and Cable Protection. Raceways and cables installed through holes, in notches, or parallel to framing members shall comply with the requirements of Section 300-4(a) and (b).

(f) Raceways. Where rigid metal conduit or intermediate metal conduit is terminated at an enclosure with a locknut and bushing connection, two locknuts shall be provided, one inside and one outside of the enclosure. ~~Rigid nonmetallic conduit, or electrical nonmetallic tubing, or surface raceways shall be permitted.~~ All cut ends of conduit and tubing shall be reamed or otherwise finished to remove rough edges.

(h)(1) Exception: Electrical metallic tubing, rigid nonmetallic conduit, or Type MI cable shall be permitted where closely routed against frames and equipment enclosures.

SUBSTANTIATION: Editorial. Raceways are not indicated as permitted to pass through studs in (c) nor is there any requirement, therefore, for protection. The requirements of Section 300-4 are more comprehensive, including other framing members, metal framing members, and installations parallel to framing members.

If the requirements of Section 300-4 are deemed necessary for safety in other type dwelling units, why not mobile home dwelling units? Different requirements in Chapter 5 pertaining to similar installations with different rules in Chapter 3 are confusing when only the type of dwelling unit is different.

The second sentence of (f) is superfluous; already covered in the first paragraph. It suggests other raceways are not permitted even though the reference to RMC, IMC, and tubing indicates they are permitted.

Type MI cable is proposed for the exception since it is resistant to damage and moisture, is small in diameter, and there is no limit on number of bends.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing text is sufficiently clear in determining the requirements. The requirements have been developed to address the particular installations of mobile and manufactured homes and be consistent with federal installation requirements. Where a requirement in chapter three is not modified by this section, the requirement is applicable to these installations.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #2446)

19- 48 - (550-10(c) (New)): Reject

SUBMITTER: Patrick S. Ouillette, Maine Dept. of Professional and Financial Regulation

RECOMMENDATION: Add a new paragraph to 550-10(c) to read as follows:

"Where notches in accordance with Section 300-4(a)(2) are used on the exterior side of wood studs of outside walls, the protective plates shall extend at least 1 in. beyond the edges of the notched wood member."

SUBSTANTIATION: In the last three years, I investigated (3) fires in manufactured (HUD certified) homes that had a common origin. In all cases the occupants of the homes either smelled burning or heard sizzling in the exterior wall of the home. The fires were controlled quickly, which left significant evidence for investigation. In each case the origin was within the outside wall of the manufactured home, where an NM cable passed through notches made on the exterior side of the outside wall studs. The notches were protected with steel plates as required. There were no outlet points at the area of origin of the fires. In at least one case the cause was conclusive. A fastening staple for the vinyl siding had been driven into the cable and caused a short circuit. The staple penetrated the NM cable just beyond the edge of the protective plate. Like many manufactured homes, this home had no structural sheathing over the outside wall studs, but rather a nonstructural insulation board, necessitating fastening the siding into the studs. In an attempt to locate sound support, the installer probably tried fastening horizontally to the left or right when the plate was encountered. In another investigation, a portion of the cable that was not fire damaged contained holes that matched the siding staples used. The holes in the NM cable were spaces apart about the width of a stud; and the portion of cable between the holes was not as discolored as other portions, suggesting that the section of cable between the holes was probably located within the notch and afforded some degree of fire protection.

Some manufacturers of manufactured homes employ notches on the exterior side of outside wall studs as a labor savings measure. A wider protective plate would likely have prevented these three fires, while continuing to allow construction methods that help to control the cost of affordable housing. (See submitter's proposal with photos for Section 545-4, related to modular dwellings.)

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing requirements have proven adequate in the vast majority of installations. The proposed change may or may not eliminate the situation that is reported to have occurred. The current language is consistent with federal installation standards.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #2031)

19- 49 - (550-11(c)(1)): Reject

SUBMITTER: David A. Kerr, Jr., Friendsville, PA

RECOMMENDATION: Revise text to read as follows:

"A bonding conductor shall be connected between the distribution panelboard and accessible copper alloy terminal on the chassis. The terminal shall not be attached by a sheet metal screw.

SUBSTANTIATION: Aluminum and steel terminals always rot away. The underside of a trailer is a very damp location. Sheet metal screws have been outlawed elsewhere, for good reason.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing text does not modify or ammend the general rules of chapters one through four with respect to the method of fastening or the suitability of the equipment for the environment encountered.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #952)

19- 50 - (550-11(c)(2)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence:
The bonding conductor between the distribution panelboard and the chassis shall be solid or stranded, insulated or bare, and shall be minimum No. 8 copper ~~minimum~~ or equivalent.
SUBSTANTIATION: Editorial. Present wording doesn't differentiate between the chassis bonding conductor of (c)(1) and other bonding conductors since this subsection stands alone, but appears to apply to (c)(1).
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation would create confusion because this proposal would only specify the size of one particular bonding jumper.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1089)

19- 51 - (550-11(c)(2)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 8" to "8 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: The NEC Style of Manual does not specify the language used one way or another. The NFPA Manual of Style seems to prefer 10 AWG. Product standards use 10 AWG or 10 AWG 110-6 says that the conductor sizes are expressed in AWG or in circular mils so the AWG is implied. The panel recognizes that the TCC may desire to take a different action to be consistent with the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2035)

19- 52 - (550-11(c)(2)): Reject
SUBMITTER: David A. Kerr, Jr., Friendsville, PA
RECOMMENDATION: Change the final sentence to read:
"The bonding conductor shall be closely routed along surfaces so as not to be exposed to physical damage."
SUBSTANTIATION: This requirement is routinely ignored by manufacturers. The frame bonding conductor routinely gets broken in transit.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation for the proposed change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #946)

19- 53 - (550-13): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Calculations. The following method shall be employed in computing the supply-cord or permanently installed feeder assembly and distribution ~~panelboard~~ equipment load ~~for each feeder assembly~~ for each mobile home in lieu of the procedure shown in Article 220 and shall be based on a 3-wire 120/240-volt supply with 120-volt loads balanced insofar as is practicable between the ~~two legs~~ ungrounded conductors of the 3-wire system.
SUBSTANTIATION: Editorial. The permanently installed feeder permitted in Section 550-5(a) should be specifically included. Where there is a separate main breaker or fused switch not part of the panelboard, distribution "equipment" would include those and the panelboard. It is not always practical to exactly balance loads. "Two legs" is not specific; one must infer the "hot" legs are intended.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing term "feeder assembly" by definition would include a permanently installed feeder. The current text is consistent with federal installation standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #947)

19- 54 - (550-15(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Listed for Outdoor Use. Outdoor receptacles, ~~or convenience outlets,~~ snap switches, and similar devices shall comply with the provisions of Sections 373-2(a), 380-4, and 410-57(a) and (b). ~~be of a gasketed cover type for wet locations.~~
SUBSTANTIATION: Editorial. "Convenience" is not defined; the term is commonly applied to a receptacle outlet. Since a snap switch may not be an "outlet" the requirement should include these and other devices. Present rule doesn't provide for damp locations and the specific conditions covered by the proposed references.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text is clear and precise. See Panel action on Proposal 19-37.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1144)

19- 55 - (550-22): Accept in Principle
Note: The Technical Correlating Committee understands that the action on this proposal further modifies the action on Proposal 19-37.
SUBMITTER: Michael Gregory Owen, Electrical Training & Consulting Service
RECOMMENDATION: Revise text to read:
550-22. ~~Minimum~~ Allowable Demand Factor "Maximum" or just "Allowable Demand Factor".
SUBSTANTIATION: The existing wording could lead one to apply a great demand value resulting in a lower feeder ampacity and rating.
PANEL ACTION: Accept in Principle.
Change title to read "Allowable Demand Factors".
PANEL STATEMENT: This text would be consistent with other demand factor tables, including 550-2.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #948)

19- 56 - (Table 550-22): Accept in Principle
Note: The Technical Correlating Committee understands that the action on this proposal further modifies the action on Proposal 19-37.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise heading:
Demand Factors for Feeders and Services ~~Entrance Conductors.~~
SUBSTANTIATION: Editorial. The first paragraph appears to relate to park site wiring systems. The second paragraph appears to cover park sites and mobile home feeders supplied from a common mobile home service which is not explicitly prohibited. This could permit, for example, a 100-ampere service to supply two mobile home feeders which does not seem to be the intent.
"Service-entrance" conductors excludes application of demand factors for service-lateral and service-drop conductors. The second paragraph allows Section 310-15(b)(6) to apply to such conductors as the word "service" applies to these conductors. Section 555-6 uses the encompassing word "service".
PANEL ACTION: Accept in Principle.
Revise heading text for the table to read as follows:
"Demand Factors for Services and Feeders"
PANEL STATEMENT: The revised language would be consistent with 310-15(b)(6) and Table 310-15(b)(6).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #306)

19- 57 - (550-23): Reject
SUBMITTER: Curtis Patterson, Christenson Electric, Inc.
RECOMMENDATION: As you can see from the diagram I have provided, the home in question is the only one on approximately 10 acres. It is connected to concrete runners and has a block foundation. If this were a stick built home it would not need the additional 200 amp disconnect on the outside of the home, but because it is a manufactured home, according to NEC 550-23 and the local inspector the disconnect is necessary.
My proposal is that wording be inserted to exclude manufactured homes in this situation from this article. Perhaps the words could state:
"If the home is the only one at this address and has a remote service on the premises and a service rated panel in the premises then it shall be exempted from 550-23."
Please word the exception, as you see fit, but this is my intent.
SUBSTANTIATION: It appears to me that 550-23 was written in reference to manufactured homes in a trailer park type setting. In this area, there are getting to be more and more of these manufactured homes on acreage, not in a park type setting.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no specific proposal stated in the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1513)

19- 58 - (550-23): Reject
SUBMITTER: Junior L. Owings, Rep. Oregon Chapter Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text as follows:
550-23. Service Equipment.
(a) Mobile Home Service Equipment. The mobile home service equipment shall be located adjacent to the mobile home and not mounted in or on the mobile home. The service equipment shall be located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves. The service equipment shall be permitted to be located elsewhere on the premises, provided that a disconnecting means suitable for service equipment is located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves. Grounding at the disconnecting means and at the manufactured dwelling shall be in accordance with Section 250-32(a).
SUBSTANTIATION: Adding the proposed wording clarifies the service disconnecting means and the manufactured dwelling frame shall be grounded in accordance with 250-32(a) when the service disconnecting means is not attached to the manufactured dwelling.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation is covered by existing text. (see panel action on Proposal 19-37).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #949)

19- 59 - (550-23(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise penultimate sentence:
The service equipment shall be permitted to be located elsewhere on the premises, provided that a disconnecting means suitable for service equipment and rated not less than the mobile home service equipment is located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves.
SUBSTANTIATION: Editorial. This disconnect is not the mobile home service equipment and therefore the minimum rating of (c) is not applicable. If this disconnect is rated less than 100 amperes the provisions of (c) are undercut.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing Code language under 550-23 (c), which covers equipment rating, addresses this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2781)

19- 60 - (550-23(a)): Reject
SUBMITTER: Daniel L. Robertus, State of Montana Electrical Insp. Dept.
RECOMMENDATION: Revise as follows:
The service equipment shall be located in sight from and not more than 50 ft (15.24 m) ~~30 feet (9.14 m)~~ from the exterior wall of...
SUBSTANTIATION: Per Article 100 Definitions, In sight from is not more than 50 feet. The fault current path for faults originating within the mobile home is still a low resistance path even with the additional 20 feet. Where sized per NEC, the equipment grounding conductor will be able to adequately carry any fault currents that may be imposed on it from the mobile home.
PANEL ACTION: Reject.
PANEL STATEMENT: Data has not been submitted to support the recommendation, specifically the increased distance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2788)

19- 61 - (550-23(a)): Reject
SUBMITTER: Joseph D. Baber, MN State Board of Electricity
RECOMMENDATION: Provide an additional sentence that would allow the service equipment to be located in sight from and not more than 100 ft if the mobile home is located on private property.
SUBSTANTIATION: There are numerous installations with mobile/manufactured homes located on private property that may consist of acreage or large lots that have combination meter/service equipment furnished by the serving utility. This seems to be the trend with the beginning of deregulation. Many of the utilities have begun a policy know as "lot line metering". The pedestal or pole is very obvious in its location and the 30 ft rule creates redundant equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: Data has not been submitted to support the recommendation, specifically the increased distance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2156)

19- 62 - (550-23(b)(2)): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
The service equipment is installed in ~~a~~ an approved manner. ~~acceptable to the authority having jurisdiction.~~
SUBSTANTIATION: "Approved" is defined in Article 100 of the NEC as "acceptable to the authority having jurisdiction."
"Standard terms have been established through accepted use or by definition and are to be used..." [NEC Style Manual 3.2.4 Standard Terms]. "Approved" is listed as one of the standard terms in Annex B of the Style Manual and defined in the code; therefore, "approved" should be used in place of its definition.
PANEL ACTION: Reject.
PANEL STATEMENT: The action on Proposal 19-37 would eliminate this text. The text is not needed because all installations must meet AHJ approval.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #950)

19- 63 - (550-23(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Rating. Individual ~~mobile home~~ service equipment shall be provided for each mobile home and rated at not less than 120/240-volts ... remainder unchanged).
SUBSTANTIATION: Though not the norm for mobile home parks, there is no specific requirement to disallow a common service equipment for two mobile homes if it complies with Section 550-23(a).
PANEL ACTION: Reject.

PANEL STATEMENT: The existing code is clear and more concise then the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3653)

19- 64 - (550-23(d)): Reject
SUBMITTER: Mahlon Davenport, Rep. Commonwealth Code Inspection Service Inc.
RECOMMENDATION: Revise text to read as follows:
"Mobile home service equipment may also contain a means for connecting a mobile home accessory building or structure...".
SUBSTANTIATION: Since mobile homes require 100 amp 120/240 sub panels, lots of circuit are available inside. Outside panels need field installed main breakers and are susceptible to overheating.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation is unenforceable Code language. Existing code addresses the issue and does not require outside panels.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #4055)

19- 65 - (550-23(d)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./Electric Light & Power Group
RECOMMENDATION: Change to read as follows:
550-23(d) Additional Outside Electrical Equipment. Either mobile ~~Mobile~~ home service equipment or the external disconnecting means permitted in Section 550-23(a) shall be permitted to ~~also~~ contain a means for connecting a mobile home accessory building or structure, or additional electrical equipment located outside a mobile home by a fixed wiring method.
SUBSTANTIATION: Section 550-23(d) requires the "service equipment" to provide a means for connecting a mobile home accessory building or structure, or additional electrical equipment located outside a mobile home, however Section 550-23(a) permits the service equipment to be located elsewhere on the premises, provided that a disconnecting means suitable for service equipment is located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves. When this occurs, it is believed that it is acceptable to make provisions for the connection of equipment external to the mobile home as part of the disconnect installation. This additional disconnect may be suitable as service equipment but it is not the service equipment and it is being supplied by a feeder not a service.
This problem becomes very apparent in the 1999 NEC when the mobile home is served via meter packs that include tenant breakers. This type of installation is very common, however in this case the meter pack becomes the service equipment, but has no possible provision for any additional circuits as required in 550-23(d). Therefore meter packs with tenant breakers in mobile home parks would violate the 1999 NEC. In the 1996 NEC it was permitted to install "fuses and disconnecting means or circuit breakers" on the supply side of a service disconnect via Section 230-82, Exception No. 2. This allowed the serving utility to feed the mobile home service equipment from a meter pack, however this exception was eliminated in the 1999 NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing Code allows what is requested in the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
SABIN-MERCADO: EL& P votes negatively with the comment that the proposal needs to be accepted -in-principle on the basis that the Panel did not provide specific technical substantiation to reject the proposal, refer to the sketch description that provides a description of the problem.
Note: Supporting material available for review upon request at NFPA headquarters.

(Log #2782)

19- 66 - (550-24(a)): Reject
SUBMITTER: Daniel L. Robertus, State of Montana Electrical Insp. Dept.
RECOMMENDATION: Revise as follows:
Or a permanently installed feeder consisting of four, ~~insulated,~~ color-coded conductors that shall be identified.
SUBSTANTIATION: The reasoning for the requirement for an insulated equipment grounding conductor (isolated fault current path) to a mobile home is moot when a supplemental grounding electrode meeting the NEC requirements is installed at the mobile home. It provides a second path from the mobile home to the mobile disconnect for fault current through the earth. The insulated conductor provides no additional safety over an uninsulated conductor. A bare copper conductor would provide a low impedance path for fault current as effectively as an insulated conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: Color coding an uninsulated wire would be problematic. Also, if the wire were aluminum it would require insulation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2783)

19- 67 - (550-24(a) Exception No. 2 (New)): Reject
SUBMITTER: Daniel L. Robertus, State of Montana Electrical Insp. Dept.
RECOMMENDATION: Add an exception to read as follows:
Exception No. 2: Where a feeder is installed to a manufactured home distribution panelboard from service equipment installed on the manufactured home meeting the requirements of 550-23(b), the feeder shall be permitted to be any approved wiring method described in Chapter 3.
SUBSTANTIATION: Where manufactured homes are now built to similar standards as site built housing and generally do not have exterior metallic coverings, the hazards which formed the requirement for the insulated equipment ground are not any greater than those in a standard site built home. With the installation of the service on the exterior of the manufactured home, SER cable appears to be a wiring method that many installers would like to utilize. The uninsulated equipment ground in SER cable makes its use a code violation at this time.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation would create a conflict with the existing federal installation standards.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #951)

19- 68 - (550-24(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Adequate ~~Feeder~~ Capacity. Mobile home lot feeder and service conductors supplying the mobile home service equipment and the disconnecting means permitted by Section 550-23(a) shall have adequate capacity for the loads supplied and shall be rated not less than 100-amperes at 120/240 volts. Conductors in compliance with Section 310-15(b)(6) shall be permitted.
SUBSTANTIATION: Service conductors and the conductors from the service equipment to the disconnect permitted in Section 550-23(a) should be included. The reference to Section 310-15(b)(6) is suggested as the feeder conductors in the last paragraph of Section 550-22 are not the mobile home lot supply conductors, and "rated" may be equated with ampacity.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal deals with service not feeders and would make the existing requirement more difficult to understand.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
BAUMAN: The Panel Statement is inverted. The Panel Statement should say that the section refers to feeders, not services.

(Log #2848)

19- 69 - (550-25): Accept in Principle in Part

Note: The Technical Correlating Committee understands that the action on this proposal further modifies the action on Proposal 19-37.

SUBMITTER: Robert J. Clarey, Cutler-Hammer, Inc.

RECOMMENDATION: Revise text as follows:

Arc-Fault Circuit-Interrupter Protection

(a) Definition. Arc-Fault Circuit-Interrupters are defined in 210-12(a).

(b) Bedrooms and living areas of mobile homes and manufactured homes. All branch circuits that supply 125-volt single-phase, 15- and 20-ampere outlets installed in bedrooms and living areas of mobile homes and manufactured homes shall be protected by arc-fault circuit interrupter(s).

FPN: A mobile home or manufactured home living area is any space,that can be normally occupied, other than bedrooms, bathrooms, toilet compartments, kitchens, closets, halls, storage, garage or utility spaces.

SUBSTANTIATION: The 1999 National Electrical Code mandates the use of Arc-Fault Circuit Protection for all branch circuits that supply 125-volt single phase 15- and 20-ampere receptacle outlets installed in dwelling unit bedrooms (see 210-12(b)). Through the detection and interruption of arcing faults, these branch/feeder AFCIs, located at the source of the branch or feeder, provide additional protection against fires associated with electrical arcing in the installed wiring and beyond. Proposals for the 2002 National Electrical Code will seek to expand this AFCI protection to the circuits supplying the outlets of dwelling unit bedrooms and living areas. In particular, the present proposal is aimed at extending branch/feeder AFCI protection to the circuits supplying the bedroom and living area outlets of mobile homes and manufactured homes.

The impetus for this Code change is to reduce the number of electrically-related fires in mobile homes and manufactured homes, with their associated death toll, injury toll and property damage. The 1998 U.S. Consumer Product Safety Commission report (1) entitled "1996 Residential Fire Loss Estimates" provides estimates of the fire losses, in residential structures, for the total electrical distribution system. For 1996 the estimate is 41600 fires, 370 civilian deaths, 1430 civilian injuries, and $682.5M in property losses. This CPSC report does not delineate Mobile Homes and Manufactured Homes within the overall category of Residences. However, a 1999 Federal Emergency Management Agency publication (2), entitled "Fire in the United States 1987-1996", states that "Manufactured housing, separated from the dwelling category, has a much greater share of fire deaths (11%) relative to its share of fires (4%). Deaths per fire are approximately twice as high for manufactured housing as for other dwellings". Although this FEMA report does not separate out the fires of electrical origin, it will be apparent that reductions in the number of fires will reduce the overall death toll. We can all relate to tragic cases of fires, of electrical origin, within such homes. As with residences in general, such fires can frequently be related to accidental wiring abuses and neglect.

An explanation of AFCIs is given in the 1997 IAEI paper (3) (copy provided). When used in conjunction with circuit breakers, these devices provide additional fire protection. Conventional circuit breakers are equipped with bimetal-elements and magnetic trip elements, and they protect the circuit wiring by responding to overcurrents. During low-current overloads, heating of the bimetal causes the breaker to unlatch the contact-separation mechanism. For high overcurrent conditions, the associated high magnetic fields cause "instantaneous tripping" of the circuit breaker. However, these thermal-magnetic circuit breakers are not specifically designed to respond to arcing faults. By contrast, AFCIs are designed to detect and interrupt the sputtering (intermittent) arcs associated with arcing faults. These devices have the ability to distinguish the waveshapes of these intermittent arcs from the transient inrush currents associated with motors, ballasts, and electronic equipment. In particular, AFCIs can interrupt arc-fault currents even though the rms current of the intermittent fault is below the handle rating of the circuit breaker.

During the previous Code cycle, the subject of AFCIs was discussed in depth, within Code Making Panel 2. At that time there were concerns with the newness of the technology. In the ensuing years, however, significant events have occurred that provide additional confidence in the availability and value of branch/feeder AFCIs. These are: First, in February 1999, Underwriters Laboratories published the first Edition of UL 1699 "Arc-Fault Circuit-Interrupters". The branch/feeder AFCIs described in that document are substantially identical to the "AFCIs classified for mitigating the effects of arcing faults" that were available during the 1999 Code cycle, and that were previously described in a draft standard. The branch/feeder AFCIs described in UL 1699 protect the installed wiring, and also provide protection against line to neutral and line to ground arcing faults in the cords connected to the outlets. The existence of this standard, and of the associated branch/feeder products, indicates that the products have matured. Second, many circuit breaker manufacturers now offer combination circuit breakers and branch/feeder AFCIs. Thus, AFCI devices are readily available. Third, Manufacturers have gained hundreds of millions of operating-hours experience with AFCIs. The consumers have benefited from the enhanced arcing fault protection. Further, consumers have not experienced "nuisance tripping" due to the false identification of circuit waveforms such as the inrush transients to motors, and the normally occurring arcing waveforms associated with devices such as thermostats, motors, and switches. Fourth, AFCI manufacturers have made numerous AFCI presentations to fire inspectors, electrical inspectors, and other groups concerned with public safety. This has raised awareness of both the technology and the associated safety potential, and the overwhelming response has been both positive and enthusiastic. Fifth, in 1999 the Consumer Product Safety Commission has made a brief report (4) entitled "Preventing Home Fires: Arc Fault Circuit Interrupters (AFCIs)". This report includes the statement, "Several years ago, a CPSC study identified arc fault detection as a promising new technology. Since then, CPSC electrical engineers have tested the new AFCIs on the market and found these products to be effective". Thus, AFCIs have moved from the conceptual stage, as discussed in the 1995 UL Report for CPSC "Technology for Detecting and Monitoring Conditions that Could Cause Electrical Wiring System Fires" to the practical stage. In particular, they are available on the market and are effective.

As with other types of residences, mobile homes and manufactured homes suffer the consequence of fires of electrical origin within the total electrical distribution system. For all residences, such electrical fires represent about 10% of all residential fires. This 10% number still represents the tragic loss of 370 lives, severe injuries, and huge property losses. The presence of presently available AFCIs at the origin of the branch circuit will result in enhanced safety through the detection and interruption of arcing events within the installed wiring. These branch/feeder AFCIs will also detect and interrupt line to neutral and line to ground faults in the cords connected to the outlets. The technology is available, the technology is effective, the technology has been included in the Code for dwelling units, and the Code Panel is now urged to accept this proposal which would apply the fire-safety-benefits of AFCIs to mobile homes and manufactured houses.

References:

(1) "1996 Residential Fire Loss Estimates", U.S. Consumer Product Safety Commission Report, 1998.

(2) "Fire in the United States 1987-1996", Eleventh Edition, Federal Emergency Management Agency, FA-173/August 1999.

(3) "Arc-Fault Circuit Interrupters: New Technology for Increased Safety", J. C. Engel, R. J. Clarey, and T. M. Doring, International Association of Electrical Inspectors News, November/December, pages 24-27, 1997.

(4) "Preventing Home Fires: AFCIs", Consumer Product Safety Review, Volume 4, #1, page 6, Summer 1999.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle in Part.

Revise text as follows:

"Arc-Fault Circuit-Interrupter Protection

(a) Definition. Arc-Fault Circuit-Interrupters are defined in 210-12(a).

(b) Bedrooms of mobile homes and manufactured homes. All branch circuits that supply 125-volt single-phase, 15- and 20-ampere outlets installed in bedrooms of mobile homes and manufactured homes shall be protected by arc-fault circuit interrupter(s)."

PANEL STATEMENT: The part of the recommendation that dealt with other living areas was deleted from the recommendation until more field experience with other locations can be obtained.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

MCCULLOUGH: I vote to reject this proposal. While not arguing the pros and cons of AFCIs, I believe that this requirement should not be included in the NEC unless or until this issue is acted upon by the NFPA 501 committee. The Panel Action on

Proposal 19-37 was to improve and ensure consistency between the NEC and NFPA 501 and acceptance of this proposal puts the two documents at odds.

WEAKLEY: The proposal concerns AFCIs in a manufactured home. The manufactured home industries' argument is that if it is not specific to the article then compliance would not be required. The consensus was that enforcement/compliance is for standards that are specific to their article (550) (by reference it is secific). The language that exists makes clear reference to other articles that are applicable. My position is, the code book is large enough, and that redundant text is not necessary. I also felt that it was a product that would eventually be an integral part of all circuit breakers, and that by reference is covered in other articles.

ARTICLE 551 — RECREATIONAL VEHICLES AND RECREATIONAL VEHICLE PARKS

(Log #521)

19- 70 - (551): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 1. In Section 551-2. Definitions. Frame., replace "16 MSG" with "1.35 mm (0.053 in.)".

2. In Section 551-2. Definitions. Travel Trailer., replace "320 ft^2 (29.7 m^2)" with "30 m^2 (320 ft^2)".

3. In Section 551-10(b)(4), replace "4 ft (1.22 m)" with "1.2 m (4 ft)".

4. In Section 551-10(b)(5), replace "18 in. (457.2 mm)" with "450 mm (18 in.)".

5. In Section 551-10(c)(3), replace "1/2-in. (12.7 mm)" with "13 mm (1/2-in.)".

6. In Section 551-10(d), replace "1.7 in^2 (1100 mm^2)" with "1100 mm^2 (1.7 in^2)" and replace "2 in. (50.8 mm)" with "50 mm (2 in.)".

7. In Section 551-10(e)(4) and its Exception, replace "18 in. (457 mm)" with "450 mm (18 in.)" throughout.

8. In Section 551-30(e), replace "18 in. (457 mm)" with "450 mm (18 in.)" throughout.

9 . In Section 551-41(a), replace "2 ft (610 mm)" with "600 mm (2 ft)" and replace "6 ft (1.83 m)" with "1.8 m (6 ft)".

10. In Section 551-41(b)(1), replace "12 in. (305 mm)" with "300 mm (12 in.)".

11. In Section 551-41(b)(3), replace "12 in. (305 mm)" with "300 mm (12 in.)" and replace "6 ft (1.83 m)" with "1.8 m (6 ft)".

12. In Section 551-41(c)(2) and its Exception No. 3, replace "6 ft (1.83 m)" with "1.8 m (6 ft)" throughout.

13. In Section 551-43(b), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".

14. In Section 551-45(b), replace "24 in. (610 mm)" with "600 mm (24 in.)" and replace "30 in. (762 mm)" with "750 mm (30 in.)".

15. In Section 551-45(b) Exception No. 1, replace "22 in. (559 mm)" with "550 mm (22 in.)" and replace "2 in. (50.8 mm)" with "50 mm (2 in.)".

16. In Section 551-46(b), replace "23 ft (7.0 m)" with "7.0 m (23 ft)"; "28 ft (8.5 m)" with "8.5 m (28 ft)"; and "3 ft (0.9 m)" with "900 mm (3 ft)" throughout.

17. In Section 551-46(d), replace "3 in. (76 mm)" with "75 mm (3 in.)"; "1 3/4 in. (44.5 mm)" with "45 mm (1 3/4 in.)"; "0.020-in. (508-µm)" with "0.51 mm (0.020 in.)"; and "0.005-in. (127-µm)" with "0.13 mm (0.005 in.)".

18. In Section 551-46(e), replace "15 ft (4.57 m)" with "4.5 m (15 ft)" and replace "18 in. (457 mm)" with "450 mm (18 in.)".

19. In Section 551-46(e) Exception No. 2, replace "15 ft (4.57 m)" with "4.5 m (15 ft)" throughout.

20. In Section 551-47(e) Exception No. 2, replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)" and replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".

21. In Section 551-47(g), replace "2 in. by 4 in." with "2-by-4"; "2 in. by 2 in." with "2-by-2"; "1 1/4 in. (31.8 mm)" with "32 mm (1 1/4 in.)"; and "No. 16 MSG" with "1.35 mm (0.053 in.)".

22. In Section 551-47(i), replace "12 in. (305 mm)" with "300 mm (12 in.)" and replace "4 1/2 ft (1.37 mm)" with "1.4 m (4 1/2 ft)".

23. In Section 551-47(j), replace "8 in. (203 mm)" with "200 mm (8 in.)".

24. In Section 551-47(l), replace "0.030 in. (762 µm)" with "0.76 mm (0.030 in.)" and replace "0.040 in. (1.016 mm)" with "1.0 mm (0.040 in.)".

25. In Section 551-77(a), replace "9 ft (2.74 m), +1 ft (0.3 m)" with "2.7 m + 0.3 m (9 ft + 1 ft)"; "15 ft (4.57 m)" with "4.5 m (15 ft)"; "16 ft (4.88 m)" with "4.9 m (16 ft)"; and "32 ft (9.75 m)" with "10 m (32 ft)".

26. In Sections 551-77(c) and (d), replace "2 ft (610 mm)" with "600 mm (2 ft)" and replace "6 1/2 ft (1.98 m)" with "2.0 m (6 1/2 ft)" throughout.

27. In Section 551-79, replace "18 ft (5.49 m)" with "5.5 m (18 ft)" and replace "3 ft (914 mm)" with "900 mm (3 ft)".

28. In Section 551-80(b), replace "18 in. (457 mm)" with "450 mm (18 in.)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following. In Items 1 and 21, No. 16 MSG is considered to represent a nominal metal thickness, corresponding to a thickness value not commonly known or available to the users of the NEC. The equivalent nominal decimal thickness is 0.060 in., based on material standards and handbooks. However, since this value is nominal, a tolerance must be applied to achieve a minimum allowable thickness. The accepted industry practice is to apply a minus tolerance of 0.007 in. for 16 MSG, resulting in a minimum thickness of 0.053 in. (1.35 mm). The SI units and inch-pound numbers in parenthesis are not shown for Item 21's stud sizes since they are not a direct conversion and a Trade Size is provided.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #1090)

19- 71 - (551): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise Article 551 as follows:

551-10(b)(2) - change "No. 6 through No. 18" to "6 through 18 AWG"

551-10(c)(5) - change "No. 8" to "8 AWG" in two places

551-20(c) - change "No. 8" to "8 AWG"

551-43(b) - change "No. 14" to "14 AWG"

551-56(c) - change "No. 8" to "8 AWG".

SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

PANEL STATEMENT: The NEC Style of Manual does not specify the language used one way or another. The NFPA Manual of Style seems to prefer 10 AWG. Product standards use 10 AWG or 10 AWG 110-6 says that the conductor sizes are expressed in AWG or in circular mils so the AWG is implied The panel recognizes that the TCC may desire to take a different action to be consistent with the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #425)

19- 72 - (551-2-Disconnecting Means): Reject

SUBMITTER: William J. Miller, Newmar Corp.

RECOMMENDATION: Revise definition of Disconnecting Means to read as follows:

Disconnecting Means. The necessary equipment usually consisting of a circuit breaker or fuses, and their accessories, <u>or plug and receptacle,</u> ~~located near the point of entrance of the supply conductors in~~ <u>on</u> a recreational vehicle and intended to constitute the means of cutoff for the supply to that recreational vehicle.

SUBSTANTIATION: Section 551-30(b), second paragraph states that "Receptacles used as a disconnecting means shall be" etc.. — therefore, the definition should include plug and receptacle as a disconnecting means. These plugs and receptacles for disconnecting the generator may be the same plug that is at the end of the power supply that is required on all recreation vehicles per 551-46. If that is the disconnecting means for the generator, it would follow that it is the disconnecting means for the power

supply to the recreational vehicle. The location of that disconnecting means becomes irrelevant since all units have the cord and plug arrangement at the entrance of the power supply. The cord is part of the recreation vehicle.
PANEL ACTION: Reject.
PANEL STATEMENT: Existing 551-45(c) and 551-77(b) conflict with this recommendation because the use of a plug and receptacle is not permitted. The recommendation would encourage the use of a plug and receptacle to be the disconnecting means.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1396)

19- 73 - (551-2-Recreational Vehicle Site): Accept
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise to read:
Recreational Vehicle Site. A plot of ground within a recreational vehicle park set aside for the accommodation of a recreational vehicle on a temporary basis. It can be used as either a recreational vehicle site or as a camping unit site.
SUBSTANTIATION: NFPA has developed a glossary of standard terms that are used in all of its codes and standards. One of the goals of the glossary project is to provide a single consistent definition for each term that can be used in each code or standard in which the term is used. In this instance, the preferred definition can be found in NFPA 501D.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel recognizes that 501D is now NFPA 1194.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GORIN: Section 1-3 of the 1999 Edition of ANSI A119.4/NFPA 1194 eliminates the definition of a "Recreational Vehicle Site" and substitutes the term "Camping Unit Site" for all sites within an RV park of campground.

(Log #2260)

19- 74 - (551-10): Accept in Principle
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
551-10. Low-Voltage Systems
(a) Low-Voltage Circuits. Low-voltage circuits furnished and installed by the recreational vehicle manufacturer, other than automotive vehicle circuits or extensions thereof, are subject to this Code. Circuits supplying lights subject to federal or state regulations shall comply with applicable government regulations and this Code.
(b) Low-Voltage Wiring.
~~1.~~ (1) Material. Copper conductors shall be used for low-voltage circuits.
Exception: Metal chassis or frame shall be permitted as the return path to the source of supply.
~~2.~~ (2) Conductor Types. Conductors shall conform to the requirements for Type GXL, HDT, SGT, SGR, or Type SXL or shall have insulation in accordance with Table 310-13 or the equivalent. Conductor sizes No. 6 through No. 18 or SAE shall be listed. Single-wire, low-voltage conductors shall be of the stranded type.
FPN: See SAE Standard J1128-1995 for Types GXL, HDT, and SXL and SAE Standard J1127-1995 for Types SGT and SGR.
~~3. Single-wire, low-voltage conductors shall be of the stranded type.~~
~~4.~~ (3) Marking. All insulated low-voltage conductors shall be surface marked at intervals not greater than 4 ft (1.22 m) as follows.
~~a.~~ (1) Listed conductors shall be marked as required by the listing agency.
~~b.~~ (2) SAE conductors shall be marked with the name or logo of the manufacturer, specification designation, and wire gauge.
~~c.~~ (3) Other conductors shall be marked with the name or logo of the manufacturer, temperature rating, wire gauge, conductor material, and insulation thickness.
~~5.~~ (4) Insulation Rating. Conductors shall have a minimum insulation rating of 90°C (194°F) for interior installations and 125°C (257°F) for all engine compartment wiring or any under-chassis installations where conductors are located less than 18 in. (457.2 mm) from any component of an internal combustion engine exhaust system.
(c) Low-Voltage Wiring Methods.
~~1.~~ (1) Physical Protection. Conductors shall be protected against physical damage and shall be secured. Where insulated conductors are clamped to the structure, the conductor insulation shall be supplemented by an additional wrap or layer of equivalent material, except that jacketed cables shall not be required to be so protected. Wiring shall be routed away from sharp edges, moving parts, or heat sources.
~~2.~~ (2) Splices. Conductors shall be spliced or joined with splicing devices that provide a secure connection or by brazing, welding, or soldering with a fusible metal or alloy. Soldered splices shall first be spliced or joined so as to be mechanically and electrically secure without solder and then soldered. All splices, joints, and free ends of conductors shall be covered with an insulation equivalent to that on the conductors.
~~3.~~ (3) Separation. Battery and dc circuits shall be physically separated by at least a 1/2-in. (12.7-mm) gap or other approved means from circuits of a different power source. Acceptable methods shall be by clamping, routing, or equivalent means that ensure permanent total separation. Where circuits of different power sources cross, the external jacket of the nonmetallic-sheathed cables shall be deemed adequate separation.
~~4.~~ (4) Ground Connections. Ground connections to the chassis or frame shall be made in an accessible location and shall be mechanically secure. Ground connections shall be by means of copper conductors and copper or copper-alloy terminals of the solderless type identified for the size of wire used. The surface on which ground terminals make contact shall be cleaned and be free from oxide or paint or shall be electrically connected through the use of a cadmium, tin, or zinc-plated internal/external-toothed lockwasher or locking terminals. Ground terminal attaching screws, rivets or bolts, nuts, and lockwashers shall be cadmium, tin, or zinc-plated except rivets shall be permitted to be unanodized aluminum where attaching to aluminum structures.
~~5.~~ The chassis-grounding terminal of the battery shall be bonded to the vehicle chassis with a minimum No. 8 copper conductor. In the event the power lead from the battery exceeds No. 8, then the bonding conductor shall be of an equal size.
(d) Battery Installations. Storage batteries subject to the provisions of this Code shall be securely attached to the vehicle and installed in an area vaportight to the interior and ventilated directly to the exterior of the vehicle. Where batteries are installed in a compartment, the compartment shall be ventilated with openings having a minimum area of 1.7 in.^{2} (1100 mm^2) at both the top and at the bottom. Where compartment doors are equipped for ventilation, the openings shall be within 2 in. (50.8 mm) of the top and bottom. Batteries shall not be installed in a compartment containing spark- or flame-producing equipment, except that they shall be permitted to be installed in the engine generator compartment if the only charging source is from the engine generator.
(e) Overcurrent Protection.
~~1.~~ (1) Wiring. Low-voltage circuit wiring shall be protected by overcurrent protective devices rated not in excess of the ampacity of copper conductors, ~~as follows.~~ in accordance with Table 551-10(E)(1).
Table 551-10(e)(1). Low-Voltage Overcurrent Protection
[Insert Table 551-10(e)(1) from 1999 NEC here]
~~2.~~ (2) Type. Circuit breakers or fuses shall be of an approved type, including automotive types. Fuseholders shall be clearly marked with maximum fuse size, and both circuit breakers and fuses shall be protected against shorting and physical damage by a cover or equivalent means.
FPN: For further information, see Standard for Electric Fuses (Cartridge Type), ANSI/SAE J554-1987; Standard for Blade Type Electric Fuses, SAE J1284-1988; and Standard for Automotive Glass Tube Fuses, UL 275-1993.
~~3.~~ (3) Appliances. Higher current-consuming, dc appliances, such as pumps, compressors, heater blowers, and similar motor-driven appliances, shall be installed in accordance with the manufacturer's instructions.

Motors that are controlled by automatic switching or by latching-type manual switches shall be protected in accordance with Section 430-32(c).

~~4.~~ (4) Location. The overcurrent protective device shall be installed in an accessible location on the vehicle within 18 in. (457 mm) of the point where the power supply connects to the vehicle circuits. If located outside the recreational vehicle, the device shall be protected against weather and physical damage.

Exception: External low-voltage supply shall be permitted to have the overcurrent protective device within 18 in. (457 mm) after entering the vehicle or after leaving a metal raceway.

(f) Switches. Switches shall have a dc rating not less than the connected load.

(g) Lighting Fixtures. All low-voltage interior lighting fixtures rated more than 4 watts, employing lamps rated more than 1.2 watts, shall be listed.

(h) Cigarette Lighter Receptacles. Twelve-volt receptacles that will accept and energize cigarette lighters shall be installed in a noncombustible outlet box, or the assembly shall be identified by the manufacturer of the product as thermally protected.

SUBSTANTIATION: Changes add titles and use new layout in accordance with the new Style Manual. Existing 551-10(b)(3) is incorporated as new last sentence of (b)(2) as more appropriate placement, remaining levels renumbered accordingly. Existing 551-10(c)(5) is incorporated as last sentence of (c)(4). 550-10(e)(1) is revised to include specific reference to Table 551-10(e)(1) rather than using the wording "as follows."

PANEL ACTION: Accept in Principle.

Revise text in title of Section (e)(1) from "wiring" to "rating".

PANEL STATEMENT: This terminology is more accurate.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #3636)

19- 75 - (551-10(a) through (h)): Reject

SUBMITTER: Kent Perkins, Recreational Vehicle Industry Assn.

RECOMMENDATION: Delete 551-10(a) through (h).

SUBSTANTIATION: The substantiation from 1999 ROP Log #2752 still applies. The adoption of ANSI 12V for use with RV and CV low voltage systems by all jurisdictions is anticipated and this section of the NEC should be deleted.

The substantiation of Log #2752 states:

"The ever increasing pace of automotive technology changes and the rapid advances in the capabilities of basic materials and derived systems have often led to conflicts of the current provisions for 12 v DC construction and the needs of the recreational vehicle products. The National Electrical Code has basically addressed 120/240 volt AC needs for all construction and through the provisions of Article 551 addressed the special needs of recreational vehicles. Paragraph 90-2(b)(1) states that similar products using low voltage systems such as watercraft, aircraft, and automotive vehicles (other than mobile homes and recreational vehicles) are not covered by the present Code. Article 551 Part B paragraph 551-10 Low Voltage Systems falls short of today's need to address integration of the automotive designs and the recreational vehicle's historic 12 v systems."

In addition, while CMP-19 agreed in concept with the substantiation during the 1999 NEC revision process, they were concerned no other low voltage requirements exist. The ANSI/RVIA 12V for conversion vehicles and recreational vehicles is currently under letter ballot for gaining ANSI recognition. Several CMP-19 members are participants on the canvas list who are responsible for the approval process of this standard.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no adequate standard in place to replace the existing low voltage requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

COMMENT ON AFFIRMATIVE:

ZIEMAN: I do not agree with the Submitter's statement that "Code-Making Panel 19 agreed in concept with the substantiation during the 1999 NEC revision process."

The submitter has failed to substantiate the need for going to an outside standard (ANSI/RVIA 12V Low Voltage...) instead of revising and updating the low voltage requirements currently with Section 551-10.

(Log #953)

19- 76 - (551-10(c)(1)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add new text to read as follows:

Conductors shall be continuous without splice between boxes, other enclosures, and equipment. Conductors installed through holes, in notches, or parallel to framing members shall comply with applicable requirements of Section 300-4. Where conductors without a metal sheath or armor, or installed in electrical nonmetallic tubing or liquidtight flexible nonmetallic conduit, pass through punched, cut, or drilled holes in metal members, they shall be protected by bushings or grommets securely fastened in the opening prior to installation of the conductors.

SUBSTANTIATION: Splices should be limited to accessible points. The proposal provides specifics to complement the general requirement of the first sentence, as is done in Section 551-47(g) for 120-volt systems to augment general requirement of Section 300-4.

PANEL ACTION: Reject.

PANEL STATEMENT: No safety data has been submitted to support the recommendation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #954)

19- 77 - (551-10(e)(3), (f)): Accept in Part

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(e) (3) ~~Higher current consuming, direct current appliances~~ Appliances such as pumps, compressors, heater blowers, and similar motor-driven appliances, shall be installed in accordance with the manufacturers instructions.

Motors that are controlled by automatic switching or latching type manual switches shall be protected in accordance with Section 430-32(c).

(f) Switches. Switches shall have a suitable ~~direct~~ current rating not less than the connected load.

SUBSTANTIATION: Editorial. In a technical sense appliances don't "consume" current. "Higher current" is not defined and requires subjective judgment. Shouldn't all appliances be installed per manufacturers instructions? The delete phrases do not adversely affect the rule. The definition of low-voltage in Section 551-2 does not limit these systems to dc. While dc is prevalent (or exclusive) ac is not excluded. The panel previously stated they do not intend to exclude ac systems. (Proposal 19-50 in the 1995 ROP.)

PANEL ACTION: Accept in Part.

The panel accepts the deletion of "Higher current consuming" in the first line of the recommendation.

PANEL STATEMENT: The existing language clearly specifies dc appliances and does not need further clarification. The dc switches require a dc rating.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #3635)

19- 78 - (551-10(g)): Accept in Principle

SUBMITTER: Kent Perkins, Recreational Vehicle Industry Assn.

RECOMMENDATION: Add as a second paragraph to read as follows:

"Ceiling fixtures in camping trailers shall be automatically deenergized by an interlock when folding down the trailer or it shall be physically impossible to fold down the trailer unless the ceiling fixture(s) are disconnected."

SUBSTANTIATION: This requirement harmonizes the NEC standard with the Canadian Standards Association (CSA) RV Standard, 1999 - Z240, paragraph 4.12.8, which reads as follows:

"Ceiling fixture(s) in tent trailers shall be automatically deenergized by an interlock when "folding down" the trailer or it shall be physically impossible to "fold down" the trailer unless the ceiling fixture(s) is (are) disconnected."

PANEL ACTION: Accept in Principle.

Change "fixture" to "luminaire" in the recommendation.

PANEL STATEMENT: See recommendation in Proposal in 19-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #2802)

19- 79 - (551-20(b), Exception): Accept in Principle
SUBMITTER: Terry Current, Jayco, Inc.
RECOMMENDATION: Change exception to second paragraph to read as follows:
Exception: A low-voltage appliance that is controlled by a momentary switch (normally open) that has no means for holding in the closed position or refrigerators with 120-volt function priority over 12-volt function shall not be considered as a connected load when determining the required converter rating. Momentarily energized appliances shall be limited to those used to prepare the vehicle for occupancy or travel.
SUBSTANTIATION: The refrigerator manufacturer guidelines are the 120-volt operation is the most efficient and first recommended mode of operation with LP-gas being second and 12-volt third typically to be used during travel and/or refueling. Accordingly, the 12-volt mode of operation is not likely used when 120-volt is available. The LP-Gas mode is used in the event 120-volt power is not available. The power supply selection is further supported by the defaults to the energy source of the refrigerators with automatic mode selection features as the supply is selected in the order of the most efficient preferred mode.
The proposal harmonizes NFPA 70 National Electrical Code with CAN/CSA-Z240 4.10(3) that has been in effect since at leas 1982 without adverse effect to vehicle performance or compromise of safety, and allows additional design flexibility.
PANEL ACTION: Accept in Principle.
Revise recommendation as follows:
"or refrigerators with an automatic 120-volt function priority over 12-volt function"
PANEL STATEMENT: The addition of the term automatic would ensure safe operation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1498)

19- 80 - (551-20(c)): Reject
SUBMITTER: Bill Wallace, Magnetek Inc.
RECOMMENDATION: Revise text as follows:
~~(The grounding conductor for the battery and metal enclosure shall be permitted to be the same conductor.)~~ The unit should be provided with a separate chassis bonding lead and shall not be used in combination with any current carrying conductor.
SUBSTANTIATION: The intent of this paragraph is to prevent 12-volt fault currents from finding their way back to the vehicle frame over the ac grounding conductor of the converter. In the case of a bad connection between the battery bonding conductor required by 551-10(c)(5) and the vehicle frame, current does flow back through the converter power supply cord.
Note: Supporting material available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation was not supported by the drawings. The safety problem was not clearly explained in the substantiation. The recommendation contains nonmandatory language (should).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3379)

19- 81 - (551-41(e) (New)): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add new text to read as follows:
(e) All receptacles shall be of the back-wired or screw-terminal type. No receptacles shall be permitted to be installed using only the push-in connection.
SUBSTANTIATION: Receptacles wired with solid wire using push-in type connections are not suitable for use in recreational vehicles.
Stranded wire should be required for all wiring in recreational vehicles, as solid wire breaks from the vibration and shaking of the wires during the motion of the vehicle. Solid wire is not suitable for use in recreational vehicles.
I have had to replace all of the receptacles in my nine year old travel trailer because of overheating at the receptacle where the solid wire has been pushed into the receptacle.
Connections to receptacles should only be made using either terminal screw or back-wired methods. Both which work well with stranded wire. Stranded wire does not make an acceptable electrical connection with push-in type terminals.
PANEL ACTION: Reject.
PANEL STATEMENT: This issue has historically not been a problem and the submitter has not supplied data to substantiate the recomendation on push-in connections.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3699)

19- 82 - (551-41(e)): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add new text to read as follows:
"All receptacles shall be of the back-wired or screw-terminal type. No receptacles shall be permitted to be installed using only the push-in connection."
SUBSTANTIATION: Receptacles wired with solid wire using push-in type connections are not suitable for use in recreational vehicles.
Stranded wire should be required for all wiring in recreational vehicles, as solid wire breaks from the vibration and shaking of the wires during the motion of the vehicle. Solid wire is not suitable for use in recreational vehicles.
I have had to replace all of the receptacles in my nine year old travel trailer because of overheating at the receptacle where the solid wire has been pushed into the receptacle.
Connections to receptacles should only be made using either terminal screw or back-wired methods. Both which work well with stranded wire. Stranded wire does not make an acceptable electrical connection with push-in type terminals.
PANEL ACTION: Reject.
PANEL STATEMENT: This issue has historically not been a problem and the submitter has not supplied data to substantiate the recomendation on push-in connections.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #625)

19- 83 - (551-44): Accept in Principle
SUBMITTER: James W. Finch, Kampgrounds of America, Inc. (KOA)
RECOMMENDATION: Revise 551-44 to read as follows:
551-44. Power Supply Assembly. Each recreational vehicle should have one and only one of the following Main Power-Supply Assemblies.
SUBSTANTIATION: There are recreational vehicles being built that are utilizing more than one power supply assembly. In addition, there are adapters (cheaters) being made that plug into both the 30-amp receptacle and the 20-amp receptacle at the campgrounds site service equipment and accept a 50-amp plug from the recreational vehicle. If more than one power assembly is allowed on a RV, it will compromise the site service in the same way that the adapter does.
Historically, there have been multiple receptacles in site service equipment on campgrounds to facilitate convenience and, more importantly, safety. The intention was to eliminate the need for adapters to use the site service equipment. Their intent was not for additional power. Please refer to the last sentence in 551-73(a). "Where the electrical supply for a recreational vehicle site has more than one receptacle, the calculated load shall only be computed for the highest rated receptacle." This statement was added to the 1996 National Electrical Code, the same code cycle that eliminated Exception No. 1 from 551-43 which allowed a second power cord. This was done to eliminate the problems that two power cords create.
If you consider vehicle site supply equipment site services, then Section 230-2 applies. "A building or other structure served shall be supplied by only one service unless permitted in (a) through (d)." The only situation in (a) through (d) that could apply is (c)(2) "Additional service shall be permitted where the load requirements of a single-phase installation are greater than the serving agency

normally supplies through one service." I do not consider this situation applicable because campgrounds' site supply equipment has not been designed to provide electrical service from all of the receptacles in the site equipment since the calculated load is only for the highest rated receptacle. (re: 551-73)

If the RV manufacturers need more power to their unit than 50-amps/240 volts, they need to propose an additional power supply assembly designed for these units. They should not overload the hundreds of thousands of site services that are already in the field.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle.

Revise 551-44 to read as follows:

"551-44. Power Supply Assembly. Each recreational vehicle shall have only one of the following Main Power-Supply Assemblies."

PANEL STATEMENT: Should is not enforceable language and the other deleted text was superfluous.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #957)

19- 84 - (551-45(c)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise second sentence to read as follows:

A single main disconnect ~~disconnecting means~~ shall be provided where fuses are used or where more than two circuit breakers are employed.

SUBSTANTIATION: Editorial. Article 100 definition of disconnecting means indicates it may be a group of devices. The intent seems to be a requirement for a single device. The innocuous change proposed would make this clear.

PANEL ACTION: Reject.

PANEL STATEMENT: The existing text is clear.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #626)

19- 85 - (551-46): Accept

Note: The Technical Correlating Committee directs that this Proposal be referred to the Technical Correlating Committee Metrication Task Group for comment.

SUBMITTER: James W. Finch, Kampgrounds of America, Inc. (KOA)

RECOMMENDATION: Revise 551-46 to read as follows:

The cord exposed usable length, measured to the point of entry on the vehicle exterior, shall be a minimum of ~~23 ft (7.0 m)~~ 25 ft (7.62 m) where the point of entrance is at the side of the vehicle, or shall be a minimum ~~28 ft (8.5 m)~~ 30 ft (9.15 m) where the point of entrance is at the rear of the vehicle.

SUBSTANTIATION: It has been proposed in 551-77 that the site supply equipment shall be moved 2 ft (0.6 m) further away from the left edge of the site stand to give adequate clearance for RV expandable room sections and for the tail swing of large RVs with up to a 15 ft (4.57 m) overhang. If this proposal is accepted, then it would logically follow that the cord needs to be 2 ft (0.6 m) longer.

PANEL ACTION: Accept.

PANEL STATEMENT: Metrication task group should check the conversion for consistency with NFPA rules.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #2279)

19- 86 - (551-46(c)): Accept

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

RECOMMENDATION: Revise text as follows:

(c) Attachment Plugs.

~~1.~~ (1) Units with One 15-Ampere Branch Circuit. (Remainder unchanged)

~~2.~~ (2) Units with One 20-Ampere Branch Circuit. (Remainder unchanged)

~~3.~~ (3) Units with Two to Five 15- or 20-Ampere Branch Circuits. (Remainder unchanged)

~~4.~~ (4) Units with 50-Ampere Power Supply Assembly. (Remainder unchanged)

SUBSTANTIATION: Changes add titles in accordance with new Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #1191)

19- 87 - (551-46(d)): Reject

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

RECOMMENDATION: Reword Section 551-46(d) to read as follows:

(d) Labeling at Electrical Entrance. Each recreational vehicle shall have permanently affixed to the exterior skin, at or near the point of entrance of the power-supply cord(s), a label 3 in. (76 mm) X 1 3/4 in. (44.5 mm) minimum size, made of etched, metal-stamped, or embossed brass, stainless steel, or anodized or alclad aluminum not less than 0.020 in. (508 µm) thick, or equivalent ~~other suitable material [e.g. 0.005 in. (127 µm) thick plastic laminate)~~ that reads, as appropriate, either ... (REMAINDER UNCHANGED).

SUBSTANTIATION: Article 550 does not recognize the use of plastic laminate material for exterior labels. Recent action by the NFPA 501 Technical Committee on Electrical has removed this recognition as well. There have been concerns raised on the suitability of such material for an exterior environment due to exposure to ultraviolet rays, temperature changes, physical damage, and susceptibility to damage by flexing as the units are transported. Since the labels required are to be permanently affixed, it is felt that metal is the material to be used.

PANEL ACTION: Reject.

PANEL STATEMENT: The documention for this recommendation has not been provided.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #3380)

19- 88 - (551-46(f) (New)): Reject

SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.

RECOMMENDATION: Add Section (f) to 551-46 to read as follows:

(f) Adapters. Adapters shall not be used which provide for the connection of a 30 amp, 125 volt plug to a 125/250 volt, 50 amp receptacle. Also, adapters shall not be used which provide for the connection of a 15 amp, 125 volt plug to a 30 amp, 125 volt connector.

SUBSTANTIATION: The use of the first adapter allows the connection of a recreational vehicle's electric-power supply cord which is only rated at 30 amps to a receptacle which is protected by a 50 amp circuit breaker. The second adapter allows the connection of any cord with a 15 amp, 125 volt plug to a receptacle which is protected by a 30 amp circuit breaker.

These adapters are sold in recreational vehicle (RV) supply stores and hardware stores.

I have stayed in at least one RV park where the owner had one of the adapters from 50 to 30 amp at electrical connection in an effort to restrict the amount of electricity each trailer could use. Most of these adapters had some overheating damage at the 30 amp connector.

PANEL ACTION: Reject.

PANEL STATEMENT: The recommendation would not be enforceable and, therefore, would not add to existing safety requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #3700)

19- 89 - (551-46(f) (New)): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add section (f) to Article 551-46 to read as follows:
(f) Adapters. Adapters shall not be used which provide for the connection of a 30 amp, 125 volt plug to a 125/250 volt, 50 amp receptacle. Also, adapters shall not be used which provide for the connection of a 15 amp, 125 volt plug to a 30 amp, 125 volt connector.
SUBSTANTIATION: The use of the first adapter allows the connection of a recreational vehicles electric-power supply cord which is only rated at 30 amps to a receptacle which is protected by a 50 amp circuit breaker. The second adapter allows the connection of any cord with a 15 amp, 125 volt plug to a receptacle which is protected by a 30 amp circuit breaker.
These adapters are sold in recreational vehicle (RV) supply stores and hardware stores.
I have stayed in at least one RV park where the owner had one of the adapters from 50 to 30 amp at each electrical connection in an effort to restrict the amount of electricity each trailer could use. Most of these adapters had some overheating damage at the 30 amp connector.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation would not be enforceable and, therefore, would not add to existing safety requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #958)

19- 90 - (551-47(f), (g)): Accept in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(f) ~~Sheath Armor.~~ Raceway and Cable Continuity ~~The sheath of nonmetallic sheathed cable, metal clad cable, and Type AC cable~~ Raceways and cable sheaths shall be continuous between ~~outlet~~ boxes and other enclosures.
(g) Delete present text and substitute:
Raceways and cables installed through holes, in notches, or parallel to, framing members shall comply with applicable provisions of Section 300-4.
Where cables without a metal sheath or armor, electrical nonmetallic tubing, and liquidtight flexible nonmetallic conduit pass through punched, cut, or drilled holes in metal members, the cable and raceway shall be protected by bushings or grommets securely fastened in the opening prior to installation of the cable or raceway.
SUBSTANTIATION: The provisions of (a) allow other type cables and raceways which warrant a requirement to be continuous, for consistency.
In (g) other suitable wiring methods covered by (a) should be included. If not included does that mean they are not permitted to pass through framing members? The proposal would correlate this section with Section 300-4 which is more comprehensive.
The grommet requirement is expanded to cover wiring methods which may be damaged by vibration during road travel.
Continuity should be required between all boxes, whether used as outlet boxes, pull boxes, junction boxes or device boxes.
PANEL ACTION: Accept in Part.
Revise to read as follows:
"(f) Raceway and Cable ContinuityRaceways and cable sheaths shall be continuous between boxes and other enclosures."
PANEL STATEMENT: Existing text in (g) is clear and does not require modification. Panel accepts recommendation to modify (f).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #47)

19- 91 - (551-47(g)): Reject
NOTE: The following proposal consists of Comment 19-30 on Proposal 19-112 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 19-112 was:
Revise Section 551-47(g) as follows:
(g) Protected. Metal-clad, Type AC, or nonmetallic-sheathed cables and electrical nonmetallic tubing shall be permitted to pass through the centers of the wide side of 2-in. by 4-in. wood studs. However, they shall be protected where they pass through 2-in. by 2-in. wood studs or at other wood studs or frames where the cable or tubing would be less than 1 1/4 in. (31.8 mm) from the inside or outside surface. Steel plates on each side of the cable or tubing, or a steel tube, with not less than No. 16 MSG wall thickness, shall be installed to protect the cable or tubing. These plates or tubes shall be securely held in place. Where nonmetallic-sheathed cables pass through punched, cut, or drilled slots or holes in metal members, the cable shall be protected by bushings or grommets securely fastened in the opening prior to installation of the cable.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in Principle revise first sentence:
(g) Protected. ~~Metal-clad~~ Type MC, Type MI, Type AC ~~or~~ nonmetallic-sheathed cable, and electrical nonmetallic tubing shall be permitted to pass through the centers of the wide side of 2 in. by 4 in. ~~wood~~ studs.
SUBSTANTIATION: Type MI cable is permitted by Section 551-47(a). Metal-clad cable is a specific type and does not cover Type MI. Type MI should be included as it is in Section 300-4(a). (Type MI should also be included in (f) requirements). This application should also be permitted for studs of other material.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of Type MI cable has not been an issue because it is not used in this application. There has been no substantiation submitted to delete the word "wood".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2278)

19- 92 - (551-47(p)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
(p) Method of Connecting Expandable Units. The method of connecting expandable units to the main body of the vehicle shall comply with the following as applicable: (Remainder unchanged)
SUBSTANTIATION: Change converts language to list format in accordance with new Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2272)

19- 93 - (551-47(q)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
(q) Prewiring for Air-Conditioning Installation. Prewiring installed for the purpose of facilitating future air-conditioning installation shall conform to the ~~following and other applicable portions of this article.~~ applicable portions of this article and the following: ~~The circuit shall serve no other purpose.~~
(1) An overcurrent protective device with a rating compatible with the circuit conductors shall be installed in the distribution panelboard and wiring connections completed.
(2) The load end of the circuit shall terminate in a junction box with a blank cover or a device listed for the purpose. Where a junction box with a blank cover is used, the free ends of the conductors shall be adequately capped or taped.
(3) A label conforming to Section 551-46(d) shall be placed on or adjacent to the junction box and shall read

AIR-CONDITIONING CIRCUIT. THIS CONNECTION IS FOR AIR CONDITIONERS RATED 110–125-VOLT AC, 60 HZ, ___ AMPERES MAXIMUM. DO NOT EXCEED CIRCUIT RATING.

An ampere rating, not to exceed 80 percent of the circuit rating, shall be legibly marked in the blank space.

(4) The circuit shall serve no other purpose.

SUBSTANTIATION: Change converts language to list format in accordance with new Style Manual. Last sentence was deleted and relocated to new list item number 4.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2277)

19- 94 - (551-47(r)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
(r) Prewiring for Generator Installation. Prewiring installed for the purpose of facilitating future generator installation shall conform to the ~~following and~~ other applicable portions of this article~~.~~ and the following: (Remainder unchanged)
SUBSTANTIATION: Revision changes language to list format in accordance with new Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #618)

19- 95 - (551-48(b)): Reject
SUBMITTER: Dale Jordal, Winnebago Ind. Inc.
RECOMMENDATION: New text to read as follows:
551-48. Conductors and Boxes.
(b) Free Conductor at Each Box. At least 4 inches (102 mm) of free conductor shall be left at each box except where conductors are intended to loop without joints.
SUBSTANTIATION: In an RV where space is at a premium, manufacturers are often forced to use the minimum square inch box allowed due to space limitations. The minimum sized box coupled with a device the size of a typical GFI receptacle makes a very snug and compact package when the excess wires are shoehorned into this box. Reverting back to the previous code in this situation would be of great benefit and should not cause any problems, as justified below.
Life expectancy of an RV is maybe a tenth that of a home. Home devices can be replaced "several times" and may need the extra conductor length if the wire needs to be clipped. Not applicable in the case of an RV. A device that is replaced more than once (if even once) would be unusual.
The RV is inhabited differently than a home. Typically, RVs would have less people living in it and also for a shorter duration, meaning less wear and tear on the devices that may need replacing.
In the 1996 NEC cycle, I believe 551-48(b) was deleted solely to match the NEC Housing Code. I am not aware that the 4 inch dimension caused any hardship for anyone. The fact is, houses are different than RVs and this is probably why 551-48(b) was put in 551.
I believe it needs to be added back in, as certain applications would benefit from a reduced conductor length frm 6 inches to 4 inches. It is clearly not a safety issue and would aid in the manufacturing of RVs when the extra space is not there.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing Code text is adequate.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
BAUMAN: My notes indicate that we should also refer the submitter to the last sentence of 300-14.

(Log #3381)

19- 96 - (551-50): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add the following to Section 551-50:
"No connection shall be permitted using a push-in type connector. All wiring devices shall be connected using stranded wire and, either the back-wired type or the screw-terminal type of connection."
SUBSTANTIATION: Stranded wire should be required for all wiring in recreational vehicles, as solid wire breaks from the vibration and shaking of the wires during the motion of the vehicle. Solid wire is not suitable for use in recreational vehicles.
Receptacles wired with solid wire using push-in type connections are not suitable for use in recreational vehicles.
I have had to replace all of the receptacles in my nine year old travel trailer because of overheating at the receptacle where the solid wire has been pushed into the receptacle.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3701)

19- 97 - (551-50): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add the following Article 551-50 to read as follows:
"No connection shall be permitted using a push-in type connector. All wiring devices shall be connected using stranded wire and, either the back-wired type or the screw-terminal type of connection.
SUBSTANTIATION: Stranded wire should be required for all wiring in recreational vehicles, as solid wire breaks from the vibration and shaking of the wires during the motion of the vehicle. Solid wire is not suitable for use in recreational vehicles.
Receptacles wired with solid wire using push-in type connections are not suitable for use in recreational vehicles.
I have had to replace all of the receptacles in my nine year old travel trailer because of overheating at the receptacle where the solid wire has been pushed into the receptacle.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3382)

19- 98 - (551-51): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Insert the following text as (a), and renumber the existing (a) as (b), and the existing (b) as (c).
(a) Wiring of Switches. All switches shall be of the "back-wired", or screw-terminal type. No switches shall be permitted to be installed using only the push-in connection. Only stranded wire shall be used.
SUBSTANTIATION: Stranded wire should be required for all wiring in recreational vehicles, as solid wire breaks from the vibration and movement of the wires caused by the motion of the vehicle. Solid wire is not suitable for use in recreational vehicles.
Switches wired with solid wire using push-in type connections are not suitable for use in recreational vehicles.
I have had to replace all of the switches in my nine year old travel trailer because of overheating at the switch where the solid wire has been pushed into the switch.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3702)

19- 99 - (551-51): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Insert the following text as (a), and renumber the existing (a) as (b), and the existing (b) as (c):
(a) Wiring of Switches. All switches shall be of the "back-wired", or screw-terminal type. No switches shall be permitted to be installed using only the push-in connection. Only stranded wire shall be used.
SUBSTANTIATION: Stranded wire should be required for all wiring in a recreational vehicle as solid wire breaks from the vibration and movement of the wires cause by the motion of the vehicle. Solid wire is not suitable for use in recreational vehicles.
Switches wired with solid wire using push-in type connections are not suitable for use in recreational vehicles.
I have had to replace all of the switches in my nine year old travel trailer because of overheating at the switch where the solid wire has been pushed into the switch.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3383)

19- 100 - (551-52): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Revise Section 551-52 to read as follows:
551-52. Receptacles. All receptacle outlets shall be of the grounding type and shall be installed using stranded wire and either the back-wired type of the screw-terminal type of connection.
SUBSTANTIATION: Stranded wire should be required for all wiring in recreational vehicles, as solid wire breaks from the vibration and shaking of the wires during the motion of the vehicle. Solid wire is not suitable for use in recreational vehicles.
Receptacles wired with solid wire using push-in type connections are not suitable for use in recreational vehicles.
I have had to replace all of the receptacles in my nine year old travel trailer because of overheating at the receptacles where the solid wire has been pushed into the receptacle.
Connections to receptacles should only be made using either terminal screw or back-wired methods. Both which work well with stranded wire. Stranded wire does not make an acceptable electrical connection with push-in type terminals.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3703)

19- 101 - (551-52): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Revise Article 551-52 to read as follows:
551-52. Receptacles. All receptacle outlets shall be of the grounding type and shall be installed using stranded wire and either the back-wired type or the screw-terminal type of connection.
SUBSTANTIATION: Stranded wire should be required for all wiring in recreational vehicles, as solid wire breaks from the vibration and shaking of the wires during the motion of the vehicle. Solid wire is not suitable for use in recreational vehicles.
Receptacles wired with solid wire using push-in type connections are not suitable for use in recreational vehicles.
I have had to replace all of the receptacles in my nine year old travel trailer because of overheating at the receptacles where the solid wire has been pushed into the receptacle.
Connections to receptacles should only made using either terminal screw or back-wired methods. Both which work well with stranded wire. Stranded wire does not make an acceptable electrical connection with push-in type terminals.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2276)

19- 102 - (551-54(c)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
(c) Insulated Neutral.
~~1.~~ The grounded circuit conductor (neutral) shall be insulated from the equipment grounding conductors and from equipment enclosures and other grounded parts. The grounded (neutral) circuit terminals in the distribution panelboard and in ranges, clothes dryers, counter-mounted cooking units, and wall-mounted ovens shall be insulated from the equipment enclosure. Bonding screws, straps, or buses in the distribution panelboard or in appliances shall be removed and discarded.
~~2.~~ Connection of electric ranges and electric clothes dryers utilizing a grounded (neutral) conductor, if cord-connected, shall be made with 4-conductor cord and 3-pole, 4-wire, grounding-type plug caps and receptacles.
SUBSTANTIATION: Material can be combined into one paragraph eliminating the need to add titles or list language to conform to the new Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #955)

19- 103 - (551-55(b), (e)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Equipment Grounding and Bonding Conductors. Bare wires, insulated wire with an outer finish that is green or green with one or more ~~a~~ yellow stripes shall be used for equipment grounding or bonding conductors only.
(e) Grounding Continuity. Where more than one equipment grounding or bonding conductors of a branch circuit... (remainder unchanged).
SUBSTANTIATION: Bonding jumpers are part of grounding and should be included. Inclusion does not preclude other insulation color where installed outside of raceways or enclosures as permitted by Section 250-102(e), or as required by Section 551-56(b). Present wording which is limited to an equipment grounding conductor does not permit a green-insulated equipment bonding jumper inside a raceway, which is required by Section 250-102(e) reference to Section 250-119. Is this section intended to modify those sections?
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #956)

19- 104 - (551-56(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence to read as follows:
The bonding conductor between the distribution panelboard and the chassis shall be solid or stranded, insulated or bare, and shall be minimum No. 8 copper, ~~minimum~~ or ~~equal~~ equivalent.
SUBSTANTIATION: Editorial. Present wording doesn't differentiate between the chassis bonding conductor of (b) and other bonding conductors since this subsection stands alone but appears intended to apply to (b). The word "equal" can mean the "same"; equivalent is more appropriate and allows for aluminum or copper-clad aluminum conductors of (b).
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation would create confusion because this proposal would only specify the size of one particular bonding jumper.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3384)

19- 105 - (551-71): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add the following to Section 551-71:
"30 amp, 125 volt, receptacles shall not be replaced with 50 amp, 125/250 volt, receptacles without upgrading the supply to 50 amp, 125/250 volt."
SUBSTANTIATION: As a cheap way of upgrading the receptacles in a Recreational Vehicle (RV) park the 30 amp, 125 volt receptacles are replaced with 50 amp, 125/250 volt receptacles, and the existing 30 amp, single-pole circuit breaker is used to supply both "hot" pins of the 50 amp receptacle.
Problem one: Unsuspecting RVer's rent a space, plug into the 50 amp, 125/250 volt receptacle, turn on the air conditioner, leave their pets locked in the RV, and go sight-seeing. When they return, the 30 amp circuit breaker has tripped, and the pets are at least uncomfortable.
Problem two: The most common appliance in a RV which uses 220 volts is the clothes drier. However, these 50 amp, 125/250 volt receptacles do not supply 250 or 220 volts, only 125. Some people have endured the unnecessary expense of having a repair shop try to locate the nonexistent problem with their RV's clothes drier.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is covered in the existing Code, such as 110-3(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #3704)

19- 106 - (551-71): Reject
SUBMITTER: Tom Dunn, Rep. Outdoor Amusement Business Assn.
RECOMMENDATION: Add the following to Article 551-71:
"30 amp, 125 volt, receptacles shall not be replaced with 50 amp, 125/250 volt, receptacles without upgrading the supply to 50 amp, 125/250 volt."
SUBSTANTIATION: As a cheap way of upgrading the receptacles in a recreational vehicle (RV) park the 30 amp, 125 volt receptacles are replaced with 50 amp, 125/250 volt receptacles, and the existing 30 amp, single-pole circuit breaker is used to supply both "hot" pins of the 50 amp receptacles.
Problem one: Unsuspecting RVer's rent a space, plug into the 50 amp, 125/250 volt receptacle, turn on the air condition, leave their pets locked in the RV, and go sight-seeing. When they return, the 30 amp circuit breaker has tripped, and the pets are at least uncomfortable.
Problem two: The most common appliances in a RV which uses 220 volts is the clothes dryer. However, these 50 amp, 125/250 volt receptacles do not supply 250 or 220 volts, only 125. Some people have endured the unnecessary expense of having a repair shop try to locate the nonexistent problem with their RV's clothes dryer.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal is covered in the existing Code, such as 110-3(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #355)

19- 107 - (551-72): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise last sentence:
The neutral conductors shall be permitted to be reduced in size below the minimum required size of the ungrounded conductors for 208-volt and 240-volt line-to-line permanently connected loads only.
SUBSTANTIATION: Where a 208y/120-volt 4 wire system is provided for 120-volt vehicle site receptacles (which may constitute a larger total load than the minimum 5 percent of 50-ampere receptacles), and such systems supply other permanently connected line-to-line loads it is reasonable to permit service and feeder neutral reduction in size as permitted for similar 240-volt loads.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation to expand the existing provisions to a 208y/120 volt distribution system has not been provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #426)

19- 108 - (551-72): Reject
SUBMITTER: Raymond J. DeStefano, Copper Valley Electric Assn.
RECOMMENDATION: Revise 551-72 to read as follows:
The recreational vehicle park secondary electrical distribution system to recreational vehicle sites shall be ~~derived from a~~ single-phase, 120/240 volt, ~~3 wire system,~~ nominal.
SUBSTANTIATION: Our utility has been involved in several disputes regarding this section of the code. The words "derived from" have caused confusion over the intent of this section. Building officials have interpreted this to mean that RV parks must take 120/240 service from the supplying utility. The proposed wording is simpler and clearer. The wording is identical to Section 550-21 (mobile home parks - distribution system), where the intent is the same as 551-72.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing Code language is sufficiently clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
BAUMAN: The NEC does not apply to the serving utility. Consequently, there is no requirement that the serving utility provide 120240-volt service. Section 551-72 only requires that 50-ampere recreational sites be derived from a single-phase, 120/240-volt 3-wire system. If the utility serves the customer with 120/208-volt or 277/480-volt, the customer would use transformer(s) to produce 120/240-volt for the 50-ampere outlets.
The misinterpretation that the submitter describes in his substantiation could be addressed by incorporating language similar to that used in 555-5. The first two sentences of 551-72 could read as follows: Each 50-ampere, 125/250-volt receptacle located at a recreational vehicle site shall be supplied with power of the same voltage class and rating corresponding to the rating of the receptacle. Other recreational vehicle site receptacles shall be permitted to be supplied from any grounded system that supplies 120-volt single-phase power.
The concept could be more simply stated by replacing the first two sentences of 551-72 with: Each receptacle located at a recreational vehicle site shall be supplied with power of the same voltage class and rating corresponding to the rating of the receptacle.

(Log #1149)

19- 109 - (551-72): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise second sentence to read:
"Other recreational vehicle sites with 125-volt, 20- and 30-ampere receptacles ~~may~~ shall be permitted to be derived from any grounded distribution system that supplies 120-volt single-phase power."
SUBSTANTIATION: Editorial change from permissive language to mandatory language to comply with Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #4108)

19- 110 - (551-72): Reject
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Revise text to read as follows:
551-72. Distribution System. The recreational vehicle park secondary electrical distribution system to a 50-ampere recreational vehicle sites shall be derived from a single-phase. 120/240 volt or 120/208 volt, 3-wire system.
SUBSTANTIATION: Most utilities provide a single-phase 120/208 volt service to their customers. What is the justification or substantiation to require that a customer add an additional

transformer to step the voltage up from 120/208 to 120/240? This causes the customer needless expense with no extra safety benefit.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter asked for the technical substantiation for the existing requirement but did not provide technical substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #959)

19- 111 - (Table 551-73 and 551-73(d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise heading for Table 551-73:
Demand Factors for Site Feeders and Services ~~entrance conductors~~ for Recreational Vehicle Parks. ~~Sites.~~
Revise last paragraph of (d):
Loads for other amenities such as, but not limited to, service buildings and swimming pools, shall be ~~sized~~ calculated separately and then be added to the value calculated for the recreational vehicle sites where they are ~~all~~ supplied by ~~one~~ a common service.
SUBSTANTIATION: Editorial. Service-entrance conductors for park sites refers to such conductors for a plot of ground for an individual recreational vehicle rather than service conductors for the park. The limitation to service-entrance conductors excludes application to service-laterals and service-drops. The word "services" includes such conductors and service-equipment.
The word "calculated" is suggested as preferable to "sized".
In (d) "one service" could be interpreted as one (separate) service for each amenity. The recreational park service could also supply one or more amenities but not "all", or all other amenities could be supplied by one service, separate from the park service. The proposal attempts to provide clearer wording to indicate that all, or any amenities supplied by the (common) park service are covered by the rule.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing Code text is sufficiently clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2955)

19- 112 - (Table 551-73): Reject
SUBMITTER: Merle J. Minor, Minor Repairs and Marketing
RECOMMENDATION: Delete Table 551-73.
Revise the sentence starting:
"The demand factors ~~set forth in Table 551-73 shall be the minimum allowable demand factors that shall be permitted in calculating load, etc.~~ shall be calculated 100 percent for service and feeders."
SUBSTANTIATION: There are many camp grounds wired close to the minimum requirements. This may be okay with minimum occupation. But, when all sites are occupied, there will be a corresponding drop in available VA to each sight, by way of its circuits demand factor. 551-73(c) points directly to this problem. It seems that no one on the Council has an RV. If so, this table would not be here.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide any technical substantiation for the change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #4307)

19- 113 - (551-73(b)): Reject
SUBMITTER: J. Kevin Vogel, Crescent Electrical Supply
RECOMMENDATION: Revise text to read as follows:
(b) Transformers and Secondary Distribution Panelboards.
(1) For the purpose... treated as services.
(2) In all cases, service entrance equipment shall be provided in accordance with Article 230 between the transformer and recreational vehicle site supply equipment.
SUBSTANTIATION: Under the present code wording, individual sites are allowed to be, and in fact are being, services by unprotected supply conductors from the transformer. This is an unsafe practice that should be stopped.
PANEL ACTION: Reject.
PANEL STATEMENT: Existing code requirements under 230 address this recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #627)

19- 114 - (551-77(a)): Accept in Principle
Note: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal regarding the SI units. This action will be considered by the Panel as a Public Comment.
SUBMITTER: James W. Finch, Kampgrounds of America, Inc. (KOA)
RECOMMENDATION: Revise to 551-77(a) to read as follows:
(a) Location. Where provided on back-in sites, the recreational vehicle site electrical supply equipment shall be located on the left (driver's) side of the parked vehicle, on a line that is ~~9 ft (2.74 m)~~ 6 ft (1.83 m) ± 1 ft (0.3 m) from the ~~longitudinal centerline~~ left edge (driver's side of the parked RV) of the stand and shall be located at any point on this line from the rear of the stand to 15 ft (4.57 m) forward of the rear of the stand.
For pull-through sites, the electrical supply equipment shall be permitted to be located at any point along the line that is 6 ft (1.83 m) ±1 ft (0.3 m) from the left edge (driver's side of the parked RV) of the stand from 16 ft (4.88 m) forward of the rear of the stand to ~~32 ft (9.75 m) forward of the rear of the stand~~ the center point between the two roads which give access to and egress from the pull through sites.
The left edge (driver's side of the parked RV) of the stand must be well marked.
SUBSTANTIATION: There are two distinct issues that require the electrical supply equipment to be moved 2 ft further from the left edge of the stand.
1. Expandable room sections have become quite prevalent in all types of larger RVs. Expandable room sections extend between 38 inches and 42 inches from either or both sides of the RV and can be located anywhere along the sides. Having the electrical supply equipment centered at 4 ft (48 in.) ±1 ft from the left edge of the stand does not give enough clearance between the extended expandable room sections and the supply equipment.
2. Many of the same large RVs have overhangs behind the rear axles of up to 15 ft. The tail swing on these units is considerable when they exit the site. When exiting to the left, the tail swings away from the utilities so it is not a problem. However, when exiting to the right, the tail swings towards the utilities and the electrical supply equipment can be in harms way.
Pull-through sites accommodate both tow vehicles that are pulling trailers and motor homes that have something in tow. It is KOA, Inc's experience that when the electrical supply is located in the center of the stand on the left side of the RV it will accommodate the largest percentage of RVs of all types without needing an extension cord. On a long site, the unit can pull forward or back-up to match the equipment and this location will accommodate all RVs. The supply equipment should not be located farther forward than the center of the site because the tail swing of the unit becomes more accentuated past this center point.
The location of the distance off the left side of the stand has been 9 ft ± 1 ft from the longitudinal centerline of the stand. This is ambiguous since the width of the stand changes where the electrical supply will be located. We cannot assume the width of the stand is always 10 ft. Even though construction is very often laid out and staked from the centerline the left edge (driver's side of the parked RV) is more accurate and less confusing which will ensure that the electrical supply equipment is far enough off the site.
The statement "the left edge (driver's side of the parked RV) of the stand must be well-marked" is needed so that the camper stays on the pad an is 6 ft ±1 ft from the power supply assembly.
These changes will permit safer accommodation of RVs with expandable room sections and/or long overhangs in new or remodeled RV parks.
PANEL ACTION: Accept in Principle.
Change "6 feet +/- 1 ft." to "5 feet to 7 feet". Also change "which give" to "that gives". In the last sentence, change "must to "shall" and delete "well".
Accept remaining changes.

PANEL STATEMENT: The changes are editorial made to meet the new style manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2488)

19- 115 - (551-77(d)): Accept in Principle
Note: The Technical Correlating Committee directs that the Panel reconsider the Panel Action and correlate with 380-8(a) regarding the SI units. This action will be considered by the Panel as a Public Comment.
SUBMITTER: James M. Imlah, City of Hillsboro, OR
RECOMMENDATION: Revise as follows:
(d) Mounting Height. Site supply equipment shall be located not less than 2 ft (610 mm) nor more than ~~6 1/2 ft~~ 6 ft 7 in. ~~(1.98 m)~~ (2.0 m) above the ground.
SUBSTANTIATION: The height requirements need to be consistent as elsewhere in the NEC, especially 380-8(a). Section 380-8(a) was changed in the 1996 NEC to have the measurement of 2 m even. The same change needs to be made to this section, 551-77(d).
PANEL ACTION: Accept in Principle.
The panel accepts the implementation of the metrication task group's actions. The panel does not accept the conversion to "6 ft 7 in". The conversion should read "6 ft 6 in".
PANEL STATEMENT: Implementation of the metrication rules will address this recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #960)

19- 116 - (551-80(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete present wording and substitute:
(a) General. Conductors used for direct burial application shall be of a type identified for such use. Splices or taps shall be permitted without boxes. Where boxes are provided they shall comply with Section 370-29. Splices and taps shall comply with Section 110-14.
SUBSTANTIATION: Editorial. The proposal is intended for clarification and correlation with other sections, e.g. 110-14, 230-30 Exception, 230-41 Exception, 300-5(e), 310-7, and 370-29. The intent of the word "continuous" is confusing and the second sentence does not appear to have a particular bearing on anything. As used in the context of other Code sections, "continuous" may mean unbroken, or electrically continuous. The last sentence infers it means electrically continuous and therefore superfluous since noncontinuous conductors don't provide a functional circuit.
PANEL ACTION: Reject.
PANEL STATEMENT: The current text is clear and the proposal contains redundant references.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

ARTICLE 552 — PARK TRAILERS

(Log #522)

19- 117 - (552): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 552-2. Definitions. Park Trailer.(2), replace "400 ft^2 (37.2 m^2)" with "37 m^2 (400 ft^2)".
2. In Section 552-10(b)(4), replace "4 ft (1.22 m)" with "1.2 m (4 ft)".
3. In Section 552-10(c)(3), replace "1/2-in. (12.7-mm)" with "13 mm (1/2-in.)".
4. In Section 552-10(d), replace "1.7 in^2 (1100 mm^2)" with "1100 mm^2 (1.7 in^2)" and replace "2 in. (50.8 mm)" with "50 mm (2 in.)".
5. In Section 552-41(a), replace "2 ft (610 mm)" with "600 mm (2 ft)" and replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
6. In Section 552-41(b)(1), replace "12 in. (305 mm)" with "300 mm (12 in.)".
7. In Section 552-41(b)(3), replace "12 in. (305 mm)" with "300 mm (12 in.)" and replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
8. In Section 552-41(c)(2), replace "6 ft (1.83 m)" with "1.8 m (6 ft)".
9. In Section 552-41(d), replace "2 ft (610 mm)" with "600 mm (2 ft)".
10. In Section 552-41(f)(1), replace "30 in. (762 mm)" with "750 mm (30 in.)".
11. In Section 552-44(b), replace "23 ft (7.0 m)" with "7.0 m (23 ft)"; "28 ft (8.5 m)" with "8.5 m (28 ft)"; "36 1/2 ft (11.13 m)" with "11 m (36 1/2 ft)"; and "3 ft (0.9 m)" with "900 mm (3 ft)" throughout.
12. In Section 552-44(d), replace "3 in. X 1 3/4 in. (76 mm X 44.5 mm)" with "75 mm X 45 mm (3 in. X 1 3/4 in.)"; "0.020-in. (0.508-mm)" with "0.51 mm (0.020 in.)"; and "0.005-in. (0.127-mm)" with "0.13 mm (0.005 in.)".
13. In Section 552-44(e), replace "15 ft (4.57 m)" with "4.5 m (15 ft)" and replace "18 in. (457 mm)" with "450 mm (18 in.)".
14. In Section 552-44(e) Exception, replace "15 ft (4.57 m)" with "4.5 m (15 ft)" throughout.
15. In Section 552-45(b), replace "24 in. (610 mm)" with "600 mm (24 in.)" and replace "30 in. (762 mm)" with "750 mm (30 in.)".
16. In Section 552-45(b) Exception, replace "22 in. (559 mm)" with "550 mm (22 in.)" and replace "2 in. (50.8 mm)" with "50 mm (2 in.)".
17. In Section 552-46(b)(1), replace "3 volt-amperes/ft^2 (32.26 VA/m^2)" with "33 VA/m^2 (3 volt-amperes/ft^2)".
18. In Section 552-47(a), replace "3 volt-amperes/ft^2" with "33 VA/m^2 (3 volt-amperes/ft^2)".
19. In Section 552-48(e) Exception No. 2, replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)" and replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)".
20. In Section 552-48(g), replace "2 in. by 4 in." with "2-by-4"; "2 in. by 2 in." with "2-by-2"; "1 1/4 in. (31.8 mm)" with "32 mm (1 1/4 in.)"; and "No. 16 MSG" with "1.35 mm (0.053 in.)".
21. In Section 552-48(h), replace "12 in. (305 mm)" with "300 mm (12 in.)" and replace "4 1/2 ft (1.37 mm)" with "1.4 m (4 1/2 ft)".
22. In Section 552-48(i), replace "8 in. (203 mm)" with "200 mm (8 in.)".
23. In Section 552-48(k), replace "0.030 in. (762 µm)" with "0.76 mm (0.030 in.)" and replace "0.040 in. (1.016 mm)" with "1.0 mm (0.040 in.)".
24. In Section 552-49(b), replace "6 in. (152 mm)" with "150 mm (6 in.)".
25. In Section 552-59(b), replace "0.020-in. (508-µm)" with "0.51 mm (0.020 in.)" and replace "3 in. X 1 3/4 in. (76 mm X 44.5 mm)" with "75 mm X 45 mm (3 in. X 1 3/4 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following. In Item 20, No. 16 MSG is considered to represent a nominal metal thickness, corresponding to a thickness value not commonly known or available to the users of the NEC. The equivalent nominal decimal thickness is 0.060 in., based on material standards and handbooks. However, since this value is nominal, a tolerance must be applied to achieve a minimum allowable thickness. The accepted industry practice is to apply a minus tolerance of 0.007 in. for 16 MSG, resulting in a minimum thickness of 0.053 in. (1.35 mm). The SI units and inch-pound numbers in parenthesis are not shown for Item 20's stud sizes since they are not a direct conversion and a Trade Size is provided.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1091)

19- 118 - (552): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 552 as follows:
552-10(b)(2) - change "No. 6 through 18" to "6 through 18 AWG"
552-10(c)(5) - change "No. 8" to "8 AWG" in two places
552-20(c) - change "No. 8" to "8 AWG"
552-57(c) - change "No. 8" to "8 AWG"
552-56(c) - change "No. 8" to "8 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

PANEL STATEMENT: The NEC Style of Manual does not specify the language used one way or another. The NFPA Manual of Style seems to prefer 10AWG. Product standards use 10 AWG or 10 AWG 110-6 says that the conductor sizes are expressed in AWG or in circular mils so the AWG is implied The panel recognizes that the TCC may desire to take a different action to be consistent with the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #2269)

19- 119 - (552-10): Accept in Principle

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

RECOMMENDATION: Revise text as follows:

552-10. Low-Voltage Systems

(a) Low-Voltage Circuits. Low-voltage circuits furnished and installed by the park trailer manufacturer, other than those related to braking, are subject to this Code. Circuits supplying lights subject to federal or state regulations shall comply with applicable government regulations and this Code.

(b) Low-Voltage Wiring.

(1) Material. Copper conductors shall be used for low-voltage circuits.

Exception: A metal chassis or frame shall be permitted as the return path to the source of supply.

(2) Conductor Types. Conductors shall conform to the requirements for Type GXL, HDT, SGT, SGR, or Type SXL or shall have insulation in accordance with Table 310-13 or the equivalent. Conductor sizes No. 6 through 18 or SAE shall be listed. Single-wire, low-voltage conductors shall be of the stranded type.

FPN: See SAE Standard J1128-1995 for Types GXL, HDT, and SXL and SAE Standard J1127-1995 for Types SGT and SGR.

~~(3) Single-wire, low-voltage conductors shall be of the stranded type.~~

~~(4)~~ (3) Marking. All insulated low-voltage conductors shall be surface marked at intervals not greater than 4 ft (1.22 m) as follows.

a. Listed conductors shall be marked as required by the listing agency.

b. SAE conductors shall be marked with the name or logo of the manufacturer, specification designation, and wire gauge.

c. Other conductors shall be marked with the name or logo of the manufacturer, temperature rating, wire gauge, conductor material, and insulation thickness.

(c) Low-Voltage Wiring Methods.

(1) Physical Protection. Conductors shall be protected against physical damage and shall be secured. Where insulated conductors are clamped to the structure, the conductor insulation shall be supplemented by an additional wrap or layer of equivalent material, except that jacketed cables shall not be required to be so protected. Wiring shall be routed away from sharp edges, moving parts, or heat sources.

(2) Splices. Conductors shall be spliced or joined with splicing devices that provide a secure connection or by brazing, welding, or soldering with a fusible metal or alloy. Soldered splices shall first be spliced or joined to be mechanically and electrically secure without solder and then soldered. All splices, joints, and free ends of conductors shall be covered with an insulation equivalent to that on the conductors.

(3) Separation. Battery and other low-voltage circuits shall be physically separated by at least a 1/2-in. (12.7-mm) gap or other approved means from circuits of a different power source. Acceptable methods shall be by clamping, routing, or equivalent means that ensure permanent total separation. Where circuits of different power sources cross, the external jacket of the nonmetallic-sheathed cables shall be deemed adequate separation.

(4) Ground Connections. Ground connections to the chassis or frame shall be made in an accessible location and shall be mechanically secure. Ground connections shall be by means of copper conductors and copper or copper-alloy terminals of the solderless type identified for the size of wire used. The surface on which ground terminals make contact shall be cleaned and be free from oxide or paint or shall be electrically connected through the use of a cadmium, tin, or zinc-plated internal/external-toothed lockwasher or locking terminals. Ground terminal attaching screws, rivets or bolts, nuts, and lockwashers shall be cadmium, tin, or zinc-plated except rivets shall be permitted to be unanodized aluminum where attaching to aluminum structures.

~~(5)~~ The chassis-grounding terminal of the battery shall be bonded to the unit chassis with a minimum No. 8 copper conductor. In the event the power lead from the battery exceeds No. 8, then the bonding conductor shall be of an equal size.

(d) Battery Installations. Storage batteries subject to the provisions of this Code shall be securely attached to the unit and installed in an area vaportight to the interior and ventilated directly to the exterior of the unit. Where batteries are installed in a compartment, the compartment shall be ventilated with openings having a minimum area of 1.7 in.^{2} (1100 mm^2) at both the top and at the bottom. Where compartment doors are equipped for ventilation, the openings shall be within 2 in. (50.8 mm) of the top and bottom. Batteries shall not be installed in a compartment containing spark- or flame-producing equipment.

(e) Overcurrent Protection.

(1) Wiring. Low-voltage circuit wiring shall be protected by overcurrent protective devices rated not in excess of the ampacity of copper conductors~~as follows.~~ in accordance with Table 552-10(E)(1).

Table 552-10(e)(1). Low-Voltage Overcurrent Protection

[Insert Table 552-10(e)(1) from 1999 NEC here]

(2) Type. Circuit breakers or fuses shall be of an approved type, including automotive types. Fuseholders shall be clearly marked with maximum fuse size and shall be protected against shorting and physical damage by a cover or equivalent means.

FPN: For further information, see Standard for Electric Fuses (Cartridge Type), ANSI/SAE J554-1987; Standard for Blade Type Electric Fuses, SAE J1284-1988; and Standard for Automotive Glass Tube Fuses, UL 275-1993.

(3) Appliances. Higher current-consuming, dc appliances such as pumps, compressors, heater blowers, and similar motor-driven appliances shall be installed in accordance with the manufacturer's instructions.

Motors that are controlled by automatic switching or by latching-type manual switches shall be protected in accordance with Section 430-32(c).

(4) Location. The overcurrent protective device shall be installed in an accessible location on the unit within 18 in. (457 mm) of the point where the power supply connects to the unit circuits. If located outside the park trailer, the device shall be protected against weather and physical damage.

Exception: External low-voltage supply shall be permitted to have the overcurrent protective device within 18 in. (457 mm) after entering the unit or after leaving a metal raceway.

(f) Switches. Switches shall have a dc rating not less than the connected load.

(g) Lighting Fixtures. All low-voltage interior lighting fixtures rated more than 4 watts, employing lamps rated more than 1.2 watts, shall be listed.

SUBSTANTIATION: Changes add titles and use new layout in accordance with the new Style Manual. Existing 552-10(b)(3) is incorporated as new last sentence of (b)(2) as more appropriate placement. Remaining level renumbered accordingly. Existing 552-10(c)(5) is incorporated as last sentence of (c)(4). 552-10(e)(1) is revised to include specific reference to Table 552-10(e)(1) rather than using wording "as follows."

PANEL ACTION: Accept in Principle.

In the title (e) (1) change the word "wiring" to "rating" and in (b) (3), the lower case a, b,and c to (1),(2), (3).

PANEL STATEMENT: The change would further clarify the requirement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

(Log #966)

19- 120 - (Table 552-10(e)(1)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete the third column of the table.
SUBSTANTIATION: Editorial. The third column indicates wire type may be solid conductors for No. 14, 12, and 10 whether single-conductor or (jacketed) cable. Section 552-10(b)(3) specifies single-conductors shall be stranded type.
PANEL ACTION: Reject.
PANEL STATEMENT: Retaining the language in the third column maintains usability of the table requirements. The proposed change would require the user to refer to other parts of the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #961)

19- 121 - (552-43(a), (b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Feeder. The power supply to the park trailer shall be a feeder assembly rated not less than the computed load, consisting of not more than one listed 30-ampere or 50-ampere park trailer power supply cord with an integrally molded or securely attached plug cap, or a permanently installed feeder rated not less than 30-amperes.
(b) Power Supply Cord. If the park trailer has a power supply cord, it shall be permanently attached to the ~~distribution panel-board~~ main disconnecting means enclosure or to a junction box permanently connected to the ~~distribution panelboard~~ main disconnecting means enclosure. ~~with the free end terminating in a molded on attachment plug cap.~~
SUBSTANTIATION: Editorial. Not less than the load should be a specified minimum rating. The permanent feeder should be noted to have a minimum rating as required for cord assemblies. The latter part of (b) conflicts with (a) which allows a securely attached (nonmolded) plug cap. Where there is a separate disconnecting means not part of a panelboard, the cord should terminate there.
PANEL ACTION: Reject.
PANEL STATEMENT: Recommendation does not further clarify existing Code text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2275)

19- 122 - (552-44(c)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
(c) Attachment Plugs.
(1) Units with Two to Five 15- or 20-Ampere Branch Circuits.
(Remainder unchanged)
(2) Units with 50-Ampere Power Supply Assembly. (Remainder unchanged)
SUBSTANTIATION: Changes add titles in accordance with new Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #1190)

19- 123 - (552-44(d)): Reject
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Reword Section 552-44(d) as follows:
"(d) Labeling at Electrical Entrance. Each park trailer shall have permanently affixed to the exterior skin, at or near the point of entrance of the power-supply assembly, a label 3 in. (76 mm) x 1 3/4 in. (44.5 mm) minimum size, made of etched, metal-stamped, or embossed brass, stainless steel, or anodized or alclad aluminum not less than 0.020 in. (508 mm) thick, or equivalent ~~other suitable material [e.g., 0.005 in. (127 mm) thick plastic laminate]~~ that reads, as appropriate, either...". (remainder unchanged)
SUBSTANTIATION: Article 550 does not recognize the use of plastic laminate material for exterior labels. Recent action by the NFPA 501 Technical Committee on Electrical has removed this recognition as well. There have been concerns raised on the suitability of such material for an exterior environment due to exposure to ultraviolet rays, temperature changes, physical damage, and susceptibility to damage by flexing as the units are transported. Since the labels required are to be permanently affixed, it is felt that metal is the material to be used.
PANEL ACTION: Reject.
PANEL STATEMENT: The documention for this recommendation has not been provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #962)

19- 124 - (552-45(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence:
A single main disconnect ~~disconnecting means~~ shall be provided where fuses are used or where more than two circuit breakers are employed.
SUBSTANTIATION: Article 100 definition of "disconnecting means" indicates it may be a group of devices. The intent seems to be a requirement for a single device. The innocuous change proposed would make this clear.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text is clear. See Panel action on Proposal 19-84.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #963)

19- 125 - (552-46(b)(3)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(3) General Appliances. (Including furnace, water heater, space heater, range, and central or room air conditioner, etc.). An individual branch circuit shall be permitted to supply any load for which it is rated. There shall be one or more circuits of adequate rating in accordance with the following:
FPN No. 1 No change
FPN No. 2: No change.
a. ~~Ampere rating of fixed appliances not over 50 percent of circuit rating if lighting outlets (receptacles, other than kitchen, dining area, and laundry, considered as lighting outlets) are on the same circuit.~~ The total rating of fixed appliances shall not exceed 50 percent of the circuit rating if lighting outlets, general-use receptacles, or both, are also supplied.
b. ~~For fixed appliances on a circuit without lighting outlets, the sum of rated amperes shall not exceed the branch circuit rating. Motor loads or other continuous duty loads shall not exceed 80 percent of the branch circuit rating.~~ For fixed appliances with a motor(s) larger than 1/8 horsepower the total computed load shall be based on 125 percent of the largest motor plus the sum of the other loads. Where a branch circuit supplies continuous load(s) or any combination of continuous and noncontinuous loads the branch-circuit conductor size shall be in accordance with Section 210-19(a).
c. The rating of a single cord- and plug-connected appliance ~~on a circuit with no other outlets~~ supplied by other than an individual branch circuit shall not exceed 80 percent of the circuit rating.
d. No change.
SUBSTANTIATION: Reference to an individual branch circuit, per Section 210-23, is proposed as present c. modifies that section and limits load to 80 percent of the circuit rating regardless of whether a motor or continuous load is served. What is the reasoning? Present c. literal wording does not accomplish what is apparently intended since one "outlet" may contain multiple receptacles. Present a. is reworded in a more lucid form. Present b. is reworded along Article 210 requirements and references continuous load. The present "continuous duty" loads seems to infer continuous loads. Continuous duty, per definition, is not necessarily the same as continuous load. Since this section apparently modifies Article 210 continuous load appliances such as

water heaters, space heaters, etc., should be provided for. Present wording is not reasonable for a nonmotor operated noncontinuous load appliance.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #357)

19- 126 - (552-47): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise first paragraph:
CALCULATIONS. The following method shall be employed in computing the ~~supply cord~~ feeder assembly and distribution-panelboard load ~~for each feeder assembly~~ for each park trailer in lieu of the procedure shown in ~~Article~~ Section 220-3 and shall be based on a 3-wire 120/240-volt supply with 120-volt loads balanced as far as practicable between the two phases of the 3-wire system,or on a 2-wire 120-volt supply, as applicable.
SUBSTANTIATION: Present wording appears limited to cord feeders; Section 552-43(a) indicates a permanent feeder is permitted. The reference to Article 220 indicates Section 220-30 cannot be used but Section 552-47(c) indicates it is permitted. Trailers are permitted to be supplied by 120-volt 2-wire systems but this section requires calculation based on 3-wire 120/240-volt supply. "Insofar as practical" would allow for loads that cannot be exactly balanced.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation does not further clarify existing text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #964)

19- 127 - (552-48(f), (g), (m)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(f) ~~Sheath Armor~~ Mechanical Continuity-Raceways and Cables. ~~The sheath of nonmetallic sheathed cable, metal clad cable, and Type AC cable~~ Raceways, cable armor, cable sheaths, and low-voltage conductors shall be continuous between ~~outlet~~ boxes, and other enclosures, and equipment.
(g) Protected. ~~Metal-clad, Type AC, or nonmetallic sheathed cables~~ Raceways, cables, and low-voltage conductors shall be permitted to pass through the centers of the wide side of nominal 2 in. by 4 in. wood ~~studs~~ framing members or nominal 4 in. metal framing members. However, they shall be protected where they pass through 2 in. by 2 in. wood studs ~~or at other wood studs or frames where the cable or tubing~~ or other framing members where the raceways, cables, or low-voltage conductors would be less than 1-1/4 in. (38 mm) from the inside or outside edge ~~surface.~~ This protection shall consist of ~~Steel~~ steel plates or a steel tube ~~with~~ not less than 1/16 in. (1.59 mm) thick. ~~No. 16 MSG wall thickness shall be installed to protect the cable or tubing.~~ These plates or tubes shall be securely held in place. Where nonmetallic-sheathed cables, liquidtight flexible nonmetallic conduit, electrical nonmetallic tubing, or low-voltage conductors without cable armor pass through punched, cut, or drilled slots or holes in metal members they ~~the cable~~ shall be protected by bushings or grommets securely fastened in the opening prior to installation of the cable, raceway, or low-voltage conductors.
Exception: Protection shall not be required for raceways as covered in Articles 345, 346, 347, and 348.
Cables, raceways, and low-voltage conductors installed parallel to framing members shall be in accordance with Section 300-4(d).
(m) Moisture or Physical Damage. Where outdoor or under-chassis wiring is 120-volts, nominal, or over, and is exposed to moisture or physical damage the wiring shall be protected by rigid metal conduit, intermediate metal conduit, or by electrical metallic tubing or rigid nonmetallic conduit, or Type MI cable, that is closely routed against frames and equipment enclosures, or other raceway or cable that is identified for the application.
SUBSTANTIATION: In (f) the required continuity should apply to all wiring methods permitted by Parts B and D. Boxes should not be limited to those designated as "outlet" but should include all boxes.
Subsection (g) should apply to all applicable wiring methods permitted by Sections 552-10 and 552-48(a), including certain raceways, Type MI cable, and low-voltage conductors, and to framing members other than wood studs. There is no need for a protection plate on both edges of a stud where an off-center bored hole provides clearance to one edge. (Not prohibited by this section). Where wiring methods other than nonmetallic-sheathed cables are subject to damage from hole edges in metal members, as from road travel vibration, they warrant the grommet requirement also.
Type MI cable is well suited to the conditions of (m) for close routing along frames due to small diameter, it is moisture and damage resistant, and there is no restriction on number of bends.
If the provisions of Section 300-4(d) are considered necessary for safety in other buildings and structures, those requirements should be specified in this article. Does the type of structure alter the need? Since the specifics of (g) closely track Section 300-4(a)(1) in lieu of a simple reference to that section, it is presumed Section 300-4(d) does not apply, by intent.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing Code text is clear and there is no need to extend the requirements to low voltage conductors.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #48)

19- 128 - (552-48(g)): Reject
NOTE: The following proposal consists of Comment 19-46 on Proposal 19-151 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 19-151 was:
Revise Section 552-48(g) as follows:
(g) Protected. Metal-clad, Type AC, or nonmetallic-sheathed cables and electrical nonmetallic tubing shall be permitted to pass through the centers of the wide side of 2-in. by 4-in. wood studs. However, they shall be protected where they pass through 2-in. by 2-in. wood studs or at other wood studs or frames where the cable or tubing would be less than 1 1/4 in. (38 mm) from the inside or outside surface. Steel plates on each side of the cable or tubing, or a steel tube, with not less than No. 16 MSG wall thickness, shall be installed to protect the cable or tubing. These plates or tubes shall be securely held in place. Where nonmetallic-sheathed cables pass through punched, cut, or drilled slots or holes in metal members, the cable shall be protected by bushings or grommets securely fastened in the opening prior to installation of the cable.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Accept in principle revise first sentence:
(g) Protected. ~~Metal-clad~~ Type MC, Type MI, Type AC, ~~or~~ nonmetallic-sheathed cable, and electrical nonmetallic tubing shall be permitted to pass through the centers of the wide side of 2 in. by 4 in. ~~wood~~ studs.
SUBSTANTIATION: Type MI cable is permitted by Section 552-48(a). Metal-clad cable is a specific type and does not cover Type MI. (Type MI should also be included in (f) requirements). Type MI cable should be included in this section as it is in Section 300-4(a). This application should also be permitted for studs of other material.
PANEL ACTION: Reject.
PANEL STATEMENT: The use of Type MI cable has not been an issue because it is not used in this application. There has been no substantiation submitted to delete the word "wood".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2274)

19- 129 - (552-48(o)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
(o) Method of Connecting Expandable Units. The method of connecting expandable units to the main body of the vehicle shall comply with the following as applicable:

SUBSTANTIATION: Change converts language to list format in accordance with new Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #2271)

19- 130 - (552-48(p)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
552-48
(p) Prewiring for Air-Conditioning Installation. Prewiring installed for the purpose of facilitating future air-conditioning installation shall conform to the ~~following and other applicable portions of this article.~~ applicable portions of this article and the following: ~~The circuit shall serve no other purpose.~~
(1) An overcurrent protective device with a rating compatible with the circuit conductors shall be installed in the distribution panelboard and wiring connections completed.
(2) The load end of the circuit shall terminate in a junction box with a blank cover or a device listed for the purpose. Where a junction box with a blank cover is used, the free ends of the conductors shall be adequately capped or taped.
(3) A label conforming to Section 552-44(b) shall be placed on or adjacent to the junction box and shall read

AIR-CONDITIONING CIRCUIT. THIS
CONNECTION IS FOR AIR CONDITIONERS
RATED 110–125-VOLT AC, 60 HZ, ___
AMPERES MAXIMUM. DO NOT EXCEED
CIRCUIT RATING.

An ampere rating, not to exceed 80 percent of the circuit rating, shall be legibly marked in the blank space.
(4) The circuit shall serve no other purpose.
SUBSTANTIATION: Change converts language to list format in accordance with new Style Manual. Last sentence was deleted and relocated to new list item number 4.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #965)

19- 131 - (552-49(b)): Accept in Principle
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Free Conductors at Each Box. ~~At least 6 in. (152 mm) of free conductor shall be left at each box except where conductors are intended to loop without joints.~~ The length of free conductor shall be in accordance with Section 300-14.
SUBSTANTIATION: Editorial. The requirement for this section should be no less comprehensive than those of Section 300-14. Presuming all code rules are for safety, there does not seem to be justification for lesser requirements in this section.
PANEL ACTION: Accept in Principle.
Revise to read as follows:
"Free Conductors at Each Box. ~~At least 6 in. (152 mm) of free conductor shall be left at each box except where conductors are intended to loop without joints.~~"
PANEL STATEMENT: This recommendation would be a redundant reference. The requirements of 300-14 apply without this reference.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
COMMENT ON AFFIRMATIVE:
LAROCCA: Although the Panel acted to Accept in Principle Proposal 19-131, the published action should have been to delete 552-49(b) in its entirety. The Panel Statement should be:
The proposed change would result in a redundant reference. By deleting this section, the requirements of 300-14 would apply. This would meet the submitter's intent to have 300-14 apply in full.
MCCULLOUGH: My notes indicate that the Panel wished to delete the entire section (b) and advise the editors to revise (a) as a singular requirement.

(Log #2273)

19- 132 - (552-55(c)): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
(c) Insulated Neutral.
~~(1)~~ The grounded circuit conductor (neutral) shall be insulated from the equipment grounding conductors and from equipment enclosures and other grounded parts. The grounded (neutral) circuit terminals in the distribution panelboard and in ranges, clothes dryers, counter-mounted cooking units, and wall-mounted ovens shall be insulated from the equipment enclosure. Bonding screws, straps, or buses in the distribution panelboard or in appliances shall be removed and discarded.
~~(2)~~ Connection of electric ranges and electric clothes dryers utilizing a grounded (neutral) conductor, if cord-connected, shall be made with 4-conductor cord and 3-pole, 4-wire, grounding-type plug caps and receptacles.
SUBSTANTIATION: Material can be combined into one paragraph eliminating the need to add titles or list language to conform to the new Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

(Log #356)

19- 133 - (552-61 (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add 552-xx. Distribution System. The recreational vehicle park electrical distribution for park trailers shall be in accordance with Section 551-72.
SUBSTANTIATION: Section 552-1 suggests the definition of Recreational Vehicle and Recreational Vehicle Park apply to this article. It is not clear if Section 551-72 is applicable, even though equally warranted for this article. A specific reference to that section would be helpful to code users.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation is outside of the scope of 552.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13

ARTICLE 553 — FLOATING BUILDINGS

(Log #1410)

19- 134 - (553-5): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Delete this section, or alternatively revise to read as follows:
Service Conductors. One set of service conductors shall be permitted to serve more than one set of service equipment, and the limitation of not more than six disconnects at any one location shall not apply.
SUBSTANTIATION: This section is not clear whether intent is to modify the qualification re: number and location of disconnects covered in Section 230-40, Exception No. 2 which allows what this section permits. If modification is intended, it should be clearly stated, and if not, this section is unnecessary. Since a "set" of service equipment may be considered to be a single enclosure with six disconnects or six separate disconnect/overcurrent device enclosures the literal wording of this section, if considered a modification of Section 230-40, Exception No. 2 allows any number of disconnect/overcurrent devices at any one location.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided technical substantiation for allowing more than six disconnects.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

ARTICLE 555 — MARINAS AND BOATYARDS

(Log #442)

19- 135 - (555): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action in part. The Technical Correlating Committee directs the Panel to reconsider the second sentence of the Scope relative to the statement of intent. This action will be considered by the panel as a public comment. The Technical Correlating Committee directs that the action on this proposal be rewritten to comply with the NEC Style Manual regarding references to entire Articles.

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

RECOMMENDATION: ARTICLE 555 -- Marinas and Boatyards

~~555-1 Scope~~

~~This article covers the installation of wiring and equipment in the areas comprising fixed or floating piers, wharfs, docks, and other areas in marinas, boatyards, boat basins, boathouses, and similar occupancies that are used, or intended for use, for the purpose of repair, berthing, launching, storage, or fueling of small craft and the moorage of floating buildings.~~

~~555-2. Application of Other Articles~~

Wiring and equipment for marinas and boatyards shall comply with this article and also with the applicable provisions of other articles of this Code.

~~FPN: For disconnection of auxiliary power from boats, see Fire Protection Standard for Pleasure and Commercial Motor Craft, NFPA 302-1994.~~

~~555-3. Receptacles~~

Where shore power is supplied, those accommodations for boats 20 ft (6.1 m) or less in length shall be equipped with shore-power receptacles of a locking and grounding type rated at not less than 20 amperes.

~~Where shore power is supplied to accommodations for boats longer than 20 ft (6.1 m) in length, shore-power receptacles of a locking and grounding type rated at 30 amperes or more shall be provided.~~

~~Fifteen- and 20-ampere, single-phase, 125-volt receptacles other than those supplying shore power to boats located at piers, wharfs, and other locations shall be protected by ground-fault circuit interrupters.~~

FPN No. 1: For various configurations and ratings of locking- and grounding-type receptacles and caps, see National Electrical Manufacturers Association's Standard for Dimensions of Attachment Plugs and Receptacles, ANSI/NEMA 18WD 6-1989.

~~FPN No. 2: For locking- and grounding-type receptacles for auxiliary power to boats, see Fire Protection Standard for Marinas and Boatyards, NFPA 303-1995.~~

~~FPN No. 3: In locating receptacles, consideration should be given to the maximum tide level and wave action. See Fire Protection Standard for Marinas and Boatyards, NFPA 303-1995, for establishment of datum plane.~~

~~555-4. Disconnecting Means~~

~~A readily accessible disconnecting means shall be provided by which each boat can be isolated from its supply circuit. The disconnecting means shall consist of a circuit breaker or switch, or both, and shall be located within sight of the shore power connection and is intended to constitute the means of cutoff of the supply to the boat.~~

~~555-5. Branch Circuits~~

~~Each single receptacle that supplies shore power to boats shall be supplied from a power outlet or panelboard by an individual branch circuit of the voltage class and rating corresponding to the rating of the receptacle.~~

~~FPN: Supplying receptacles at voltages other than the voltages marked on the receptacle may cause overheating or malfunctioning of connected equipment, for example, supplying single-phase, 120/240-volt, 3-wire loads from a 208Y/120-volt, 3-wire source.~~

~~555-6. Feeders and Services~~

~~The load for each feeder and/or service circuit supplying receptacles that supply shore power for boats shall be calculated as follows. These calculations may be modified as indicated in sections (a) and (b).~~

~~Number of Receptacles~~	~~Sum of the Rating of the Receptacles (percent)~~
~~1–4~~	~~100~~
~~5–8~~	~~90~~
~~9–14~~	~~80~~
~~15–30~~	~~70~~
~~31–40~~	~~60~~
~~41–50~~	~~50~~
~~51–70~~	~~40~~
~~71–plus~~	~~30~~

~~a. Where shore power accommodations provide two receptacles specifically for an individual boat slip and these receptacles have different voltages (for example, one 30-ampere, 125-volt and one 50-ampere, 125/250-volt), only the receptacle with the larger kilowatt demand shall be required to be calculated.~~

~~b. If the facility being installed includes individual kilowatt-hour submeters for each slip, and is being calculated using the criteria listed in Section 555-6, the total demand amperes may be multiplied by 0.9 to achieve the final demand amperes.~~

~~FPN: These demand factors may be inadequate in areas of extreme hot or cold temperatures with loaded circuits for heating, air-conditioning, or refrigerating equipment.~~

~~555-7. Wiring Methods~~

~~The wiring method shall be of a type identified for use in wet locations. Extra-hard-usage portable power cable listed for both wet locations and sunlight resistance shall be permitted for a feeder where flexibility is required.~~

~~FPN: For further information on wiring methods for various locations and for establishment of datum plane, see Fire Protection Standard for Marinas and Boatyards, NFPA 303-1995.~~

~~555-8. Grounding~~

~~(a) Equipment to Be Grounded. The following items shall be connected to an equipment grounding conductor run with the circuit conductors in a raceway or cable:~~

~~1. Boxes, cabinets, and all other metal enclosures~~

~~2. Metal frames of utilization equipment~~

~~3. Grounding terminals of grounding-type receptacles~~

~~(b) Type of Equipment Grounding Conductor. The equipment grounding conductor shall be an insulated copper conductor with a continuous outer finish that is either green or green with one or more yellow stripes.~~

~~Exception: The equipment grounding conductor of Type MI cable shall be permitted to be identified at terminations.~~

~~(c) Size of Equipment Grounding Conductor. The insulated copper equipment grounding conductor shall be sized in accordance with Section 250-122 but not smaller than No. 12.~~

(d) Branch-Circuit Equipment Grounding Conductor. The insulated equipment grounding conductor for branch circuits shall terminate at a grounding terminal in a remote panelboard or the grounding terminal in the main service equipment.

~~(e) Feeder Equipment Grounding Conductors. Where a feeder supplies a remote panelboard, an insulated equipment grounding conductor shall extend from a grounding terminal in the service equipment to a grounding terminal in the remote panelboard.~~

~~555-9. Wiring Over and Under Navigable Water~~

~~Wiring over and under navigable water shall be subject to approval by the authority having jurisdiction.~~

~~555-10. Gasoline Dispensing Stations — Hazardous (Classified) Locations~~

~~Electrical equipment and wiring located in gasoline dispensing stations shall comply with Article 514.~~

~~FPN: For further information, see Automotive and Marine Service Station Code, NFPA 30A-1996, and Fire Protection Standard for Marinas and Boatyards, NFPA 303-1995.~~

~~555-11. Location of Service Equipment~~

~~The service equipment for floating docks or marinas shall be located adjacent to, but not on or in, the floating structure.~~

555.1 Scope.

This article covers the installation of wiring and equipment in the areas comprising fixed or floating piers, wharfs, docks, and other areas in marinas, boatyards, boat basins, boathouses, yacht clubs, boat condominiums, docking facilities associated with residential condominiums, any multiple docking facility, or similar occupancies, and facilities that are used, or intended for use, for the purpose of repair, berthing, launching, storage, or fueling of small craft and the moorage of floating buildings.

A single, private, non-commercial docking facility for a one-family dwelling, is not intended to be covered by this Article.

FPN: See *Fire Protection Standard for Marinas and Boatyards*, NFPA 303-1995 for additional information

~~555.2 Definitions~~.

Electrical Datum Plane. The electrical datum plane is defined as follows:

(a) In land areas subject to tidal fluctuation, the electrical datum plane is a horizontal plane 2 ft (606 mm) above the highest tide level for the area occurring under normal circumstances, i.e., highest high tide.

~~*(b) In land areas not subject to tidal fluctuation, the electrical*~~ *datum plane is a horizontal plan~~e 2 ft (606 mm) above the highest water~~ level for the area occurring under normal circumst~~ances.*

(c) The electrical datum plane for floating piers and landing stages that are (1) installed to permit rise and fall response to water level, without lateral movement, and (2) that are so equipped that they can rise to the datum plane established for (a) or (b) above, is a horizontal plane 30 in. (762mm) above the water level at the floating pier or landing stage and a minimum of 12 in. (305 mm) above the level of the deck.

Marine Power Outlet. An enclosed assembly that can include receptacles, circuit breakers, fused switches, fuses, watt-hour meter(s), and monitoring means approved for marine use.

555.4 Distribution System. Yard and pier distribution systems shall not exceed 600 volts phase to phase.

555.5 Transformers. Transformers and enclosures shall be specifically approved for the intended location. The bottom of enclosures for transformers shall not be located below the electrical datum plane.

555.7 Location of Service Equipment. The service equipment for floating docks or marinas shall be located adjacent to, but not on or in, the floating structure.

555.9 Electrical Connections. All electrical connections shall be located at least 12 in. (305 mm) above the deck of a floating pier. All electrical connections shall be located at least 12 in. (305 mm) above the deck of a fixed pier, but not below the electrical datum plane.

555.10 Electrical Equipment Enclosures.

(A) Securing and Supporting. Electrical equipment enclosures installed on piers above deck level shall be securely and substantially supported by structural members, independent of any conduit connected to them. If enclosures are not attached to mounting surfaces by means of external ears or lugs, the internal screw heads shall be sealed to prevent seepage of water through mounting holes.

(B) Location. Electrical equipment enclosures on piers shall be located so as not to interfere with mooring lines.

555.11 Circuit Breakers, Switches, Panelboards, and Marine Power Outlets.

(A) Overcurrent Protection. Overcurrent protection for feeders or branch circuits shall be provided by the use of circuit breakers to avoid the difficulty of fuse replacement in gasketed enclosures.

(B) Enclosures. Circuit breakers and switches installed in gasketed enclosures shall be arranged to permit required manual operation without exposing the interior of the enclosure. All such enclosures shall be arranged with a weep hole to discharge condensation.

555.12 Load Calculations for Service and Feeder Conductors. The load for each service and/or feeder circuit supplying receptacles that provide shore power for boats shall be calculated using the demand factors shown in Table 555.12(A). These calculations shall be permitted to be modified as indicated in notes (1) and (2). General lighting and other loads shall be calculated in accordance with Article 220. The minimum rating and size of conductors shall comply with Article 215 or Article 230 as applicable.

Table 555.12(A) Demand Factors

Number of Receptacles	Sum of the Rating of the Receptacles (percent)
1-4	100
5–8	90
9–14	80
15–30	70
31–40	60
41–50	50
51–70	40
71–plus	30

Note 1. Where shore power accommodations provide two receptacles specifically for an individual boat slip and these receptacles have different voltages (for example, one 30 ampere, 125 volt and one 50 ampere, 125/250 volt), only the receptacle with the larger kilowatt demand shall be required to be calculated.

Note 2. If the facility being installed includes individual kilowatt-hour submeters for each slip, and is being calculated using the criteria listed in Table 555.12(A), the total demand amperes may be multiplied by 0.9 to achieve the final demand amperes.

FPN: These demand factors may be inadequate in areas of extreme hot or cold temperatures

with loaded circuits for heating, air-conditioning, or refrigerating equipment.

555.13 Wiring Methods and Installation.

(A) Wiring Methods.

(1) General. Wiring methods of Chapter 3 shall be permitted where identified for use in wet locations.

(2) Portable Power Cables. Extra-hard usage portable power cables rated not less than 167^{0}F (75^{0}C), 600 volts, listed for both wet locations and sunlight resistance, having an outer jacket rated to be resistant to temperature extremes, oil, gasoline, ozone, abrasion, acids, and chemicals shall be permitted as follows:

1. As permanent wiring on the underside of piers (floating or fixed).

2. Where flexibility is necessary as on piers composed of floating sections.

(3) Temporary Wiring. Temporary wiring, except as permitted by Article 305, shall not be used to supply power to boats.

(B) Installation.

(1) Overhead Wiring. Overhead wiring shall be installed to avoid possible contact with masts and other parts of boats being moved in the yard.

(a) Conductors and cables shall be routed to avoid wiring closer than 20 ft (6.1 m) from the outer edge or any portion of the yard that can be used for moving vessels or stepping or unstepping masts.

(2) Outside Branch Circuits and Feeders. Outside branch circuits and feeders shall comply with Article 225 except that clearances for overhead wiring in portions of the yard other than those described in (B)(1) shall not be less than 18 ft (5.49 m) above grade.

(3) Wiring Over and Under Navigable Water. Wiring over and under navigable water shall be subject to approval by the authority having jurisdiction

FPN: See *Fire Protection Standard for Marinas and Boatyards*, NFPA 303-1995 for warning

sign requirements.

(4) Portable Power Cables.

(a) Where portable power cables are permitted by 555.13(A)(2), the installation shall comply with the following.

1. Cables shall be properly supported.

2. Cables shall be located on the underside of the pier.

3. Cables shall be securely fastened by nonmetallic clips to structural members other than the deck planking.

4. Cables shall not be installed where subject to physical damage.

5. Where cables pass through structural members they shall be protected against chafing by a permanently installed oversized sleeve of nonmetallic material.

(b) Where portable power cables are used as permitted in 555.13(a)(2)2. there shall be an approved junction box of corrosion-resistant construction with permanently installed terminal blocks on each pier section to which the feeder and feeder extensions are to be connected. Metal junction boxes and their covers, and metal screws and parts that are exposed externally to the boxes, shall be of corrosion-resistant materials, or protected by material resistant to corrosion.

(5) Protection. Rigid metal or nonmetallic conduit suitable for the location shall be installed to protect wiring above decks of piers and landing stages and below the enclosure that it serves. The conduit shall be connected to the enclosure by full standard threads. The use of special fittings of nonmetallic material to provide a threaded connection into enclosures on rigid nonmetallic conduit, employing joint design as recommended by the conduit manufacturer for attachment of the fitting to the

conduit will be acceptable provided the equipment and method of attachment are approved and the assembly meets the requirements of installation in damp or wet location as applicable.

555.15 Grounding. Wiring and equipment within the scope of this article shall be grounded as specified in Article 250 and with the following additional requirements.

(A) Equipment to Be Grounded. The following items shall be connected to an equipment grounding conductor run with the circuit conductors in the same raceway, cable, or trench:

1. Metal boxes, metal cabinets, and all other metal enclosures.
2. Metal frames of utilization equipment.
3. Grounding terminals of grounding-type receptacles.

(B) Type of Equipment Grounding Conductor. The equipment grounding conductor shall be an insulated copper conductor with a continuous outer finish that is either green or green with one or more yellow stripes. The equipment grounding conductor of Type MI cable shall be permitted to be identified at terminations. For conductors larger than No. 6, or where multiconductor cables are used, re-identification of conductors as allowed in 250.119(A)(2) and (3) or 250.119(B)(2) and (3) shall be permitted.

(C) Size of Equipment Grounding Conductor. The insulated copper equipment grounding conductor shall be sized in accordance with 250.122 but not smaller than No. 12.

(D) Branch-Circuit Equipment Grounding Conductor. The insulated equipment grounding conductor for branch circuits shall terminate at a grounding terminal in a remote panelboard or the grounding terminal in the main service equipment.

(E) Feeder Equipment Grounding Conductors. Where a feeder supplies a remote panelboard, an insulated equipment grounding conductor shall extend from a grounding terminal in the service equipment to a grounding terminal in the remote panelboard.

555.17 Disconnecting Means for Shore Power Connection(s). Disconnecting means shall be provided to isolate each boat from its supply connection(s).

(A) Type. The disconnecting means shall be permitted to consist of a circuit breaker, switch, or both, and shall be properly identified as to which receptacle it controls.

(B) Location. The disconnecting means shall be readily accessible, located not more than 30 in. (762 mm) from the receptacle it controls, and shall be located in the supply circuit ahead of the receptacle. Circuit breakers or switches located in marine power outlets complying with this section shall be permitted as the disconnecting means.

555.19 Receptacles. Receptacles shall be located not less than 24 in. (610 mm) above the deck surface of the pier, and not below the electrical datum plane on a fixed pier.

(A) Shore Power Receptacles.

(1) Enclosures. Receptacles intended to supply shore power to boats shall be housed in marine power outlets listed for wet locations, listed enclosures protected from the weather, or listed weatherproof enclosures. The weatherproof integrity of the assembly shall not be affected when the receptacles are in use with any type of properly configured booted or non-booted attachment plug/cap inserted.

(2) Strain relief. Means shall be provided to reduce the strain on the plug and receptacle caused by the weight and catenary angle of the shore power cord by either of the following methods:

(a) The receptacle face shall be at any angle from horizontal to 65 degrees below horizontal.

See Figure 555.19(A)(2)(a).

(b) Separate mechanical strain relief which will not damage the shore power cord.

(3) Branch Circuits. Each single receptacle that supplies shore power to boats shall be supplied from a marine power outlet or panelboard by an individual branch circuit of the voltage class and rating corresponding to the rating of the receptacle

FPN: Supplying receptacles at voltages other than the voltages marked on the receptacle may cause overheating or malfunctioning of connected equipment, for example, supplying single-phase, 120/240-volt, 3-wire loads from a 208Y/120-volt, 3-wire source.

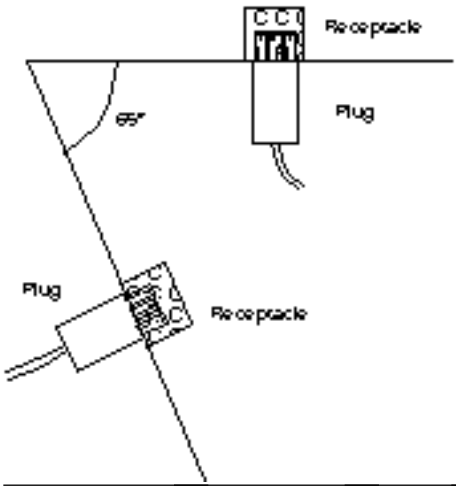


Figure 555.19(A)(2)(a) Example of receptacle face position

(4) Ratings. Receptacles that provide shore power for boats shall be rated not less than 30 amperes and shall be single outlet type.

FPN: For locking- and grounding-type receptacles for auxiliary power to boats, see *Fire Protection Standard for Marinas and Boatyards*, NFPA 303-1995.

(a) Receptacles rated not less than 30 amperes nor more than 50 amperes shall be of the locking- and grounding-type.

FPN: For various configurations and ratings of locking- and grounding-type receptacles and caps, see National Electrical Manufacturers Association's *Standard for Dimensions of Attachment Plugs and Receptacles*, ANSI/NEMA 18WD 6-1989.

(b) Receptacles rated for 60 amperes or 100 amperes shall be of the pin and sleeve type.

FPN: For various configurations and ratings of pin and sleeve receptacles, see ANSI/UL 1686, *UL Standard for Safety Pin and Sleeve Configurations*.

(B) Other Than Shore Power.

(1) Ground-Fault Circuit Interrupter (GFCI) Protection for Personnel. Fifteen- and 20-ampere, single-phase, 125-volt receptacles installed outdoors, in boathouses, in buildings used for storage, maintenance, or repair where portable electrical hand tools, electrical diagnostic equipment, or portable lighting equipment are to be used shall be provided with GFCI protection for personnel. Receptacles in other locations shall be protected in accordance with 210.8(B).

(2) Marking. Receptacles, other than those supplying shore power to boats shall be permitted to be housed in marine power outlets with the receptacles that provide shore power to boats, provided they are marked to clearly indicate that they are not to be used to supply power to boats.

555.21 Gasoline Dispensing Stations – Hazardous (Classified) Locations. Electrical wiring and equipment located at, or serving gasoline dispensing stations shall comply with Article 514 in addition to the requirements of this article.

555.23 Marine Hoists, Railways, Cranes, and Monorails. Motors and controls for marine hoists, railways, cranes, and monorails shall not be located below the electrical datum plane. Where it is necessary to provide electric power to a mobile crane or hoist in the yard, and a trailing cable is utilized, it shall be a listed portable power cable rated for the conditions of use and be provided with an outer jacket of distinctive color for safety.

SUBSTANTIATION: This proposal offers a total rewrite of Article 555 that incorporates the physical installation rules contained in NFPA 303, Fire Protection Standard for Marinas and Boatyards. The two documents have for some time been in basic agreement as far as installation rules were concerned. However, the NEC has never stated certain rules in the same depth as NFPA 303. Indeed, in the nine specific installation rule sections in Article 555, the user of the NEC is referred to NFPA 303 four times in fine print notes. Many AHJ's have had difficulty in applying the specific rules in NFPA 303 due to these references being in explanatory fine print

notes which are not enforceable as Code. Those who do have the ability to enforce these other referenced standards find that in the vast majority of cases, the installers do not have access to them and are, therefor, not aware of the specific installation requirements. These requirements are critical in ensuring that the installation meets all applicable safety rules. The NEC is the primary installation requirement document used by electrical contractors around the country and the book they use almost exclusively does not contain the requirements they must meet. The concept of the proposal is similar to that which was applied to NFPA 20 and Article 695, put the installation requirements into the NEC and leave the performance and testing requirements in the other NFPA standard. NFPA 303 is currently in its change cycle and many of the accepted proposals to date remove specific or redundant requirements from NFPA 303 and refer the user of that document to the National Electrical Code. This proposal, while offering substantive technical changes to the NEC, does not change any of the technical requirements from those that were found in NFPA 303. Specific technical substantiation for these requirements may be found in the ROP for NFPA 303. In some cases paragraphs have been combined or reworded to meet the NEC Style Manual and the entire format is written to conform with the latest edition of the Style Manual recently adopted.

One major change to Article 555 appears in 555.1 Scope. For several cycles there has been a conflict between the two documents with regards to applicability of the rules to residential docking facilities. NFPA 303 for some time has indicated that the standard was not applicable to single family docks, this proposal brings that intent into Article 555. A designer, installer, or homeowner could certainly apply Article 555 to a particular installation if he or she so desired, but the requirements would not be mandated by the Code. There does not appear to be any statistical information that indicate safety at private, single-family residential docks has been compromised by applying the general rules of the NEC to their installation. A companion proposal is being submitted to CMP-2 to add GFCI requirements back into 210-8 for residential boathouses. The submitter understands that the Technical Correlating Committee has jurisdiction for the "scope" provisions.

The definition of "electrical datum plane" has been added to Article 555 along with specific installation rules for equipment to be located above that plane. The specific wiring methods and installation rules formerly referenced through fine print notes have been added.

Another significant change is found in 555.19(A)(4) regarding the rating of receptacles to be installed for shore power. NFPA 303 does not and has not required a specific rating of receptacle dependent on the length of the boat. It sets a minimum rating and leaves it up to the designer and owner to provide the receptacles they deem necessary based on projected usage of the slips. This minimum rating is being changed to 30 amperes as information available to the NFPA 303 Technical Committee indicates that there are no longer any boats being manufactured with shore power provisions of 20 amperes nor have they been manufactured for a number of years.

The proposal adds requirements for 60 and 100 ampere pin and sleeve receptacles that have never been mentioned in Article 555.

Acceptance of this proposal will ensure that the installers and authorities having jurisdiction have access to all the installation rules that should have been applied to these installations.

PANEL ACTION: Accept.
PANEL STATEMENT: This proposal offers scope language which is the jurisdiction of the TCC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #967)

19- 136 - (555-1, Exception (New)): Reject

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee agrees that the Exception is not necessary.

SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:

Exception: Communications circuits, sound-recording and reproducing circuits, Class 2 and Class 3 circuits, and power-limited fire alarm circuits are covered by Articles 640, 725, 760 and 800.

SUBSTANTIATION: This section appears to literally apply to the wiring and equipment related to the articles noted in the proposal. Section 555-2 indicates those articles and this article apply. The problem is Section 555-7 which requires equipment grounding with an insulated minimum no. 12 conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: The scope is under the jurisdiction of the TCC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #3646)

19- 137 - (555-2, FPN (New)): Accept in Principle
SUBMITTER: Philip A. Teah, Charles Industries
RECOMMENDATION: Add a new FPN to read:

"Specific information for Marinas and Boatyards can be found in the Fire Protection Standard for Marinas and Boatyards, NFPA 303."

SUBSTANTIATION: Many engineers and designers are unaware of the standard NFPA 303. This standard should be referenced just as it is in 555-3.
PANEL ACTION: Accept in Principle.
Proposal 19-135 picks up this proposal almost verbatim.
PANEL STATEMENT: Panel action on proposal 19-135 addresses this recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #523)

19- 138 - (555-3): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In Section 555-3, replace "20 ft (6.1 m)" with "6.0 m (20 ft)" throughout.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #3648)

19- 139 - (555-3): Reject
SUBMITTER: Philip A. Teah, Charles Industries
RECOMMENDATION: Where the second paragraph reads:

"Where shore power...shall be provided.", add to the last sentence of the second paragraph:

"Receptacles must supply only the type power as they are rated for."

SUBSTANTIATION: There is a misconception in the Marina industry that a receptacle rating is for the maximum voltage. For example, a receptacle marked as 125/250 is an acceptable receptacle for 208V; it is not.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation is covered in the existing 210-7 and 555-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #3762)

19- 140 - (555-3): Reject
SUBMITTER: Robert R. Kress, Charles Industries Marine Group
RECOMMENDATION: Add the following FPN at the end of the second paragraph. This is in addition to those at the end of the third paragraph:

FPN No. 1 For 120/208 single phase service derived from two legs of 120/208 volt 3-phase WYE service is in violation of the code since:

(a) It is impossible to achieve balance on an electrical distribution panel that is configured for 120/240 volts (single phase), resulting in the potential for overcurrent on the neutral (white) conductor and the potential for fire and
(b) Since suitable receptacles or inlets are not manufactured for this modified service.
SUBSTANTIATION: Numerous connections with burned neutral male elements clearly indicate the overcurrent found on the neutral conductor in "208" (single phase) supplied marinas when 125.250 volt boat inlets and cordset connectors to shoreside power pedestals are scrutinized.
It should be emphasized somewhere that single phase power derived from 120/208 volt, 3 phase WYE is potential fire hazard.
PANEL ACTION: Reject.
PANEL STATEMENT: A FPN should clarify a requirement not state a requirement. This requirement in the recommendation is addressed in the existing code (555-5).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #3645)

19- 141 - (555-4): Accept in Principle
SUBMITTER: Philip A. Teah, Charles Industries
RECOMMENDATION: Instead of: "be located within sight of the shore power connection", delete "within sight of" and replace with "next to".
SUBSTANTIATION: The new Manual of Style for NFPA Technical Committee Documents 2000 edition intent is to eliminate vague or unenforceable terms (see 2.2.2.3 and 2.2.2.4). The breaker should be at the point of connection to allow a quick response to the need to terminate power.
PANEL ACTION: Accept in Principle.
The text in Proposals 19-135, 555-17 (b) covers this recommendation.
PANEL STATEMENT: Proposal 19-135 addresses this recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #3761)

19- 142 - (555-4, FPN): Reject
SUBMITTER: Robert R. Kress, Charles Industries Marine Group
RECOMMENDATION: Revise text to read as follows:
FPN: "...3-wire loads <u>from</u> a 208Y/120 -volt, 3-wire source." and add:
"Suitable receptacles do not exist for modified 120/280 volt, 3-phase WYE, i.e., a single phase power source."
SUBSTANTIATION: Typographical error - replace "for" with "from".
PANEL ACTION: Reject.
PANEL STATEMENT: The reference should be to 555-5 not 555-4. Additionally, the typographical error mentioned has been corrected in the 1999 NEC. Also, there has been no technical substantiation submitted to support the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #3647)

19- 143 - (555-5): Reject
SUBMITTER: Philip A. Teah, Charles Industries
RECOMMENDATION: Add a new second sentence to read as follows:
"120/208 branch circuits shall not be used to provide service to receptacles rated 125/250 volts single phase."
SUBSTANTIATION: When the panel added the FPN, they thought the FPN would address the problem of using inadequately rated receptacles. The industry is still using 125/250V rated receptacles supplied by 120/208 branch circuits. This stronger language is needed.
Note: Supporting Material is available for review at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing 210-7(a) and 555-5 cover this recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #358)

19- 144 - (555-6): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise:
FEEDERS AND SERVICES. <u>The computed load in volt-amperes for each receptacle shall be based on the receptacle current and voltage rating and number of phases (for example, a 30 ampere 208y/120 volt 3-phase receptacle shall be computed at not less than 10,800 volt-amperes).</u> The receptacle load for each feeder and /or service circuit that supplies shore power for boats shall be calculated as follows. These calculations may be modified as indicated in sections (a) and (b).

NUMBER OF RECEPTACLES (percent)	SUM of the RATING <u>in Volt- Amperes</u> of the RECEPTACLES
1-4	100
5-8	90
9-14	80
15-30	70
31-40	60
41-50	50
51-70	40
71-plus	30

(a) Where shore power accommodations provide <u>two or more</u> receptacles specifically for an individual boat slip and these receptacles have different ~~voltages~~ <u>ratings</u> ~~(for example, one 30 ampere 125 volt and one 50 ampere 125/250 volt),~~ only the receptacle with the larger ~~kilowatt demand~~ rating shall be required to be calculated.
(b) No change.
FPN: No change.
SUBSTANTIATION: The table and Section 555-3 indicate receptacle ratings are confined to amperes. No Code limitations re: voltage or phases is indicated. Calculation of load based solely on receptacle ampere rating without consideration of voltage and phases can result in a lower ampere rated receptacle that can supply greater load than one rated higher (20 ampere 208y/120 volt 3-phase = 7200 VA; 50 ampere 125 volt = 6250 VA). Determination of the larger kilowatt demand can vary dependent on the boat connected and equipment on-line at any one time. A fixed assigned load value per receptacle covers worst case (Maximum load) conditions.
More than two receptacles may be provided for a slip to provide for a variety of boat lengths and requirements. Present requirement of (a) only applies where two receptacles are provided and doesn't apply where the voltage ratings are the same, but ampere ratings are different.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing text is sufficiently clear.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #4340)

19- 145 - (555-6): Reject
SUBMITTER: Leonard L. Johnson, Dept. of Insp, Licenses & Permits, Howard Cnty, MD
RECOMMENDATION: Revise text to read as follows:
"555-6. Feeders and Services. The load for each feeder and/or service <u>conductor</u> ~~circuit~~ supplying receptacles that supply...".
Remaining text remains as is.
SUBSTANTIATION: When calculating feeders and services the method has always been very specific for applying the demand factors of the "Number of Receptacles". The demand factor is based on the number of receptacles on a individual (single) service or feeder conductor. When the word "circuit" replaced the word "conductor" it became very confusing to many.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommendation would change the text to the requirements of the previous edition which gave a method that resulted in over sizing the service.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #968)

19- 146 - (555-8(b) Exception No. 2 (New)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception No. 2: Equipment grounding conductors larger than No. 6 shall be permitted to be identified by a durable and permanent green marking in accordance with Section 250-119(a).
SUBSTANTIATION: Larger than No. 6 conductors with green insulation are not always available. Provisions of Section 250-119(a) which are generally suitable for hazardous (classified) locations, hospitals, and other premises should be suitable for this article. Limitation to green marking (not stripping of insulation) would preserve conductor corrosion-resistance.
PANEL ACTION: Accept in Principle.
The Panel action on proposal 19-135 addresses the recommendation.
PANEL STATEMENT: The submitter's substantiation is accepted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

(Log #1092)

19- 147 - (555-8(c)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 12" to "12 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: The NEC Style Manual does not specify the language used one way or another. The NFPA Manual of Style seems to prefer 10AWG. Product standards use 10 AWG or 10 AWG 110-6 says that the conductor sizes are expressed in AWG or in circular mils so the AWG is implied The panel recognizes that the TCC may desire to take a different action to be consistent with the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9

ARTICLE 600 — ELECTRIC SIGNS AND OUTLINE LIGHTING

(Log #550)

18- 71 - (600): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: a) Section 600-4(b): Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
b) Section 600-7: Replace "100 ft (30.5 m)" with "30 m (100 ft)"; Replace "2 in. (50.8 mm)" with "50 mm (2 in.)"; Replace "3/4 in. (19 mm)" with "19 mm (3/4 in.)"; Replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)"; Replace "1 3/4 in. (44.45 mm)" with "45 mm (1 3/4 in.)".
c) Section 600-8(c): Replace "0.020 in. (508 mm)" with "0.51 mm (0.020 in.)"; Replace "0.016 in. (406 mm) (No. 28 MSG)" with "0.41 mm (0.016 in.)".
d) Section 600-9(a): Replace "14 ft (4.4 m)" with "4.3 m (14 ft)".
e) Section 600-9(c): Replace "2 in. (50.8 mm)" with "50 mm (2 in.)".
f) Section 600-9(d): Replace "1/2 in. (12.7 mm)" with "13 mm (1/2 in.)"; Replace "1/4 in. (6.35 mm)" with "6 mm (1/4 in.)".
g) Section 600-10(c)(2): Replace "12 in. (305 mm)" with "300 mm (12 in.)".
h) Section 600-10(d)(2): Replace "15 ft (4.57 m)" with "4.5 m (15 ft)".
i) Section 600-21(d): Replace "3 ft (914 mm)" with "900 mm (3 ft)" in 3 locations.
j) Section 600-21(e): Replace "3 ft (914 mm)" with "900 mm (3 ft)" in 2 locations; Replace "2 ft (610 mm)" with "600 mm (2 ft)" in 2 locations; Replace "12 in. (305 mm)" with "300 mm (12 in.)".
k) Section 600-32(a): Replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)"; Replace "1 3/4 in. (44.45 mm)" with "45 mm (1 3/4 in.)".
l) Section 600-32(e): Replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)".
m) Section 600-32(g)(1): Replace "4 in. (102 mm)" with "100 mm (4 in.)".
n) Section 600-32(g)(2): Replace "2 1/2 in. (64 mm)" with "65 mm (2 1/2 in.)".
o) Section 600-32(j): Replace "20 ft (7 m)" with "6 m (20 ft)"; Replace "50 ft (15.2 m)" with "15 m (50 ft)".
p) Section 600-41(c): Replace "1/4 in. (6.5 mm)" with "6 mm (1/4 in.)".
q) Section 600-42(c): Replace "6 in. (152 mm)" with "150 mm (6 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

Note: The sequence no. 18-72 was not used.

(Log #2854)

18- 73 - (600-3): Reject
SUBMITTER: Bill F. Neitzel, Madison, WI
RECOMMENDATION: Add the following wording between the end of the first paragraph and subsection (a):
"Listing marks for all signs other than those described in parts (a) and (b) shall be visible from grade level after installation."
SUBSTANTIATION: Listing marks quite often are located out of sight for appearance sake. This practice raises questions about the listing of these signs. The listing marks are not obtrusive in appearance, and requiring them to be visible after installation benefits the owners, the supervising professionals, and the code officials. Call backs for verification of the listing marks cause increased costs to all parties.
PANEL ACTION: Reject.
PANEL STATEMENT: The visibility of the Listing mark sought is dependent on the orientation and installation of the sign and location of the observer. It is physically impractical in many instances to view the listing mark from the ground due to the size of the listing mark versus the physical location of the installed sign. For example a high rise pylon sign, or a sign mounted on the side of a building at a height of more than 2 stories. Nothing in the substantiation justified such a requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP1802)

18- 73a - (600-5(b)): Accept
SUBMITTER: CMP 18
RECOMMENDATION: "Modify 600-5(b) to read as follows:
(b) Rating. Branch circuits that supply signs shall be rated as follows:
(1) Incandescent and fluorescent. Branch circuits that supply signs and outline lighting systems containing incandescent and fluorescent forms of illumination shall be rated not to exceed 20 amperes.
(2) Neon. Branch circuits that supply neon tubing installations shall not be rated in excess of 30 amperes."
SUBSTANTIATION: Section revised to conform to the style manual Section 2.1.5 and 2.1.5.1. The load calculation required for branch circuits which supply signs is already covered by 220-3(b)(6).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP1803)

18- 73b - (600-5(c)): Accept
SUBMITTER: CMP 18
RECOMMENDATION: Modify 600-5(c)(1) through (3) to read as follows:
"(c) Wiring Methods. Wiring methods used to supply signs shall comply with the following:
(1) Supply. The wiring method used to supply signs and outline lighting systems shall terminate within a sign, an outline lighting system enclosure, a suitable box, or a conduit body.
(2) Enclosures as Pull Boxes. Signs and transformer enclosures shall be permitted to be used as pull or junction boxes for conductors supplying other adjacent signs, outline lighting systems, or floodlights that are part of a sign, and shall be permitted to contain both branch and secondary circuit conductors.
(3) Metal poles. Metal poles used to support signs shall be permitted to enclose supply conductors, provided the poles and conductors are installed in accordance with Section 410-15(b)."
SUBSTANTIATION: Section revised conform to Style Manual Section 2.1.5 and 2.1.5.1.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3680)

18- 74 - (600-5(c)(4)and Exception (New)): Reject
SUBMITTER: Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL
RECOMMENDATION: Add a new paragraph (4) to read as follows:
(4) Conductors and neon tubing shall maintain a height of at least eight ft from the ground, and shall not be installed on walls where they can be reached from platforms, balconies, fire escapes or through windows, doors, or other similar openings. Neon below eight (8) ft shall be enclosed to prevent direct contact with neon tubing.
Exception : Where signs are totally enclosed so that ready accessibility is prevented and signs that totally insulate all connecting terminals, the eight foot height requirement shall not apply.
SUBSTANTIATION: By adding this new text it will add an extra measure of safety around neon, especially in areas of high public contact, such as restaurants, pubs, and sub shops.
PANEL ACTION: Reject.
PANEL STATEMENT: Paragraph 3-3.3 (d) of the NFPA Regulations Governing Committee Projects requires the submitter to provide "a statement of the problem and substantiation". This proposal contains neither.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1463)

18- 75 - (600-6(a)): Accept in Principle in Part
SUBMITTER: David B. Perry, City of Chattanooga, TN
RECOMMENDATION: Rewrite to read as follows:
a) Location shall be in accordance with either 1) or 2) below:
1) The disconnecting means shall be within sight of the sign or outline lighting it controls. Where the disconnecting means is not visible from the entire sign or outline lighting it shall be capable of being locked in the open position.
2) Signs or outline lighting systems operated by electronic or electromechanical controllers located external to the sign or outline lighting system shall be permitted to have a disconnecting means located within sight of the controller or in the same enclosure with the controller. The disconnecting means shall disconnect the sign from all ungrounded supply conductors. It shall be designed so that no pole can be operated independently and it shall be capable of being locked in the open position.
SUBSTANTIATION: This change will be cleaner and easier to read.
PANEL ACTION: Accept in Principle in Part.
Modify Section 600-6(a) to read as follows:
"(a) Location.
(1) Within sight of the sign. The disconnecting means shall be within sight of the sign or outline lighting system that it controls. Where the disconnecting means is out of the line of sight from any section that may be energized, the disconnecting means shall be capable of being locked in the open position.
(2) Within sight of the controller. The following shall apply for signs or outline lighting systems operated by electronic or electromechanical controllers located external to the sign or outline lighting system:
(a) The disconnecting means shall be permitted to be located within sight of the controller or in the same enclosure with the controller.
(b) The disconnecting means shall disconnect the sign or outline lighting system and the controller from all ungrounded supply conductors.
(c) The disconnecting means shall be designed so that no pole can be operated independently and shall be capable of being locked in the open position."
PANEL STATEMENT: The rearrangement proposed was accepted and editorially reformatted to conform with the Style Manual. The change in wording is rejected because no explanation of the problem or rationale for requiring visibility of the disconnect from the entire sign was given in the substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1093)

18- 76 - (600-7): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 600 as follows:
600-7 - change "No. 14" to "14 AWG"
600-31(b) - change "No. 18" to "18 AWG"
600-32(b) - change "No. 18" to "18 AWG".
SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1763)

18- 77 - (600-7): Accept in Principle
SUBMITTER: Herbert Moulton, Masters Technology Inc.
RECOMMENDATION: Revise the second sentence of the first paragraph to read as follows:
600-7. Grounding. signs and metal equipment of outline lighting systems shall be grounded. Listed flexible metal conduit or listed liquidtight flexible metal conduit that encloses the ~~secondary wiring of a transformer or power supply for use with electrical discharge tubing shall be permitted as a bonding means in lengths not exceeding 100 ft (30.5 m)~~ secondary circuit conductors of a transformer or power supply shall not exceed 100 ft (30.5 m) total length in the secondary circuit where used as a bonding means.
Shall... Rest to remain as is.
SUBSTANTIATION: Confusion in the interpretation of the 100 foot requirement in this section seems to permit unlimited or 200 foot length of total flexible metal conduit. It appears that each high voltage terminal can have their own 100 foot length to comply with this section now.
UL tests have confirmed that the length be limited to 100 foot maximum in the secondary conductor circuit where used as a bonding means.
The way the section now reads allows an unlimited use of flexible metal conduit.
Also the flexible conduit cannot enclose the secondary wiring of a transformer or power supply. Only the enclosure that encloses the windings or parts of a power supply can enclose the secondary wiring or parts.
Flexible metal conduit can only enclose the secondary conductors not the wiring (windings) of the transformer or power supply.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action and statement on Proposal 18-78.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2999)

18- 78 - (600-7): Accept in Principle

Note: The Technical Correlating Committee understands that the SI units will be as shown in Proposal 18-71.

SUBMITTER: Stephen G. Kieffer, Randall K. Wright, Kieffer & Co., Inc. / Wright Sign Co./Rep. Int'l Sign Assn.

RECOMMENDATION: Change format of 600-7 into subsections as follows:

600-7. Grounding. Signs and metal equipment of outline lighting systems shall be grounded.

(a) Listed flexible metal conduit or listed liquidtight flexible metal conduit that encloses the secondary wiring of a transformer or power supply for use with electric discharge tubing shall be permitted as a bonding means in lengths not exceeding 100 ft (30.5 m).

(b) Small metal parts not exceeding 2 in. (50.8 mm) in any dimension, not likely to be energized, and spaced at least 3/4 in. (19 mm) from neon tubing shall not require bonding.

(c) Where listed nonmetallic conduit is used to enclose the secondary wiring of a transformer or power supply and a bonding conductor is required, the bonding conductor shall be installed separate and remote from the nonmetallic conduit and be spaced at least 1 1/2 in. (38 mm) from the conduit when the circuit is operated at 100 Hz or less or 1 3/4 in. (44.45 mm) when the circuit is operated at over 100 Hz.

(d) Bonding conductors shall be copper and not smaller than No. 14.

(e) Metal parts of a building shall not be permitted as a grounded or equipment grounding conductor.

SUBSTANTIATION: Proposal improves readability of this complex section.

PANEL ACTION: Accept in Principle.

Revise 600-7 to read as follows:

"600-7. Grounding. Signs and metal equipment of outline lighting systems shall be grounded.

(a) Flexible metal conduit length. Listed flexible metal conduit or listed liquidtight flexible metal conduit that encloses the secondary circuit conductor from a transformer or power supply for use with electric discharge tubing shall be permitted as a bonding means if the total accumulative length of the conduit in the secondary circuit does not exceed 30.5 m (100 feet) .

(b) Small metal parts. Small metal parts not exceeding 50.8 mm (2 in.) in any dimension, not likely to be energized, and spaced at least 19 mm (3/4 in.) from neon tubing shall not require bonding.

(c) Nonmetallic conduit. Where listed nonmetallic conduit is used to enclose the secondary circuit conductor from a transformer or power supply and a bonding conductor is required, the bonding conductor shall be installed separate and remote from the nonmetallic conduit and be spaced at least 38 mm (1 1/2 in.) from the conduit when the circuit is operated at 100 Hz or less or 44.45 mm (1 3/4 in.) when the circuit is operated at over 100 Hz.

(d) Bonding conductors. Bonding conductors shall be copper and not smaller than 14 AWG.

(e) Metal building parts. Metal parts of a building shall not be permitted as a secondary return conductor or an equipment grounding conductor.

FPN: Refer to 600-32(j) for restrictions on length of high-voltage secondary conductors."

PANEL STATEMENT: The section was revised as proposed and editorially rewritten to conform to the Manual of Style. The word "wiring" in (a) and (c) was changed to "conductors" because flexible metal conduit can only enclose the secondary conductors, not the wiring (windings) of the transformer or power supply. The wording was further revised to clarify that the length limitations apply to the conduit, not to the conductors.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3613)

18- 79 - (600-7): Accept in Principle

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

600-7. Grounding. Signs and metal equipment of outline lighting systems shall be grounded. Listed flexible metal conduit or listed liquidtight metal conduit that encloses the ~~secondary wiring of a transformer or power supply for use with electric discharge tubing shall be permitted as a bonding means in lengths not exceeding 100 ft (30.5 m)~~ secondary circuit conductors of a transformer or power supply shall not exceed 100 ft (30.5 m) total length in the secondary circuit where used as a bonding means. Small metal parts not exceeding 2 in. (50.8 mm) in any dimension, not likely to be energized, and spaced at least 3/4 in. (19 mm) from neon tubing shall not require bonding. Where listed nonmetallic conduit is used to enclosure the secondary wiring of a transformer or power supply and a bonding conductor is required, the bonding conductor shall be installed separate and remote from the nonmetallic conduit and be spaced at least 1 1/2 in. (38 mm) from the conduit when the circuit is operated at 100 Hz or less or 1 3/4 in. (44.45 mm) when the circuit is operated at over 100 Hz. Bonding conductors shall be copper and not smaller than No. 14. Metal parts of a building shall not be permitted as a grounded or equipment grounding conductor.

FPN: Refer to Section 600-32(j) for additional restrictions on length of high-voltage secondary conductors.

SUBSTANTIATION: Confusion in the interpretation of the 100 ft requirement in this section seems to permit unlimited or at least 200 ft lengths of total flexible metal conduit. It appears that each high voltage terminal can have their own 100 ft length to comply with this section now. UL tests have confirmed that the total length needs to be limited to 100 ft maximum in the secondary conductor circuit where used as a bonding means. The way the section now reads allows an unlimited use of flexible metal conduit. Also the flexible conduit cannot enclosure the secondary wiring of a transformer power supply. Only the enclosure that encloses the windings or parts of a power supply can enclose the secondary wiring or parts. Flexible metal conduit can only enclose the secondary conductors not the wiring (windings) of the transformer or power supply.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: See panel action and statement on Proposal 18-78.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

COCHRAN: I support the panel action but believe there is still a need to clarify the use, application, and length of raceways for secondary conductor circuits. The proposed change is needed to clarify the intent of the code and make it more user friendly.

(Log #4249)

18- 80 - (600-7): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Add the following as a second paragraph:

Signs or outline lighting installed inside a fountain shall have all metal parts and equipment grounding con-ductors bonded to the equipment grounding conductor for the fountain recirculating system. The bonding connection shall be as near as practicable to the fountain, and shall be permitted to be made to metal piping systems that are bonded in accordance with Section 680-53.

SUBSTANTIATION: This proposal relieves a direct conflict in the 1999 NEC. Section 600-7 was supposed to contain a bonding requirement as shown in the first sentence of this proposal (Proposal 18-102). Section 680-57(e) points to the bonding requirement supposedly in this section. However, CMP 18 forgot they included the requirement when they acted on public comments. Comment 18-89 inadvertently wiped out the requirement while the panel was making other changes to this section. The result is an important safety requirement lost because Section 690-57(e) now points to a nonexistent bonding requirement. Unfortunately the Correlating Committee completely missed this as well.

This wording improves on the CMP 18 wording in the proposal period because it specifies that the equip-ment grounding conductor being bonded to is the one for the recirculation system, which the CMP 18 word-ing would have left in doubt. The recirculation system would have the principal grounding conductor. The second sentence completes the rule with a location requirement. Since the point of the requirement is the elimination of local potential differentials, the connection should be close if possible. In addition, local metal piping systems, where bonded per Code, can be a practical way of achieving a close connection.

PANEL ACTION: Accept in Principle.

Add the following as item (f) to Section 600-7:

"(f) Signs in fountains. Signs or outline lighting installed inside a fountain shall have all metal parts and equipment grounding conductors bonded to the equipment grounding conductor for the fountain recirculating system. The bonding connection shall be as near as practicable to the fountain, and shall be permitted to be

made to metal piping systems that are bonded in accordance with Section 680-53."
PANEL STATEMENT: The proposal was modified to conform with the NEC Style Manual and rearrangement of Section 600-7 as adopted in Proposal 18-78. This requirement was inadvertently left out of the 1999 NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #970)

18- 81 - (600-10(d)(1)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Cords shall be SP-2, SPE-2, SPT-2, ~~or heavier~~ junior hard service or hard service types, as designated in Table 400-4.
SUBSTANTIATION: Editorial. The proposal is intended to clarify what "heavier" (a vague term) is apparently intended to mean.
PANEL ACTION: Reject.
PANEL STATEMENT: The current wording of 600-10(d) permits any cord heavier than SP2. The proposed wording eliminates types of cords presently acceptable that are not junior hard service such as SPT-3 and SVT. No technical rationale was presented to support this change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2795)

18- 82 - (600-21(e) and (f)): Reject
SUBMITTER: Phillip David Martin, City of Chattanooga, TN/Rep. Public Works-Insp. Div, Chattanooga, TN
RECOMMENDATION: Combine (e) and (f):
Attic locations and suspended ceilings to include the same requirements of the 1999 code but include the phrase "A switched lighting outlet be installed in any space where sign transformer or ballast are installed or serviced."
SUBSTANTIATION: Attics with sign transformers are usually installed in spaces with little or not light in the working space and the transformers are usually high-voltage transformers.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation was provided to support the proposed combination of (e) and (f). No technical substantiation was provided for adding a lighting outlet requirement in a soffit or above a suspended ceiling. The requirement for a lighting outlet in attics already exists in 210-70(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2870)

18- 83 - (600-21(e)): Accept in Principle
SUBMITTER: Eric Langfield, Wazel Crane
RECOMMENDATION: Add text to read as follows:
soffit and attic location
SUBSTANTIATION: Pararaph includes the soffit.
PANEL ACTION: Accept in Principle.
Add the word "soffit" to the title of 600-21(e) to read "attic and soffit locations"
PANEL STATEMENT: The panel action clarifies the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #CP1801)

18- 83a - (600-21(f)): Accept
SUBMITTER: CMP 18
RECOMMENDATION: Modify 600-21(f) to read as follows:
"(f) Suspended Ceilings. Ballasts, transformers, and electronic power supplies shall be permitted to be located above suspended ceilings, provided their enclosures are securely fastened in place and not dependent on the suspended ceiling grid for support. Ballasts, transformers and electronic power supplies installed in suspended ceilings shall not be connected to the branch circuit by flexible cord."
SUBSTANTIATION: A common practice is to install a cord-connected transformer in a suspended ceiling. This practice does not result in a Code compliant installation, see 400-8(2) & (5)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3679)

18- 84 - (600-21(g) (New)): Reject
SUBMITTER: Leonard F. Devine, Jr., W. Palm Beach County Bldg & Zoning, FL
RECOMMENDATION: Add new paragraph (g) to read as follows:
(g) When neon tubing is removed for repairs, jumpers shall be installed in high-voltage wire, supported with the same clearance as the tubing, but the jumpers must be removed within seven days, the repairs completed, or shut the sign down.
SUBSTANTIATION: This would allow a sign to be put into repair, without totally shutting down a sign. It is a reasonable length of time to make any necessary repairs to a sign.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not address an installation issue. This is an installation code, not a maintenance or safe work practice manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #45)

18- 85 - (600-23(b)): Reject
NOTE: The following proposal consists of Comment 18-97 on Proposal 18-117 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 18-117 was:
Revise as follows:
600-23. Transformers and Electronic Power Supplies.
(a) Type. Transformers and electronic power supplies shall be identified for the use and shall be listed.
(b) Secondary Circuit Fault Protection. Transformers and electronic power supplies other than the following shall have secondary circuit ground-fault protection.
~~Exception No.~~ (1) Transformers with isolated secondaries and with a maximum open circuit voltage of 7500 volts or less ~~need not have secondary ground fault protection.~~
Exception No.(2) Transformers with integral porcelain or glass secondary housing for the neon tubing and requiring no field wiring ~~on~~ of the secondary circuit ~~shall not be required to have secondary ground fault protection.~~
(c) Voltage. Secondary circuit voltage shall not exceed 15,000 volts, nominal, under any load condition. The voltage to ground of any output terminals of the secondary circuit shall not exceed 7500 volts, under any load conditions.
(d) Rating. Transformers and electronic power supplies shall have a secondary circuit current rating of not more than 300 milliamperes.
(e) Secondary Connections. Secondary circuit outputs shall not be connected in parallel or in series.
SUBMITTER: Thomas E. Trainor, City of San Diego, CA
RECOMMENDATION: This proposal was intended to clarify the requirements for secondary fault protection. This comment continues that effort by making the text in Subsection (b) consistent with the title of the Subsection and describing what secondary fault protection is intended to accomplish.
Revise Section 600-23 (b) to read as follows:
(b) Secondary Circuit Fault Protection. Transformers and electronic power supplies other than the following shall have secondary circuit ~~ground~~fault protection.
(1) Transformers with isolated secondaries and with a maximum open circuit voltage of 7500 volts or less.
(2) Transformers with integral porcelain or glass secondary housing for the neon tubing and requiring no field wiring of the secondary circuit.
The protective device shall deenergize the secondary circuit under any of the following conditions:

(1) When the secondary circuit faults to ground;
(2) When there is in-line arcing or excessive current on the secondary circuit;
(3) When there is an open circuit in the secondary caused by a break in the tubing or wiring.
The protective device shall respond to these conditions within 10 seconds, shall have a manual reset and shall also be permitted to incorporate an automatic resetting feature that operates a maximum of 3 times before requiring manual resetting.
SUBSTANTIATION: This proposed revision clearly describes the expectations for secondary fault protection as they were discussed in the 1996 code cycle. Evidently, the work of the transformer manufacturer's and test labs to date has resulted in a secondary protector that only senses faults to ground. These protectors do not sense in-line arcing , excessive current flow or open circuit conditions. All of these conditions represent serious fire and shock hazards. Protection against these conditions was considered to be a part of the requirement for secondary fault protection in the original panel discussions. The technology clearly exists to provide this type of secondary protection and anything less simply does not effectively provide the level of safety required for neon installations.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation or fire safety data is provided to support the requirement for open circuit protection. The transformers used in neon tubing circuits are current limiting devices. The panel is not aware of any conditions where in-line arcing without a ground fault resulted in a fire. The product standard has required the secondary circuit ground fault protection since September 1999. The last paragraph of the proposal contains requirements that may be more appropriate for the product standard. For example: A 10 second time delay might result in a fire.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #969)

18- 86 - (600-23(b)(1)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(1) Transformers with isolated ungrounded secondaries and with a maximum open circuit voltage of 7500 volts, or less.
SUBSTANTIATION: Editorial. If it is the intent to provide for isolated ungrounded secondaries it should be stated. Isolated secondaries are not necessarily ungrounded; many are required by Section 250-26 to be grounded.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4350)

18- 87 - (600-23(f)): Accept in Part
SUBMITTER: Lawrence Brown, Nat'l Assn. of Home Builders
RECOMMENDATION: Revise as follows:
(f) Marking. A transformer or power supply ~~must~~ shall be marked to ~~include that~~ indicate it ~~has~~ contains secondary fault protection.
SUBSTANTIATION: Clearer, more enforceable language.
PANEL ACTION: Accept in Part.
Modify 600-23(f) to read as follows:
"(f) Marking. A transformer or power supply shall be marked to indicate that it has secondary-circuit ground-fault protection."
Reject the word "contains".
PANEL STATEMENT: Accept the proposed change from "must" to "shall." Reject the word "contains" because the protection is not required to be inside the transformer. The proposal is editorially revised to add the words "circuit" and "ground".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3614)

18- 88 - (600-32): Accept in Principle in Part
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
600-32. Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal. (a) Wiring ~~Method.~~ Methods. Conductors shall be installed on insulators, in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, or other equipment listed for the purpose. Wiring methods shall be installed in accordance with the requirements of Chapter 3. Only one secondary circuit conductor shall be installed ~~per length~~ in 1/2 in. or larger ~~of~~ conduit or tubing. Nonmetallic conduit or flexible nonmetallic conduit, when operated at 100 Hz or less, shall be spaced at least 1 1/2 in. (38 mm) from grounded or bonded parts; and, when operated at over 100 Hz, shall be spaced at least 1 3/4 in (44.45 mm) from grounded or bonded parts. Metal parts of a building shall not be used as a grounded or equipment grounding conductor.
SUBSTANTIATION: As written this section leads to confusion in the fact that Chapter 3 requires 1/2 in. minimum for conduit and tubing be installed for Article 600. Inspectors are confused as to what equipment constitutes allowing 3/8 in. flexible metal conduit. Present wiring methods which utilize the installation of a cable known GTO cable. Various types of GTO cable will over fill a 3/8 in. flexible metal conduit and leads to insulation deterioration of the cable. This is created by the electrostatic fields generated by the high voltages in relationship to the close proximity to the ground plane of the conduit being grounded. Servicing signs and outline lighting where this is smaller diameter conduits have been installed reinforces the requirement as proposed.
Example, Section 350-10(a)(2) allows 3/8 in. flexible metal conduit for utilization equipment. Inspectors and installers are confused since Article 600 does not address the minimum size conduit or tubing allowed for the installation of the high voltage secondary circuit conductors. Revising this sentence will clarify this requirement. Also please note that Article 490 is also silent on this requirement.
PANEL ACTION: Accept in Principle in Part.
The panel accepts the change from "method" to "methods". The panel accepts the clarification of 1/2" conduit or tubing as the minimum acceptable size. The panel rejects the addition of "secondary circuit". See panel action on Proposal 18-91.
PANEL STATEMENT: The panel accepts the change from "method" to "methods". The panel accepts the clarification of 1/2" conduit or tubing as the minimum acceptable size. See panel action and statement on Proposal 18-91. The panel rejects the addition of "secondary circuit". This wording would have permitted the installation of other conductors, such as branch circuit conductors, in conduit with the secondary circuit conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
COCHRAN: I support the panel action but believe there is still a need for clarification concerning the possibility of installing two or more secondary conductors in a secondary circuit raceway. This section needs further text clarification to achieve that objective and should be addressed during the comment stage.

(Log #46)

18- 89 - (600-32(a)): Reject
NOTE: The following proposal consists of Comment 18-116 on Proposal 18-124 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 18-124 was:
Delete: "RIGID NONMETALLIC CONDUIT", 'LIQUID TIGHT FLEXIBLE NONMETALLIC CONDUIT", "ELECTRICAL NONMETALLIC TUBING".
Exception No. 1: Rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, electrical nonmetallic tubing may be used in dry locations with electronic power supplies, where listed for the purpose.
SUBMITTER: Charles W. Forsberg, Lamson & Sessions
RECOMMENDATION: 1. Continue to delete the nonmetallic raceways per the panel action.
2. Add an Exception to read:

Exception: Rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, and electrical nonmetallic tubing shall be permitted where the secondary conductors are installed in listed nonmetallic sign tubing.

SUBSTANTIATION: If the Panel does not accept my companion comment to reject this proposal, this comment is intended to add an additional level of safety that will permit the nonmetallic raceways to be used in this application. The combination of the listed nonmetallic sign tubing and the wall of the nonmetallic raceway will adequately contain any corona that is generated from deteriorated GTO cable.

Acceptance of this comment will provide a safe wiring means while evaluation and testing can be conducted to determine the accurate source of the sign problem so that specific proposals can be submitted for the 2002 NEC.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter provided no technical substantiation to support this change.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1759)

18- 90 - (600-32(a)): Accept in Principle in Part

SUBMITTER: Herbert Moulton, Masters Technology Inc.

RECOMMENDATION: Revise the title and third sentence of the first paragraph to read as follows:

(a) Wiring ~~method~~ methods. Conductors ... to remain ... wiring... to remain. Only one secondary circuit conductor shall be installed ~~per length of~~ in 1/2 in. or larger conduit or tubing.

Nonmetallic ...rest to remain as is.

SUBSTANTIATION: As written this section leads to confusion in the fact that Chapter 3 requires 1/2 inch minimum for conduit and tubing be installed for Article 600. Inspectors are confused as to what equipment constitutes allowing 3/8 inch flexible metal conduit.

Present wiring methods which utilize the installation of a cable know GTO cable. Various types of GTO cable will overfill a 3/8 inch flexible metal conduit and leads to insulation deterioration of the cable. This is created by the electrostatic fields generated by the high voltages in relationship to the close proximity to the ground plane of the conduit being grounded.

Servicing signs and outline lighting where this smaller diameter conduits have been installed reinforces this requirement as proposed.

Example, Section 350-10(a)(2) allows 3/8 inch flexible metal conduit for utilization equipment. Inspectors and installers are confused since Article 600 does not address the minimum size conduit or tubing allowed for the installation of the high voltage secondary circuit conductors.

Revising this sentence will clarify this requirement.

Also, please note that Article 490 is also silent on this requirement.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: See panel action and statement on Proposal 18-88.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3000)

18- 91 - (600-32(a)): Accept in Principle

Note: The Technical Correlating Committee understands that the SI units will be as shown in Proposal 18-71.

SUBMITTER: Stephen G. Kieffer, Randall K. Wright, Kieffer & Co., Inc. / Wright Sign Co./Rep. Int'l Sign Assn.

RECOMMENDATION: Change format of 600-32(a) into subsections and revise subpart iv as follows:

600-32. Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal.

(a) Wiring Method.

(i) Conductors shall be installed on insulators, in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, or other equipment listed for the purpose.

(ii) Wiring methods shall be installed in accordance with the requirements of Chapter 3.

(iii) Only one conductor shall be installed per length of conduit or tubing.

(iv) Other than at the location of connection to a metal enclosure or sign body, nonmetallic conduit or flexible nonmetallic conduit, ~~when operated at 100 Hz or less,~~ shall be spaced at least 1 1/2 in. (38 mm) from grounded or bonded parts when the conduit contains a conductor operating at 100 Hz or less; and~~, when operated at over 100 Hz,~~ shall be spaced at least 1 3/4 in. (44.45 mm) from grounded or bonded parts when the conduit contains a conductor operating at over 100 Hz.

(v) Metal parts of a building shall not be used as a grounded or equipment grounding conductor.

SUBSTANTIATION: Proposal improves readability of this complex section and corrects improper English usage in subpart iv.

The additional wording in the subpart is added to make it clear that spacing must occur at all times, except where the nonmetallic is connected to a sign.

PANEL ACTION: Accept in Principle.

Modify and reformat 600-32(a) into subsections and revise subpart iv as follows:

"600-32. Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal.

(a) Wiring Methods.

(1) Installation. Conductors shall be installed on insulators, in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit, flexible metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, or other equipment listed for the purpose and shall be installed in accordance with the requirements of Chapter 3.

(2) Number of conductors. Conduit or tubing shall contain only one conductor.

(3) Size. Conduit or tubing shall be minimum 1/2" electrical trade size.

(4) Spacing from ground. Other than at the location of connection to a metal enclosure or sign body, nonmetallic conduit or flexible nonmetallic conduit shall be spaced no less than 38 mm (1 1/2 in.) from grounded or bonded parts when the conduit contains a conductor operating at 100 Hz or less; and shall be spaced no less than 44.45 mm (1 3/4 in.) from grounded or bonded parts when the conduit contains a conductor operating at more than 100 Hz.

(5) Metal building parts. Metal parts of a building shall not be permitted as a secondary return conductor or an equipment grounding conductor."

PANEL STATEMENT: Specific wording was added to clarify that 1/2" trade size conduit or tubing is the minimum acceptable size for enclosing a secondary conductor. The wording was modified to conform with the style manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3742)

18- 92 - (600-32(a)): Reject

SUBMITTER: Donald W. Shields, Town of Normal, IL

RECOMMENDATION: Delete the words "on insulators" from the first sentence to read:

"Conductors shall be installed in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, liquidtight flexible metal conduit, electrical metallic tubing, metal enclosures, or other equipment listed for the purpose."

SUBSTANTIATION: The words "on insulators" is pervasive and confusing, which can and does lead to improper installations. GTO is required to be installed in a raceway or other equipment listed for the purpose. The use of insulators for installation would be covered in the UL 48 sign standard as a listed unit, not a field installation.

PANEL ACTION: Reject.

PANEL STATEMENT: Insufficient substantiation was submitted for the panel to define the specific parameters of the problem. Further, the proposal lacked specific wording necessary to address the concerns of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

COCHRAN: GTO is evaluated under the UL 814 Standard. That standard does not evaluate GTO to be used as a stand-alone conductor. It is required to be installed inside of a listed raceway,

sign enclosure, or sign body. Either the raceway or enclosure provides the required physical protection from wet environments, abrasion and physical damage. GTO installed upon insulators outside of a listed sign body or enclosure violates the principles of safe wiring practice and the fundamental applications of the National Electrical Code. A past practice of wiring in this manner is not a license to continue and cause a condition of either electrical shock or potential for fire. This is an issue of safety.

(Log #3784)

18- 93 - (600-32(a)): Reject
SUBMITTER: Jeffrey Peters, Young Electric Sign Co.
RECOMMENDATION: Deleted text.
"...rigid nonmetallic conduit, liquidtight flexible nonmetallic conduit,..."
"Nonmetallic conduit or flexible nonmetallic conduit, when operated at 100Hz or less, shall be spaced at least 1 1/2 in. (38mm) from grounded or bonded parts; and, when operated at over 100 Hz, shall be spaced at least 1 3/4 in. (44.45mm) from grounded or bonded parts."
SUBSTANTIATION: The deletion of this text would eliminate the confusion caused by the statement, also in 600-32(a), that "Wiring methods shall be installed in accordance with the requirements of Chapter 3." The use of high voltage cable in nonmetallic conduits is restricted by article 331-4(6).
In the field, I have seen the charring of nonmetallic conduit when moisture from condensation (or otherwise) has come in contact with the high voltage cable.
Also, the spacing of the nonmetallic conduit from grounded or bonded parts makes it difficult, if not impossible, to use.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no technical substantiation. While providing anecdotal information, the substantiation did not contain any documentation demonstrating problems with code compliant installations.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4250)

18- 94 - (600-32(a)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Delete "liquidtight flexible nonmetallic conduit" from the body of the rule (two places). Delete "on insulators" from the rule.
Add the following two exceptions:
Exception No. 1: Liquidtight flexible nonmetallic conduit shall be permitted at terminations where flexibility is required. The conduit shall be arranged or secured to assure, on a continuing basis, the same spacing from grounded or bonded objects as would otherwise apply to rigid nonmetallic conduit.
Exception No. 2: Open wiring on insulators shall be permitted at terminations.
SUBSTANTIATION: After much controversy, CMP 18 removed ENT as an allowable wiring method due to its likelihood of sagging over time and not maintaining the required spacings to grounded objects. Fair enough. However, the panel failed to apply the same reasoning to liquidtight flexible nonmetallic conduit, a wiring method with the word "flexible" right in its name. If ENT will sag, LTFNC will sag much more. This proposal allows for limited usage of the flexible product at terminations, with appropriate restrictions.
The proposal also addresses the issue of open wiring on insulators. The opening language of this section is an open invitation to run the GTO exposed above a hung ceiling for indefinite distances. I have seen this done in the field. In numerous seminars, representatives of the sign industry have expressed the opinion that this should only be done at the neon tubing termination, and not in lieu of a recognized wiring method. This proposal provides the appropriate framework for the panel to revisit this issue.
PANEL ACTION: Reject.
PANEL STATEMENT: Flexibility is required in the majority of installations of neon secondary circuit conductors. As the proposal or substantiation does not address what constitutes the need for flexibility, the use of liquidtight flexible nonmetallic conduit should be permitted as in the present code rather than by exception. It is understood per the existing text that the required spacings from grounded or bonded parts must be maintained over the length of the secondary circuit conductors. No substantiation was provided to indicate that liquidtight flexible nonmetallic conduit installed in accordance with 351-27 and 600-32(a) is unsatisfactory.
Insufficient substantiation was submitted for the panel to define the specific parameters of the problem with respect to GTO cable installed on insulators.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1760)

18- 95 - (600-32(b)): Reject
SUBMITTER: Herbert Moulton, Masters Technology Inc.
RECOMMENDATION: Delete original text and replace section with this revised test to read as follows:
(b) Insulation and Size. Secondary conductors shall be Type GTO cable, listed for the purpose, rated for the voltage, not smaller than No. 14 AWG, and have a minimum temperature rating of 115 degree centigrade.
Exception: Where the secondary conductors do not come in contact with the neon tube electrode, the minimum temperature shall be permitted to 105 degrees centigrade.
SUBSTANTIATION: Field installations using No. 18 AWG size Type GTO cable has demonstrated failure to the insulation of the cable due to the concentrated electrostatic field generated by the smaller diameter of the No. 18 AWG wire as opposed to the larger outside diameter of the original required No. 14 AWG as required in the 1993 and previous codes.
Due to the development of newer insulating materials, the flexibility concerns of the code panel during 1996 and 1999 has been addressed by the manufacturers.
Transformer manufacturers and neon electrode manufacturers have verified with tests that the temperature at the electrodes of the tubes can exceed 105 degrees centigrade. The enclosures both glass and polymeric, in most installations, require the Type GTO cable to come in contact with the neon tube electrode.
Note: Supporting Material is available for review at NFPA headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: In reference to the increased size of the conductor, the substantiation does not support the proposal, as it does not indicate if other installation requirements were in accordance with the Code in those installations demonstrating unacceptable performance of the secondary circuit conductors. From review of the 1995 Committee Report on Proposals for the 1996 Code, flexibility was only one issue relating to the change to 18 AWG minimum conductors. As the submitter indicates, insulating materials have been enhanced. These enhancements not only address the flexibility issue but also address protection of the conductors from physical abuse as noted in the substantiation statement included in the 1995 Committee Report. As the conductors shall be listed for the purpose, further enhancements to these insulating materials may have occurred in order to comply with the revised requirements per the 1999 revisions to the nationally recognized standard for gas-tube-sign cable that became effective on August 1, 1999. In reference to the increase in temperature rating of the conductor, the substantiation does not support the proposal. Only two temperatures over 105 degrees C were noted in the material provided with the proposal. However, no details of the test method were included in the documentation. The statement "Temperatures above 105 degrees C can be used as an indication for a quality problem or overload of the electrode" included in the material is indicative of an improper installation or use, not an indication of a need to raise the minimum temperature rating of the conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3615)

18- 96 - (600-32(b)): Reject
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
600-32. Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal.
(b) ~~Insulation and Size. Conductors shall be insulated, listed for the purpose, rated for the voltage, not smaller than No. 18, and~~

~~have a minimum temperature rating of 105°C (221°F).~~ Insulation and Size. Secondary conductors shall be type GTO cable, listed for the purpose, rated for the voltage, not smaller than No. 14 AWG, and have a minimum temperature rating of 115°C.

SUBSTANTIATION: Field installations using No. 18 AWG size type GTO cable has demonstrated failure to the insulation of the cable due to the concentrated electrostatic field generated by the smaller diameter of the No. 18 AWG wire as opposed to the larger outside diameter of the original required No. 14 AWG as required in the 1993 and previous codes. Due to the development of newer insulating materials the flexibility concerns of the code panel during 1996 and 1999 has been addressed by the manufacturers. Transformer manufacturers and neon electrode manufacturers have verified with tests that the temperature at the electrodes of the tubes can exceed 105 degrees centigrade. The enclosures both glass and polymeric, in most installations, require the Type GTO cable to come in contact with the neon tube electrode.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter provided no technical substantiation to support this change. See panel statement for Proposal 18-95.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

COCHRAN: There needs to be corrections to the installation types, size and ratings of secondary conductors.

(Log #1761)

18- 97 - (600-32(e)): Accept in Part

SUBMITTER: Herbert Moulton, Masters Technology Inc.

RECOMMENDATION: Revise this section to read as follows:

(e) Spacing. Secondary conductors shall be separated from each other and from all objects other than insulators or neon tubing by a spacing of not less than 1 1/2 in. (38 mm). GTO cable installed in metal conduit or tubing ~~requires no spacing between the cable insulation and the conduit or tubing.~~ shall be required to have an insulating sleeving where the secondary conductor voltage is 3750 volts or more.

SUBSTANTIATION: Tests conducted at the request of UL and sign manufacturers have shown that damage to the Type GTO cable is evident over time and not evident when this cable is first installed.

Testing has also shown that the ozone generated due to this value of voltage creates extreme damage over time. By placing an insulating tubing or sleeving over the cable within the conduit or tubing will prevent the cable from being in contact with the grounding plane created by the conduit or tubing. This added sleeving also helps keep the electrostatic field more centered within the conduit or tubing thereby reducing the point stresses on the insulation of the cable.

Also, at present, UL standard 814 has no requirement for testing of Type GTO cable within flexible metal conduit. Thereby, the condition as referenced by this code change would not be evident by the requirements in UL Standard 814.

Note: Supporting Material is available for review at NFPA headquarters.

PANEL ACTION: Accept in Part.

The panel accepts the addition of the word "secondary" and rejects the remainder of the recommendation.

The panel modified (e) to read "Spacing. Conductors shall be separated from each other and from all objects other than insulators or neon tubing by a spacing of not less than 1 38 mm (1/2 in.)."

PANEL STATEMENT: The code does not presently prohibit the use of sleeving. The documentation did not substantiate requiring the use of sleeving. The nationally recognized standard for gas-tube-sign cable, identified as type GTO cable, was revised to include ozone exposure testing to address field reports of degradation of the cable insulation due to ozone. This revision became effective August 1, 1999. The substantiation does not indicate that cable listed to this revised standard, and thus meeting the requirements for the ozone exposure testing, would need the additional insulating sleeving.

The panel modified (e) to conform with the Style Manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3616)

18- 98 - (600-32(e)): Accept in Part

SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors

RECOMMENDATION: Revise text to read as follows:

600-32. Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal.

(e) Spacing. Secondary c~~C~~onductors shall be separated from each other and from all objects other than insulators or neon tubing by a spacing of not less than 1 1/2 in. (38 mm). GTO cable installed in metal conduit or tubing ~~requires no spacing between the cable insulation and the conduit or tubing.~~ shall be required to have listed insulating sleeving where the secondary conductor voltage is 3750 volts or more to ground.

SUBSTANTIATION: Tests conducted at the request of UL and Sign Manufacturers have shown that damage to the Type GTO cable is evident over time and NOT evident when this cable is first installed. Testing has also shown that the Ozone generated due to the value of voltage creates extreme damage over time. By placing an insulation tubing or sleeving over the cable within the conduit or tubing will prevent the cable from being in contact with the grounding plane created by the conduit or tubing. This added sleeving also helps keep the electrostatic field more centered within the conduit or tubing thereby reducing the point stresses on the insulation of the cable.

Also at present, UL standard 814 has no requirement for testing of Type GTO cable within flexible metal conduit. Thereby the condition as referenced by this code change would not be evident by the requirements in UL 814.

PANEL ACTION: Accept in Part.

The panel accepts the addition of the word "secondary" and rejects the remainder of the recommendation.

Also modify in (e)"1 1/2 in. (38 mm)" to "38mm (1 1/2 in.)"

PANEL STATEMENT: The submitter provided no technical substantiation to support this change. See panel statement for Proposal 18-97. Modified (e) to conform with style manual.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

COMMENT ON AFFIRMATIVE:

COCHRAN: I support the panel action but believe the additional use of the material would contribute to a safer installation.

(Log #3001)

18- 99 - (600-32(h)): Accept in Principle

SUBMITTER: Stephen G. Kieffer, Randall K. Wright, Kieffer & Co., Inc. / Wright Sign Co./Rep. Int'l Sign Assn.

RECOMMENDATION: Revise text deleting incorrect terminology "mid-point ground", replacing it with the terminology "mid-point return". Delete the sentence addressing length restrictions, see ISA proposal for 600-32(j).

(h) Between Neon Tubing and ~~Grounded~~ Midpoint Return. Conductors shall be permitted to run ~~from~~ between the ends of neon tubing or to the ~~grounded~~ secondary circuit midpoint return of transformers or electronic power supplies listed for the purpose and provided with terminals at the midpoint. ~~Where such connections are made to the grounded midpoint, the connections between the high voltage terminals and the line ends of the neon tubing shall be as short as possible.~~

SUBSTANTIATION: The mid-point return is part of the high voltage secondary circuit. The secondary mid-point is not always referenced to ground. The historic use of the term mid-point ground has cause this terminal to be confused with equipment grounding and has resulted in incorrect wiring practices. Changing the code to delete the term ground will help eliminate this confusion.

The second sentence has been deleted. This is a length restriction which should be placed in 600-32(j). See ISA's proposal for that subsection.

PANEL ACTION: Accept in Principle.

Modify to revise text as follows:

"(h) Between Neon Tubing and Midpoint Return. Conductors shall be permitted to run between the ends of neon tubing or to the secondary circuit midpoint return of transformers or electronic power supplies listed for the purpose and provided with terminals at the midpoint."

PANEL STATEMENT: The panel made editorial revisions to the text.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1762)

18- 100 - (600-32(j)): Accept in Principle
SUBMITTER: Herbert Moulton, Masters Technology Inc.
RECOMMENDATION: Revise the title and section to read as follows:
(j) Length of ~~High Voltage Cable~~ Secondary Circuit Conductor. Not more than 20 ft (7 m) of ~~high voltage cable~~ secondary circuit conductor shall be permitted in metal conduit or tubing from a high-voltage terminal of a transformer/power supply to the first neon tube electrode. Not more than ~~50 ft (15.2 m)~~ 20 ft (7 m) of high-voltage cable shall be permitted in nonmetallic conduit from a high-voltage terminal of a transformer/power supply to the first neon tube electrode.
SUBSTANTIATION: Change title to reflect the main topic as stated in 600-32.
By allowing the nonmetallic conduit to be installed in 50 foot lengths creates additional resistance and capacitance creating additional load on the transformer and/or power supply.
This causes the transformer and/or power supply to fail prematurely or may overheat to create a fire potential.
PANEL ACTION: Accept in Principle.
See panel action in Proposal 18-101.
PANEL STATEMENT: The panel accepts the concept of the length limitations, with the exception of the limitation of 20 feet for nonmetallic conduit. The submitter provided no technical substantiation for this change. See Proposal 18-101 and the panel action and statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3002)

18- 101 - (600-32(j)): Accept in Principle
SUBMITTER: Stephen G. Kieffer, Randall K. Wright, Kieffer & Co., Inc. / Wright Sign Co./Rep. Int'l Sign Assn.
RECOMMENDATION: Revised section to limit metal conduit length when 30 ma transformers or power supplies are used. Section will read as follows:
(j) Length of High-Voltage Cable.
(i) Not more than 10 ft (7 m) of high-voltage cable shall be permitted in metal conduit or tubing from a high-voltage terminal to the first neon tube of a transformer/power supply rated 45 ma or less.
(ii) Not more than 20 ft (7 m) of high-voltage cable shall be permitted in metal conduit or tubing from a high-voltage terminal to the first neon tube of a transformer/power supply rated greater than 45 ma.
(iii) Not more than 50 ft (15.2 m) of high-voltage cable shall be permitted in nonmetallic conduit from a high-voltage terminal to the first neon tube of a transformer/power supply.
(iv) All other sections of high voltage cable in a neon tubing circuit shall be as short as practicable.
SUBSTANTIATION: Test data has proven that excessive capacitive coupling occurs with 30 ma transformers, neon tubing and longer lengths of GTO in conduit, resulting in excessive electrostatic fields, the potential production of ozone and potential destruction of the transformer and conductor. 60 ma transformers do not exhibit these characteristics. A 45 ma restriction was selected as a likely decision point and to avoid the production of transformers rated only slightly higher than 30 ma in order to avoid this restriction. Transformers rated 45 ma are not presently available for testing. Oscilloscope displays documenting these tests are provided.
Subpart (iv) has been added to address all the other lengths of GTO in conduit which are part of the secondary circuit. Although not as critical as the run to the first tube, due to voltage drops, every length of conduct in conduct does add capacitance to the total system.
In addition, a proposed restructuring of the section is presented for readability.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
Modify the text to read as follows:
"(j)Length of Secondary Circuit Conductors .
(1)Secondary conductor to the first electrode. The length of secondary circuit conductors from a high voltage terminal of a transformer or electronic power supply to the first neon tube electrode shall not exceed:
(a) 3m (10 feet) when installed in metal conduit or tubing for a transformer or electronic power supply rated 45 ma or less.
(b) 6m (20 feet) when installed in metal conduit or tubing for a transformer or electronic power supply rated greater than 45 ma.
(c) 15m (50 feet) when installed in nonmetallic conduit.
(2) Other secondary circuit conductors. All other sections of secondary circuit conductor in a neon tube circuit shall be as short as practicable."
PANEL STATEMENT: The panel accepts the proposed limitations of the length of secondary circuit conductors. The text has been editorially revised to conform with the style manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3617)

18- 102 - (600-32(j)): Accept in Principle
SUBMITTER: Philip H. Cox, Int'l Assn. of Electrical Inspectors
RECOMMENDATION: Revise text to read as follows:
600-32. Neon Secondary Circuit Conductors, Over 1000 Volts, Nominal.
(j) Length of ~~High Voltage Cable~~ Secondary Circuit Conductor. Not more than 20 ft (7 m) of ~~high voltage cable~~ secondary circuit conductor shall be permitted in metal conduit or tubing from a high-voltage terminal of a transformer/power supply to the first neon tube electrode. Not more than ~~50 ft (15.2 m)~~ 20 ft (7 m) of ~~high voltage cable~~ secondary circuit conductor shall be permitted in nonmetallic conduit from a high-voltage terminal of a transformer/power supply to the first neon tube electrode.
SUBSTANTIATION: Change title to reflect the main topic as stated in Section 600-32. By allowing the nonmetallic conduit to be installed in 50 ft lengths creates additional resistance and capacitance creating additional load on the transformer and/or power supply. This causes the transformer and/or power supply to fail prematurely or may overheat to create a fire potential.
PANEL ACTION: Accept in Principle.
See panel action on Proposal 18-101.
PANEL STATEMENT: The panel accepts the concept of the length limitations, with the exception of the limitation of 20 feet for nonmetallic conduit. The submitter provided no technical substantiation for this change. See Proposal 18-101 and the panel action and statement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
COMMENT ON AFFIRMATIVE:
COCHRAN: I support the panel action but believe the change in wording would lead to a cleaner and more understandable text as well as a safer installation.

(Log #3785)

18- 103 - (600-32(j)): Reject
SUBMITTER: Jeffrey Peters, Young Electric Sign Co.
RECOMMENDATION: Deleted text.
"Not more than 50 ft (15.2 m) of high-voltage cable shall be permitted in nonmetallic conduit from a high-voltage terminal of a transformer/power supply to the first neon tube."
SUBSTANTIATION: The deletion of this text would eliminate the confusion caused by article 331-4(6), which restricts the use of high voltage cable in nonmetallic conduits.
In the field I have seen the charring of nonmetallic conduit when moisture from condensation (or otherwise) has come in contact with the high voltage cable.
Also, the spacing of the nonmetallic conduit from grounded or bonded parts makes it difficult, if not impossible, to use.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no technical substantiation to delete the use of nonmetallic conduit. There should be no confusion with 331-4(6) because electrical nonmetallic tubing is not permitted in Article 600.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4443)

18- 104 - (600-32(j)): Reject
SUBMITTER: Tom Edwards
RECOMMENDATION: Revise as follows:
Not more than 20 ft of high voltage cable.
Change the 50 ft to 20 ft.
SUBSTANTIATION: A 15,000 volt transformer, that's 7500 volts each secondary leg, with 20 ft leads will short out time after time. Distance traveled creates heat there for a short occurs. At 12 ft leads on each leg this does not happen.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel assumes that the submitter was referring to nonmetallic conduit. The submitter provided no technical substantiation to restrict the length of nonmetallic conduit when installed in compliance with the National Electrical Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3778)

18- 105 - (600-41(g)): Reject
SUBMITTER: Albert Sklar, Neon By Sklar, Inc.
RECOMMENDATION: Revise as follows:
Electrode enclosures such as receptacles, boots, caps or cups shall be capable of withstanding both normal and abnormal conditions, including the neon electrode end of life. And shall be spaced at least 1-1/2" (38 mm) from grounded or bonded parts or shall be separated from grounded or bonded parts by noncombustible material, or shall be made of noncombustible material and be listed for the purpose.
SUBSTANTIATION: A- Neon fires are still a negative factor in the neon sign and lighting industry. This is in spite of the efforts of transformer manufacturers and the Code Panel to include the use of secondary ground fault protection into the manufacturing process of neon signs. The SGFI (secondary ground fault interrupter) does not disable the transformer's secondaries unless there is a fault to ground. Fires can still happen in situations where the arc of the secondary does not go to ground.
B- Section 600-32(a) rightfully states that, "nonmetallic conduit or flexible nonmetallic conduit when operated at 100 Hz or less shall be spaced at least 1-1/2" (38 mm) from grounded or bonded parts."
Summary: Nonmetallic conduit containing a GTO wire conductor with substantial insulation, as well as the nonmetallic conduit, is considerably thicker than boots, caps and sleeving, and is constructed with a very similar material. However, the high voltage connection, which is merely protected from ground by the use of a polymeric boot or cap, and which may possess the very highest potential that a neon transformer produces, has no clearance requirement in the listing or recognition by UL or other testing laboratories for this protection.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel assumes the proposal was referring to 600-42(g). End of life requirements and tests may be appropriate for product standards, not for installation codes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3743)

18- 106 - (600-42): Reject
SUBMITTER: Donald W. Shields, Town of Normal, IL
RECOMMENDATION: Add new text to read as follows:
Electrode Spacing: Electrodes not connected in listed receptacles shall be spaced 25 mm (1 inch) from their outer shell edge to any surface.
SUBSTANTIATION: Clearance spacing requirements for electrodes is required when listed receptacles are not used. Proximity to any surface, especially when conditions are wet, changes the capacitance in the system. Close proximity to a surface, especially a grounded one, in border applications can lead to burn through of the shell wall, pin holes, and potential arcing conditions.
Air gap is still the best and safest form of insulation. The addition of this spacing requirement will follow the UL 48 guidelines for minimum high-voltage spacing requirements. This will also align itself with the guidelines of 600-32(e) spacing for GTO. The requirement dimension will facilitate accurate installations and proper inspections. It should make field installed skeleton neon easier for the required sign off procedures by municipalities.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation was submitted to restrict other listed enclosure types. There are listed enclosures other than receptacles that have no spacing requirements as a condition of their listing.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
COCHRAN: While it is true that some electrode enclosures are listed at zero clearance, not all listed products are! The UL 48 Standard has a set of clearance dimensions based on operational voltages of neon supplies. The required clearance distance for 10,001 - 15,000 volt insulated conductors and ground (mounting surfaces, etc.) is defined by Table 29.2 of the UL 48 Standard. The defined clearance dimension will ensure safe installations regardless of enclosure, transformer current rating or voltage.

Note: The sequence no. 18-17 was not used.

ARTICLE 604 — MANUFACTURED WIRING SYSTEMS

(Log #3900)

19- 147a - (604-3): Reject
SUBMITTER: Alfred A. Fiorello, Fiorello Electric Inc.
RECOMMENDATION: Revise as follows:
~~All~~ Other Applicable. (Remove the word "all").
SUBSTANTIATION: Gives the relief needed in support of cables.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantion does not support the recommendation. The support issue has been dealt with action on proposal 19-153.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #1148)

19- 148 - (604-5): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Replace existing text with the following:
"Uses Not Permitted. Manufactured Wiring System types shall not be permitted where limited by the applicable article in Chapter 3 for the wiring method used in its construction."
SUBSTANTIATION: Rewritten as complete sentence using mandatory language to comply with the Style Manual. Change also removes the specific references to only Articles 333 and 334 as Flexible Metal and Liquidtight Flexible Conduit are permitted construction types. Flexible cord is also permitted and if Article 400 is not moved to Chapter 3 as contemplated by the Usability Task Group, this proposal should be modified to reference Chapter 4 as well.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2270)

19- 149 - (604-6): Accept
SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ
RECOMMENDATION: Revise text as follows:
604-6. Construction.
(a) ~~Cable or Conduit~~ Types.
(1) Cables. Cable shall be listed armored cable or metal-clad cable containing nominal 600-volt No. 10 or 12 copper-insulated conductors with a bare or insulated copper equipment grounding conductor equivalent in size to the ungrounded conductor.
(2) Conduits. Conduit shall be listed flexible metal conduit or listed liquidtight flexible conduit containing nominal 600-volt No. 10 or 12 copper-insulated conductors with a bare or insulated copper equipment grounding conductor equivalent in size to the ungrounded conductor.

Exception No. 1 to (1) and (2): A fixture tap, maximum 6 ft (1.83 m) long, intended for connection to a single fixture shall be permitted to contain conductors smaller than No. 12 but not smaller than No. 18.

Exception No. 2 to (1) and (2): Conductors smaller than No. 12 shall be permitted for remote-control, signaling, or communications circuits. The assembly shall be listed for the purpose.

(3) Flexible Cord. ~~Exception No. 3 to (1) and (2):~~ Flexible cord suitable for hard usage, with minimum No. 12 conductors, shall be permitted as part of a listed factory-made assembly not exceeding 6 ft (1.83 m) in length when making a transition between components of a manufactured wiring system and utilization equipment, not permanently secured to the building structure. The cord shall be visible for its entire length and shall not be subject to strain or physical damage.

~~(3)~~ (b) Marking. Each section shall be marked to identify the type of cable, flexible cord, or conduit.

~~(b)~~ (c) Receptacles and Connectors. Receptacles and connectors shall be of the locking type, uniquely polarized and identified for the purpose, and shall be part of a listed assembly for the appropriate system.

~~(c)~~ (d) Other Component Parts. Other component parts shall be listed for the appropriate system.

SUBSTANTIATION: Titles added to (1) and (2) to conform to new Style Manual. Former Exception No. 3 is restated as new (3) since it is a permitted wiring method. Existing (3) is retitled (b) ,Marking, as the requirements apply to the three types of construction used in MWS. Remaining sections relettered accordingly.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #4037)

19- 150 - (604-6, Exceptions No. 4 through No. 9): Accept in Principle in Part

Note: The Technical Correlating Committee notes that the word "clause" will be deleted. The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual 3.1.4 relative to the excessive use of Exceptions. The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal regarding the cables added in the Exception to 604-6(a)(1) and (2). This action will be considered by the Panel as a Public Comment.

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add new Exceptions to read as follows:

Exception No. 4 to (1) and (2): Cables listed in clause 725-61 shall be permitted for wiring of devices and appliances identified in Article 725.

Exception No. 5 to (1) and (2): Cables listed in clauses 760-31 and 760-61 shall be permitted for wiring of fire alarm equipment identified in Article 760.

Exception No. 6 to (1) and (2): Cables listed in clause 770-50 shall be permitted for connection to devices and appliances utilizing optical fiber technology.

Exception No. 7 to (1) and (2): Cables listed in clause 800-50 shall be permitted for wiring of equipment identified in clause 800-1.

Exception No. 8 to (1) and (2): Cables listed in clause 820-50 shall be permitted for wiring of equipment identified in clause 820-1.

Exception No. 9 to (1) and (2): Cables listed in clause 830-5 shall be permitted for wiring of equipment identified in clause 830-1.

SUBSTANTIATION: There are available a variety of Manufactured Wiring Systems that are not typically wired as indicated by this section. Examples may include telecommunications systems such as loud speaker assemblies, CCTV cameras, aural and visual annunciators, motion detectors, light sensors, audio sensors.

PANEL ACTION: Accept in Principle in Part.

Revise recommendation as follows and renumber as appropriate:

"Exception No. 4 to (1) and (2): Cables listed in 725-61 shall be permitted for wiring of devices and appliances identified in Article 725.

Exception No. 7 to (1) and (2): Cables listed in 800-50 shall be permitted for wiring of equipment identified in clause 800-1.

Exception No. 8 to (1) and (2): Cables listed in 820-50 shall be permitted for wiring of equipment identified in clause 820-1.

Exception No. 9 to (1) and (2): Cables listed in 830-5 shall be permitted for wiring of equipment identified in clause 830-1."

PANEL STATEMENT: Exceptions No. 5 and No. 6 are outside of the scope of the article. The term clause is not used in the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #1094)

19- 151 - (604-6(a)): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise Article 604-6(a) as follows:

604-6(a)(1) - change "No. 10 or 12" to "10 or 12 AWG"

604-6(a)(2) - change "No. 10 or 12" to "10 or 12 AWG"

604-6(a)(2), Exception No. 1 - change "No. 12" to "12 AWG" and "No. 18" to "18 AWG"

604-6(a)(2), Exception No. 2 - change "No. 12" to "12 AWG"

604-6(a)(2), Exception No. 3 - change "No. 12" to "12 AWG".

SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

PANEL STATEMENT: The NEC Style of Manual does not specify the language used one way or another. The NFPA Manual of Style seems to prefer 10AWG. Product standards use 10 AWG or 10 AWG 110-6 says that the conductor sizes are expressed in AWG or in circular mils so the AWG is implied The panel recognizes that the TCC may desire to take a different action to be consistent with the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #524)

19- 152 - (604-6(a)(2)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: In Section 604-6(a)(2) Exception Nos. 1 and 3, replace "6 ft (1.83 m)" with "1.8 m (6 ft)" throughout.

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

(Log #971)

19- 153 - (604-6(d) (New)): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add new paragraph (d) to read as follows:

(d) Support. Manufactured wiring systems shall be supported in accordance with the applicable cable or conduit article for the cable or conduit type employed.

SUBSTANTIATION: Although Section 604-3 may be construed as requiring proper support, it may also be interpreted that there are no specific support requirements since this chapter covers special equipment. I have noted installations in high-bay bar joist and open beam construction of home supply centers, chain department stores, club member discount establishments and the like with no rhyme or reason for support. A specific requirement may promote improved support.

PANEL ACTION: Accept.

PANEL STATEMENT: The recommendation would significantly increase the usability of the Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8

VOTE ON PANEL ACTION:

AFFIRMATIVE: 8

ARTICLE 605 — OFFICE FURNISHINGS (CONSISTING OF LIGHTING ACCESSORIES AND WIRED PARTITIONS)

(Log #551)

18- 108 - (605): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: a) Section 605-4(3): Replace "2 ft (610 mm)" with "600 mm (2 ft)".
b) Section 605-5(b): Replace "9 ft (2.74 m)" with "2.7 m (9 ft)".
c) Section 605-8: Replace "30 ft (9.14 m)" with "9.0 m (30 ft)".
d) Section 605-8(a): Replace "2 ft (610 mm)" with "600 mm (2 ft)".
e) Section 605-8(b): Replace "12 in. (305 mm)" with "300 mm (12 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #972)

18- 109 - (605-4(1)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(1) The cord is extra-hard usage type <u>with No. 12 or larger conductors, with an insulated grounding conductor.</u>
SUBSTANTIATION: Additional specifics similar to Section 605-8(a) are warranted.
PANEL ACTION: Accept.
Revise to read as follows:
"(1) The cord is extra-hard usage type with 12 AWG or larger conductors, with an insulated grounding conductor."
PANEL STATEMENT: The panel made an editorial correction to comply with the style manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #1095)

18- 110 - (605-5(b)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 18" to "18 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #1096)

18- 111 - (605-8(a)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 12" to "12 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

(Log #973)

18- 112 - (605-8(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(c) Individual partitions or groups of interconnected individual partitions shall not contain more than thirteen <u>single-phase</u> 15- <u>or</u> 20-ampere, 125-volt <u>single or multiple (duplex) receptacles</u> ~~outlets.~~
SUBSTANTIATION: Editorial. Intent appears to be intended to limit the number of receptacles. However the number of outlets is limited, and an outlet may consist of more than one receptacle. Section 220-3(c) indicates each single or multiple receptacle on one strap shall be considered as a 180 va load, but present wording may appear to modify that section. What safety considerations preclude 20-ampere receptacles?
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no technical substantiation for adding single phase, or for adding 20 ampere receptacles. It is the intent that 15 ampere receptacles be installed because the partitions are likely to be connected to 15 ampere circuits. It was the intent to limit the number of receptacle outlets, not the number of receptacles.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10

ARTICLE 610 — CRANES AND HOISTS

(Log #563)

12- 14 - (610): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 610-2(b)(2), replace "6 in. (152 mm)" with "150 mm (6 in.)".
2. In Section 610-21(b), replace "1 1/2 in. (38 mm)" with "38 mm (1 1/2 in.)".
3. In Section 610-21(c), replace "20 ft. (6.1 m)" with "6.0 m (20 ft.)".
4. In Section 610-21(c), replace "6 in. (152 mm)" with "150 mm (6 in.)".
5. In Section 610-21(c), replace "3 in. (76 mm)" with "75 mm (3 in.)".
6. In Section 610-21(c), replace "40 ft. (12.2 m)" with "12 m (40 ft.)".
7. In Section 610-21(d), replace "2 1/2 in. (64 mm)" with "65 mm (2 1/2 in.)".
8. In Section 610-21(d), replace "80 ft. (24.4 m)" with "25 m (80 ft.)".
9. In Section 610-21(d), replace "50 ft (15.2 m)" with "15 m (50 ft.)".
10. In Section 610-21(e), replace "15 ft. (4.57 m)" with "4.5 m (15 ft.)".
11. In Section 610-21(e), replace "1 in. (25.4 mm)" with "25 mm (1 in.)".
12. In Section 610-57, replace "2 1/2 ft. (762 mm)" with "750 mm (2 1/2 ft.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #974)

12- 15 - (610-11): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 7 to correlate with the action in Article 333. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Wiring Method. Conductors shall be enclosed in raceways or be ~~Type AC cable with insulated grounding conductor.~~ Type MC or Type MI cable unless otherwise permitted <u>or required</u> in (a) through (e).
(a) No change.

(b) No change.
(c) Where flexible connections are necessary to motors and similar equipment, flexible stranded conductors shall be installed in flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit, ~~multiconductor~~ Type AC cable with insulated equipment grounding conductor, or an approved nonmetallic enclosure.
SUBSTANTIATION: Editorial. The first paragraph indicates general wiring methods include Type AC cable. However, Section 333-4(5) limits Type AC except as provided in Section 610-11(c), wherein it is only covered by the term "multiconductor cable". Code users can easily overlook the restrictions of Section 333-4(5) when applying this section, which is misleading. The proposal would correlate the two sections.
Subsections (c) and (d) are not permissive but mandatory and warrant "or required" in the first paragraph.
PANEL ACTION: Reject.
PANEL STATEMENT: In the 1996 NEC cycle, the panel voted to allow Type AC cable with insulated grounding conductor to be used as a wiring method for cranes and hoists. The problem described by the submitter is that Article 333 was not changed to correlate with this action. This problem needs to be rectified by changing 333-4(5). The Panel requests the TCC to address the issue with Panel 7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #CP1202)

12- 15a - (610-11, 610-14, 610-51, 610-53): Accept
SUBMITTER: CMP 12
RECOMMENDATION: Add subdivision titles to the following sections:
610-11(a) Contact Conductor
610-11(b) Open Conductors
610-11(c) Flexible Connections to Motors and Similar Equipment
610-11(d) Pushbutton Stations Multiconductor Cable
610-11(e) Flexibility to Moving Parts
610-14(e)(1) Single Motor
610-14(e)(2) Multiple Motors on Single Crane or Hoist
610-14(e)(3) Multiple Cranes or Hoists on a Common Conductor System
610-51(a) Motions with More Than One Motor
610-51(b) Multiple Motion Controller
610-53(a) Taps to Control Transformers
610-53(b) Continuity of Power
SUBSTANTIATION: The proposal resolves style manual issues.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #2087)

12- 16 - (610-11(c)): Accept in Principle
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Delete the following ~~(or an approved nonmetallic enclosure.)~~ in the last sentence.
c. Where flexible connections are necessary to motors and similar equipment, flexible stranded conductors shall be installed in flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit, multiconductor cable~~, or an approved nonmetallic enclosure~~.
SUBSTANTIATION: An approved nonmetallic enclosure does not by itself imply that this approved enclosure is flexible.
During the rewrite this may have been overlooked.
This leaves the authority having jurisdiction wondering if flexibility is really required.
PANEL ACTION: Accept in Principle.
Rather than deleting the language as proposed, insert the word "flexible" between "approved" and "nonmetallic".
PANEL STATEMENT: The panel action clarifies the provision and should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #CP1203)

12- 16a - (610-11(e)): Accept
SUBMITTER: CMP 12
RECOMMENDATION: In list Item (2), revise to read as follows:
"In Class 1, Division 2 locations, the cord is approved for extra-hard usage."
SUBSTANTIATION: The proposal revises the list item to comply with the NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #975)

12- 17 - (610-12(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Bushing in Lieu of a Box. A bushing shall be permitted to be used in lieu of a box or terminal fitting specified in (a) at the end of a ~~rigid metal conduit, intermediate metal~~ conduit or electrical metallic tubing where the raceway terminates at enclosed controls or similar equipment, including contact conductors, collectors, resistors, brakes ~~power circuit~~ limit switches, and dc split frame motors.
SUBSTANTIATION: Editorial. The specific type terminal fitting of (a) should be noted. Since the "raceways" of Section 610-11 include NMRC and flexible conduits, a bushing should be permitted for those raceways. Since flexible conduit must be supported within 12 in. of termination, generally, this should not allow for excessive movement. Limit switches in control circuits should be included.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not document any problems with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #2231)

12- 18 - (610-13(a)): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Revise to read:
A conductor(s) exposed to external heat or connected to resistors shall have a ~~flame-resistant~~ flame tested outer covering or be covered with ~~flame-resistant~~ a listed tape individually or as a group.
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
A "listed" tape for the purpose could be evaluated for not only its capability to meet an applicable flame test requirement but other physical and electrical properties that may be necessary for this application.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "flame tested" does not specify any level of performance, whereas the term "flame resistant", as currently used, implies some level of performance with regard to fire behavior. The submitter offers no substantiation any problems exist with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

COMMENT ON AFFIRMATIVE:
PITTMAN: See comment by Ravindra H. Ganatra on Proposal 6-3.

(Log #3121)

12- 19 - (610-14(a)): Reject
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 6-5. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the second column of the table heading.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL-44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Reject.
PANEL STATEMENT: Type RH insulation is still in use and is addressed in Article 310. If Panel 6 removes Type RH insulation from Article 310, the Panel asks the TCC to direct it to remove the reference in 610-14(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #1097)

12- 20 - (610-14(c)): Accept
Note: The Technical Correlating Committee directs that the Panel add a number and title to the Table. This action will be considered by the Panel as a Public Comment.
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise 610-14(c) as follows:
610-14(c) - change "No. 16" to "16 AWG"
610-14(c)(1) - change "No. 18" to "18 AWG"
610-14(c)(2) - change "No. 20" to "20 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #562)

12- 21 - (610-14(d)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In Section 610-14(d) add the metric values and delete the Note regarding conversion of units.

Distance Between End Strain Insulators or Clamp-Type Intermediate Supports	Size of Wire AWG
Less than ~~30~~ 9.0 m (30 ft)	6
~~30 — 60~~ 9.0 m – 18 m (30 ft – 60 ft)	4
Over ~~60~~ 18 m (60 ft)	2

~~Note: For SI units, 1 ft = 0.3048 m~~

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #CP1201)

12- 21a - (610-31): Accept
SUBMITTER: CMP 12
RECOMMENDATION: In list Item (2), delete "Arranged to be locked in the open position" and replace with "Capable of being locked in the open position"
SUBSTANTIATION: The proposal is necessary for consistency with 430-102 and 610-32.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #976)

12- 22 - (610-32): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Disconnecting Means for Cranes and Hoists. A motor-circuit switch, molded-case switch, or circuit breaker ~~arranged to be locked in the open position~~ with provisions for locking in the open position shall be provided in the leads from the runway contact conductors or other power supply on all cranes and monorail hoists. ~~a motor circuit switch, circuit breaker, or molded case switch arranged to be locked in the open position shall be provided.~~
(remainder unchanged)
SUBSTANTIATION: Editorial. Proposal incorporates the second sentence which is redundant except for addition of molded case switch. "Arranged to be locked" infers the disconnecting means must be locked open, as "arranged" in other sections infers a mandatory condition, e.g., Section 380-8(b).
PANEL ACTION: Accept in Principle.
Revise to read as follows:
"Disconnecting Means for Cranes and Monorail Hoists. A motor-circuit switch, molded-case switch, or circuit breaker ~~arranged to be locked in the open position~~ shall be provided in the leads from the runway contact conductors or other power supply on all cranes and monorail hoists. ~~a motor circuit switch, circuit breaker, or molded case switch arranged to be locked in the open position shall be provided. The disconnecting means shall be capable of being locked in the open position."~~
(remainder unchanged)
PANEL STATEMENT: The proposal has been revised to be consistent with other references in the Code. The revisions should be consistent with the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 2 Kelly, Laney

(Log #4251)

12- 23 - (610-42): Accept in Principle in Part
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
Branch-Circuit Short-Circuit and Ground-Fault Protection. Branch circuits shall be protected ~~as follows~~ in accordance with (a) following. Branch-circuit taps, where made, shall comply with (b).
(a) Fuse or Circuit Breaker Rating. Crane, hoist, and monorail hoist motor branch circuits shall be protected by fuses or inverse-time circuit breakers that have a rating in accordance with Table 430-152. Where two or more motors operate a single motion, the sum of their nameplate current ratings shall be considered as a single motor current in ~~the above~~ this calculation.
(b) Taps.
(1) Multiple Motors. Where two or more motors ~~shall be permitted to be~~ are connected to the same branch circuit, ~~if~~ each ~~no~~ tap conductor to an individual motor ~~has~~ shall have an ampacity not less than one-third that of the branch circuit. ~~and if~~ Each motor shall be protected from overload according to Section 610-43.
(2) Control Circuits. Where taps to control circuits ~~shall be permitted to be taken from~~ originate on the load side of a branch-circuit protective device, ~~provided~~ each tap and piece of equipment ~~is~~ shall be ~~properly~~ protected in accordance with Section 430-72.

~~Where two or more motors operate a single motion, the sum of their nameplate current ratings shall be considered as a single motor current in the above calculations.~~

~~Two or more motors shall be permitted to be connected to the same branch circuit if no tap conductor to an individual motor has an ampacity less than one third of the branch circuit and if each motor is protected from overload according to Section 610-43.~~

~~(b) Taps to Brake Coils.~~ Exception: Taps to brake coils ~~do not require~~ shall be permitted without separate overcurrent protection.

SUBSTANTIATION: This section was my poster child in the prior cycle of how not to convert exceptions to positive text. There were two exceptions and they changed their typeface and nothing else. The result was two exceptions in all but name, unnumbered, difficult for an authority having jurisdiction to easily cite and therefore amenable to confusion. As a matter of principle, I don't offer criticism without offering solutions, and this proposal is an attempt to look at the entire section editorially, to see if the exceptions should go back or whether there's another way.

In this case, the opening section language needs to editorially set up the fact that what will come after may not be consistent except by applying the opening language. Former Exception No. 1 describes how to apply the general rule in a common and specific application. As such, it should be directly integrated with the main rule for branch-circuit protection. As presented in this proposal, the result is a two-sentence rule. The sentences aren't overly long, and they flow together well.

The next subsection picks up, in two numbered paragraphs and an exception, the three instances of tap applications in the original rule (one of which occurred within the principal rule). The tap rules have been reworded to avoid the exception form ("shall be permitted"). The first one also now uses two sentences in order to break up a long sentence addressing two distinct subjects (minimum ampacity and overload protection). The second paragraph required some research to determine the subject of the imprecise word "properly," which under current style manual provisions is suspect. This was Proposal 12-36 for the 1975 NEC, and after looking at the entire context, it seems the intent was to describe circuit parameters rather than physical protection. The proposal wording is specific for that reason. If CMP 12 wants to be somewhat less precise, it could add Section 430-73 to the reference, or it could even reference all of Part F of Article 430.

Again referencing the substantiation for 1975 NEC Proposal 12-36, the last part of the rule allows for brake circuits to run to failure, but without being a requirement that they do so. As such it is permissive design allowance in the control circuit design. Since the control circuit rule now appears as (b)(2), this is now a properly worded permissive exception at this point.

It is possible to convert many exceptions into positive text, as this proposal demonstrates. However, it requires enormous care, editorial rigor, and often extensive research. Furthermore, there is a definite role for a limited application of the exception form, as the TCC has made very clear. For clarity, what follows is the text of this section if the proposal is accepted:

610-42. Branch-Circuit Short-Circuit and Ground-Fault Protection. Branch circuits shall be protected in accordance with (a) following. Branch-circuit taps, where made, shall comply with (b).

(a) Fuse or Circuit Breaker Rating. Crane, hoist, and monorail hoist motor branch circuits shall be protected by fuses or inverse-time circuit breakers that have a rating in accordance with Table 430-152. Where two or more motors operate a single motion, the sum of their nameplate current ratings shall be considered as a single motor current in this calculation.

(b) Taps.

(1) Multiple Motors. Where two or more motors are connected to the same branch circuit, each tap conductor to an individual motor shall have an ampacity not less than one-third that of the branch circuit. Each motor shall be protected from overload according to Section 610-43.

(2) Control Circuits. Where taps to control circuits originate on the load side of a branch-circuit protective device, each tap and piece of equipment shall be protected in accordance with Section 430-72.

Exception: Taps to brake coils shall be permitted without separate overcurrent protection.

PANEL ACTION: Accept in Principle in Part.

Revise as follows:

"610-42. Branch-Circuit Short-Circuit and Ground-Fault Protection. Branch circuits shall be protected in accordance with (a). Branch-circuit taps, where made, shall comply with (b).

(a) Fuse or Circuit Breaker Rating. Crane, hoist, and monorail hoist motor branch circuits shall be protected by fuses or inverse-time circuit breakers that have a rating in accordance with Table 430-152. Where two or more motors operate a single motion, the sum of their nameplate current ratings shall be considered as that of a single motor.

(b) Taps.

(1) Multiple Motors. Where two or more motors are connected to the same branch circuit, each tap conductor to an individual motor shall have an ampacity not less than one-third that of the branch circuit. Each motor shall be protected from overload according to Section 610-43.

(2) Control Circuits. Where taps to control circuits originate on the load side of a branch-circuit protective device, each tap and piece of equipment shall be protected in accordance with Section 430-72.

(3) Brake Coils. Taps without separate overcurrent protection shall be permitted to brake coils."

The panel did not accept the creation of a new exception. The proposed wording is relocated to item (3).

PANEL STATEMENT: The editorial changes, as revised by the panel, will meet the submitter's intent and help prevent any misapplication of this section.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 2 Kelly, Laney

(Log #CP1204)

12- 23a - (610-43(a)(3)): Accept

SUBMITTER: CMP 12

RECOMMENDATION: Revise second sentence of 610-43(a)(3) to read:

"A hoist or trolley shall be considered to be protected if the sensing device is connected in the hoist's upper limit switch circuit so as to prevent further hoisting during an overload condition of either motor."

SUBSTANTIATION: The proposal addresses NEC Style Manual issues.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 2 Kelly, Laney

ARTICLE 620 — ELEVATORS, DUMBWAITERS, ESCALATORS, MOVING WALKS, WHEELCHAIR LIFTS, AND STAIRWAY CHAIR LIFTS

(Log #564)

12- 24 - (620): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 1. In Section 620-21(a)(2), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".

2. In Section 620-21(a)(2)(a), In the first Paragraph, replace "3/8 in." with "Metric Designator 12 (Trade size 3/8)".

3. In Section 620-21(a)(2)(a) Exception, replace 6 ft. (1.83 m)" with "1.8 m(6 ft.)".

4. In Section 620-21(a)(2)(a) Exception, replace "3/8 in." with "Metric Designator 12 (Trade size 3/8)".

5. In Section 620-21(a)(2)(c), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".

6. In Section 620-21(a)(2)(d), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".

7. In Section 620-21(a)(3)(a), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".

8. In Section 620-21(a)(3)(a), replace "3/8 in." with "Metric Designator 12 (Trade size 3/8)".

9. In Section 620-21(a)(3)(a) Exception, replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".

10. In Section 620-21(a)(3)(b), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".

11. In Section 620-21(a)(3)(c), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".

12. In Section 620-21(a)(3)(d), replace "3 ft (914 mm)" with "900 mm (3 ft.)".

13. In Section 620-21(a)(4), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".

14. In Section 620-21(b)(1), replace "6 ft (1.83 m)" with "1.8 m (6 ft.)".
15. In Section 620-21(b)(1), replace "3/8 in." with "Metric Designator 12 (Trade size 3/8)".
16. In Section 620-21(b)(1) Exception, replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".
17. In Section 620-21(b)(1) Exception, replace "3/8 in." with "Metric Designator 12 (Trade size 3/8)".
18. In Section 620-21(c)(1), replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".
19. In Section 620-21(c)(1), replace "3/8 in." with "Metric Designator 12 (Trade size 3/8)".
20. In Section 620-21(c)(1) Exception, replace "6 ft. (1.83 m)" with "1.8 m (6 ft.)".
21. In Section 620-21(c)(1) Exception, replace "3/8 in." with "Metric Designator 12 (Trade size 3/8)".
22. In Section 620-32, replace "15 ft. (4.57 m)" with "4.5 m (15 ft.)".
23. In Section 620-41(2), replace "100 ft. (30.5 m)" with "30 m (100 ft.)".
24. In Section 620-41(3), replace "200 ft. (61 m)" with "60 m (200 ft.)".
25. In Section 620-44, replace "6 ft (1.83 m)" with "1.8 m (6 ft.)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #CP1205)

12- 24a - (620): Accept

Note: The Technical Correlating Committee directs that the Panel clarify the Panel Action on this Proposal with regard to the title recommended in Section 620-61(b)(1) to read as follows: "Duty Rating on Elevator, Dumbwaiter, and Motor-Generator Sets Driving Motors." This action will be considered by the Panel as a Public Comment.

SUBMITTER: CMP 12
RECOMMENDATION: Add titles as follows:
620-12(a)(1) Lighting Circuits.
620-12(a)(2) Other Circuits.
Figure 620-13 Single-Line Diagram.
620-23(a) Separate Branch Circuit.
620-23(b) Lighting Switch.
620-23(c) Duplex Receptacle.
620-24(a) Separate Branch Circuit.
620-24(b) Lighting Switch.
620-24(c) Duplex Receptacle.
620-61(b)(1) Duty Rating on Elevator Dumbwaiter and MG Sets Driving Motors.
620-61(b)(2) Duty Rating on Escalator Motors.
620-61(b)(3) Overload Protection.
620-61(b)(4) Duty Rating and Overload Protection on Wheelchair and Stairway Chair Lift Motors.

SUBSTANTIATION: The proposal addresses NEC Style Manual issues.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #3277)

12- 25 - (620-3(a)): Reject
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise 620-3(a) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

(a) Power Circuits. Branch circuits to door operator controllers and door motors and branch circuits and feeders to motor controllers, driving machine motors, machine brakes, and motor-generator sets shall not have a circuit voltage in excess of 600 volts. Internal voltages of power conversion and functionally associated equipment, including the interconnecting wiring, shall be permitted to have higher voltages provided that all such equipment and wiring shall be listed for the higher voltages. Where the voltage exceeds 600 volts, warning labels or signs ~~that read~~ with the following words or equivalent: "DANGER - HIGH VOLTAGE" shall be attached to the equipment and shall be plainly visible.

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "equivalent" is vague and unenforceable in accordance with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1895)

12- 26 - (620-5(a)): Accept
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Delete the word "is" after (4) and replace with "shall be permitted to be". The paragraph shall now read:

(a) Flexible Connections to Equipment. Electrical equipment in (1) through (4) shall be permitted to be provided with flexible leads to all external connections so that it can be repositioned to meet the clear working space requirements of Section 110-26(a).

SUBSTANTIATION: The present language is in an informational form which is suitable for fine print notes. This paragraph contains mandatory requirements and must be written in mandatory language.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1712)

12- 27 - (620-5(e) (New)): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Add the following text:

(e) Depth of Working Space. Condition 2 working clearances in Section 110-26(a)(1) shall be permitted between controllers, disconnecting means, and other electrical equipment located across from each other where conditions of maintenance and supervision ensure that written procedures have been adopted to prohibit equipment located across from each other from being open at the same time, and only qualified persons who are authorized will service the equipment.

SUBSTANTIATION: To permit relief in tight machine room locations (e.g., hydraulic elevator machine rooms) where there are written procedures prohibiting facing equipment from being open at the same time and where only authorized and qualified personnel will service the equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: Minimum dimensional requirements are provided in 110-26 to assure safety which should not be compromised.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: Elevator equipment is only serviced by authorized and qualified persons who work under the strick requirements outlined in Section 110-26(a)(1), Exception No. 3. If the present clearance requirements in the code are safe for existing buildings, the same clearances are safe for new buildings also.

COMMENT ON AFFIRMATIVE:
JONES: The requirements of 110-26 are intended to protect qualified persons. Spaces for electrical equipment need to be designed with adequate working space to provide safe working conditions for qualified persons and their apprentices. A written procedure is not an effective means of safeguarding a person from the hazards of electricity.
QUAVE: Section 110-26 provides for minimum dimensional requirements to assure the safety of qualified persons. To alter these spaces or to rely on written procedures could create more hazards.

(Log #2232)

12- 28 - (620-11): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" (or "flame retardant") to "flame tested" in four (4) places: one (1) in 620-11 FPN, one (1) in 620-11(a), two (2) in 620-11(c).
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Reject.
PANEL STATEMENT: The term "flame tested" does not specify any level of performance, whereas the term "flame retardant", as currently used, implies some level of performance with regard to fire behavior. The submitter offers no substantiation that any problems exist with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #2830)

12- 29 - (620-11(d)): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. CANENA Tech Harmonization Subcomm. For Bldg Wire and Cable Products
RECOMMENDATION: Revise 620-11(d) as follows:
Insulation. All conductors shall have an insulation voltage rating equal to at least the maximum nominal circuit voltage applied to any conductor within the enclosure, cable, or raceway. Insulations and outer coverings that are marked for limited smoke ~~designated with the suffix "LS"~~ and are so listed shall be permitted.
SUBSTANTIATION: This proposal is submitted on behalf of the THSC - Building Wire and Cable Product Standards, of Council of Harmonization of Electrotechnical Standardization of North America (CANENA).
Abbreviation LS has been found to represent different requirements in different national product standards in North America. In Mexico, "LS" is used to indicate compliance with requirements associated with marking for low smoke. In the US, "LS" marking has been used to indicate compliance with requirements associated with marking for limited smoke. However, the requirements in Mexico and the US are different. Further, requirements for "ST1" marking used in Canada are similar to limited smoke marking used in the US.
Thus, removal of the abbreviation in the Code will facilitate harmonization of marking requirements in the product standards.
The proposal does not recommend any change in the test method or performance requirements for a product being evaluated for limited smoke marking.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1098)

12- 30 - (620-12): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: 620-12(a)(1) - change "No. 14" to "14 AWG" in two places and "No. 20" to "20 AWG"
620-12(a)(2) - change "No. 20" to "20 AWG"
620-12(b) - change "No. 24" to "24 AWG".
SUBSTANTIATION: To provide consistency throughout the Code The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1713)

12- 31 - (620-21): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
620-21. Wiring Methods. Conductors and optical fibers located in hoistways, in escalator and moving walk wellways, in wheelchair lifts, stairway chair lift runways, ~~and~~ machinery spaces, control spaces, in or on cars, ~~and~~ in machine rooms, and control rooms, not including the traveling cables connecting the car or counterweight and hoistway wiring, shall be installed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, rigid nonmetallic conduit, or wireways, or shall be type MC, MI, or AC cable unless otherwise permitted in (a) through (c).
SUBSTANTIATION: To harmonize with terms used within the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation does not provide information as to the definition of new terminology. The panel feels that spaces will be permitted that would not be protected by the other provisions of Article 620.
The submitter has not presented any technical substantiation for this change. The change is too broad in scope.
The panel is of the opinion that new spaces will be created by this proposal that are not adequately defined and this may lead to other problems relative to the application of Article 620 and other requirements of this Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #2233)

12- 32 - (620-21): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" (or "flame retardant") to "flame tested" in seven (7) places: 620-21(a)(1)(b), 620-21(a)(2)(c), 620-21(a)(2)(d), 620-21(a)(3)(c), 620-21(a)(4), 620-21(b)(2), and 620-21(c)(2).
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be

tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

PANEL ACTION: Reject.

PANEL STATEMENT: The term "flame tested" does not specify any level of performance, whereas the term "flame retardant", as currently used, implies some level of performance with regard to fire behavior. The submitter offers no substantiation any problems exist with the current language.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #3027)

12- 33 - (620-21): Reject

SUBMITTER: Gerard Henry, Plano, TX

RECOMMENDATION: Revise text as follows:

620-21. Wiring Methods. Conductors located in hoistways, in escalator and moving walk wellways, in wheelchair lifts, stairway chair lift runways, and machinery spaces, in or on cars, from machine rooms/hoistways to remote Fire Command Panels, and in the machine and control rooms not including the traveling cables connecting the car and hoistway wiring, shall be installed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, rigid nonmetallic conduit, or wireways, or shall be Type MC, MI, or AC cable.

SUBSTANTIATION: A review of Article 620 of the National Electrical Code (NEC) revealed that only wires run in both elevator hoistways and machine rooms are required to be run in conduit. The Code is silent on elevator wiring run from machine rooms/hoistways to remote Fire Command Centers. The elevator panels in these Fire Command Centers typically provide "Phase I Fire Recall Switches" in addition to "Emergency Power Selector Switches." In many cases electrical contractors are directing the elevator contractors to simply run this critical wiring to these remote panels in open rib retention wire trays which run around the perimeter of a building. This wiring method in lieu of the traditional use of conduits thereby directly exposes this critical elevator wiring to open flames in a fire resulting in grounding and or shorting conditions. This grounding and shorting condition may disable the elevators during a fire emergency when they are needed by fire fighting personnel.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal is adequately addressed by 760-1, FPN-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #4395)

12- 34 - (620-21(a)(1), Exception (New)): Reject

SUBMITTER: Monte R. Ewing, State of Wisconsin

RECOMMENDATION: Add an exception to read as follows:

Exception: The hoistway storm water sump and the hoistway oil recovery pump shall be permitted to be cord connected. The cord shall be a hard usage oil resistant type and shall be routed where not subject to physical damage.

SUBSTANTIATION: The present text does not permit cord-connected appliances such as these within a hoistway. The single receptacle permitted by Section 620-85 is pointless when a sump pump is not permitted to have a cord per the present Section 620-21(a)(1). The State of Wisconsin has created this modification in their 1999 code and I feel that it should be addressed by the National Electrical Code.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided substantiation documenting problems with the current wording. Cord-connected appliances are not prohibited in the pit by the current language.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #1714)

12- 35 - (620-21(a)(1)c (New)): Accept in Principle

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Add the following text:

620-21. Wiring Methods.

(a) Elevators.

(1) Hoistways.

(c) Flexible cords and cables that are components of listed equipment and used in circuits operating at 30 volts rms or less or 42 volts dc or less shall be permitted in lengths not to exceed 6 ft (1.83 m) provided the cords and cables are supported and protected from physical damage and are of a jacketed and flame-retardant type.

SUBSTANTIATION: Section 620-71(b) provides for driving machines located on the car, counterweight, or in the hoistway. The same wiring methods for equipment located on the car or on the counterweight [see Articles 620-21(a)(2)(c) and 620-21(a)(4)] should be afforded to the same types of equipment located in the hoistway itself.

PANEL ACTION: Accept in Principle.

Accept the proposal as modified by reversing the metric and English units in accordance with the NFPA Manual of Style, and use the hard conversion 1.8 m (6 ft).

PANEL STATEMENT: The proposal has been modified to comply with the NFPA Manual of Style.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

COMMENT ON AFFIRMATIVE:

JONES: I voted against this proposal during the panel meeting, however, after further consideration I agree with the panel action.

(Log #1715)

12- 36 - (620-21(a)(1)d (New)): Accept in Principle

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Add the following text:

620-21. Wiring Methods.

(a) Elevators.

(1) Hoistways.

(d) Flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit or flexible cords and cables, or conductors grouped together and taped or corded that are part of listed equipment, a driving machine, or a driving machine brake shall be permitted in the hoistway, in lengths not to exceed 6 ft (1.83 m) without being installed in a raceway and where located to be protected from physical damage and are of a flame-retardant type.

SUBSTANTIATION: Section 620-71(b) provides for driving machines located on the car, counterweight, or in the hoistway. The same wiring methods for equipment located on the car or on the counterweight [see Articles 620-21(a)(2)(d) and 620-21(a)(4)] should be afforded to the same type of equipment or driving machines located in the hoistway itself.

PANEL ACTION: Accept in Principle.

Accept the proposal as modified by reversing the metric and English units in accordance with the NFPA Manual of Style, and use the hard conversion 1.8 m (6 ft).

PANEL STATEMENT: The proposal has been modified to comply with the NFPA Manual of Style.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

COMMENT ON AFFIRMATIVE:

JONES: I voted against this proposal during the panel meeting, however after further consideration I agree with the panel action.

(Log #1716)

12- 37 - (620-21(a)(3)): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
(3) Within Machine Rooms, Control Rooms, and Machinery Spaces, and Control Spaces.
SUBSTANTIATION: To harmonize with the terms used within the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposal 12-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #2977)

12- 38 - (620-21(a)(3)(a), Exception): Accept in Principle
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
Exception: Liquidtight flexible nonmetallic conduit of 3/8-in. nominal trade size or larger, as defined in Section 351-22(2) shall be permitted to be installed in lengths in excess of 6 ft (1.83 m).
SUBSTANTIATION: This proposal revises the text to be consistent with the text used in other exceptions found in Section 620-21.
PANEL ACTION: Accept in Principle.
Revise the proposal by inserting "Metric Designator 12 (Trade size 3/8) in place of 3/8-in. Also reverse the metric and English units, and use the hard conversion 1.8 m (6 ft).
PANEL STATEMENT: The proposal is modified to comply with the NFPA Manual of Style, and for consistency with Proposal 12-24.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1717)

12- 39 - (620-22(a)): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
(a) Car Light Source. A separate branch circuit shall supply the car lights, receptacle(s), auxiliary lighting power source, and ventilation on each elevator car. The overcurrent device protecting the branch circuit shall be located in the elevator machine room or control room/machinery space or control space.
SUBSTANTIATION: To harmonize with terms used within the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the committee action on Proposal 12-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1718)

12- 40 - (620-22(b)): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
(b) Air Conditioning and Heating Source. A dedicated branch circuit shall supply the air-conditioning and heating units on each elevator car. The overcurrent device protecting the branch circuit shall be located in the elevator machine room or control room/machinery space or control space.
SUBSTANTIATION: To harmonize with terms used within the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the committee action on Proposal 12-31
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1719)

12- 41 - (620-23): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
620-23. Branch Circuits for Machine Room or Control Room/Machinery Space or Control Space Lighting and Receptacle(s).
SUBSTANTIATION: To harmonize with terms used within the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the committee action on Proposal 12-31
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1720)

12- 42 - (620-23(a)): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
(a) A separate branch circuit shall supply the machine room or control room/machinery space or control space lighting and receptacle(s). Required lighting...
SUBSTANTIATION: To harmonize with terms used within the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the committee action on Proposal 12-31
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1721)

12- 43 - (620-23(b)): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
(b) The machine room or control room/machinery space or control space lighting switch shall be located at the pont of entry. ~~to such machine room/machinery spaces.~~
SUBSTANTIATION: To harmonize with terms used within the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the committee action on Proposal 12-31
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1722)

12- 44 - (620-23(c)): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
(c) At least one 125-volt, single phase, duplex receptacle shall be provided in each machine room or control room and machinery space or control space.
SUBSTANTIATION: To harmonize with terms used within the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the committee action on Proposal 12-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1723)

12- 45 - (620-25 (New)): Accept in Principle in Part
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Add the following text:
620-25. Branch Circuits for Other Utilization Equipment.
(a) Separate branch circuits shall supply other utilization equipment not identified in Sections 620-22, 620-23, and 620-24. Other utilization equipment is restricted to that equipment identified in Section 620-1, Scope.
(b) The overcurrent devices protecting the branch circuits shall be located in the machinery room or control room/machinery space or control space.
SUBSTANTIATION: To recognize that when other related electrical equipment not identified in Sections 620-22, 620-23, and 620-24 is located on elevator or dumbwaiter cars, in the wellways of escalators and moving walks, and on counterweights, a separate branch circuit is required.
PANEL ACTION: Accept in Principle in Part.
Add the following text:
"620-25. Branch Circuit(s) for Other Utilization Equipment.
(a) Additional branch circuits. Additional branch circuit(s) shall supply utilization equipment not identified in 620-22, 620-23, and 620-24. Other utilization equipment shall be restricted to that equipment identified in 620-1, Scope.
(b) Overcurrent devices. The overcurrent devices protecting the branch circuit(s) shall be located in the elevator machine room/machinery space."
PANEL STATEMENT: The revised wording should satisfy the submitter's intent. See the action on Proposal 12-31 regarding the deletion of the terms "control room" and "control space".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney
COMMENT ON AFFIRMATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1724)

12- 46 - (620-37): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise text as follows:
620-37. Wiring in Hoistways, ~~and~~ Machine Rooms, Control Rooms, Machinery Spaces, and Control Spaces.
SUBSTANTIATION: To harmonize with the terms used in the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposal 12-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1725)

12- 47 - (620-37(a)): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co.
RECOMMENDATION: Revise text as follows:
(a) Uses Permitted. Only such electric wiring, raceways, and cables used directly in connection with the elevator or dumbwaiter, including wiring for signals~~,~~ for communication with the car~~,~~ for lighting, heating, air conditioning, and ventilating the elevator car~~,~~ for fire detecting systems~~,~~ for pit sump pumps~~,~~ and for heating, lighting, and ventilating the hoistway, shall be permitted inside the hoistway, ~~and the~~ machine ~~room~~ rooms, control rooms, machinery spaces, and control spaces.
SUBSTANTIATION: To harmonize with the terms used in the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the Panel action on Proposal 12-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1726)

12- 48 - (620-44): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise second paragraph as follows:
Traveling cables shall be continued to be permitted to elevator controller enclosures and to elevator car and machine room, control room, machinery space, and control space connections, as fixed wiring, provided they are suitably supported and protected from physical damage.
SUBSTANTIATION: To harmonize with the terms used in the A17.1 Elevator Safety Code.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposal 12-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #4394)

12- 49 - (620-51(a), Exception (New)): Reject

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the panel as a public comment.

SUBMITTER: Monte R. Ewing, State of Wisconsin

RECOMMENDATION: Add an exception to read as follows:

Exception: Where an individual branch circuit supplies a wheelchair lift, the disconnecting means required by 620-51(c)(4) shall be permitted to comply with Section 430-109, Exception No. 3. This disconnecting means shall be listed and shall be capable of being locked in the open position.

SUBSTANTIATION: Most wheel chair lifts are wired from an individual branch circuit and are not of grouped installations as are elevators. They pose no threat if the overcurrent device is not selectively coordinated, as does an elevator. The biggest problem is there are contained units in a since. The controller is built into the lift and they both fit into the lift/hoistway area. There is no location within this lift area to locate a disconnect that may require servicing while energized such as a fused disconnect or a circuit breaker. By permitting compliance with Section 109 there is an option to install a toggle switch as the disconnecting means and the need for servicing while energized problem goes away. This text has been incorporated into the Wisconsin State Electrical Code to resolve this ongoing problem and I feel that the provision belongs in the National Electrical Code.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no Exception 3 to 430-109 in the 1999 NEC.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9
NEGATIVE: 3
NOT RETURNED: 2 Kelly, Laney

EXPLANATION OF NEGATIVE:

CARTAL: This proposal should have been accepted as the submitter addressed a valid concern dealing with wheelchair lifts. The panel statement was only concerned with the fact that the referenced NEC Exception is no longer in the 1999 NEC which does not deal with the submitter's concerns.

QUAVE: Although there is no Exception No. 3 to Section 430-109 in the 1999 NEC, the reference makes sense when using the 1996 NEC. Section 430-109, Exception No. 3 from the 1996 NEC was removed as an Exception and put in positive language for the 1999 NEC and renumbered as 430-109(3). The requirement to allow a general use switch capable of being locked in the open position near the controller is a safe installation.

The Article 100 definition of "In Sight From" would allow a visible switch located 50 ft away. This I believe may cause a safety concern for servicing the unit.

The submitter's incorrect NEC reference should not keep this panel from accepting Proposal 12-49.

TROUT: This proposal should have been accepted. The panel statement does not indicate a serious review of the submitter's concerns. The submitter erred in using a 1996 NEC code reference in his substantiation, but the language in the section referred to by the submitter is present in the referred to section in the 1999 NEC, but has been removed as an exception and put into the body of Section 430-109(c) in positive language.

The proposal has merit and would eliminate a dangerous condition that now exists while servicing this equipment.

(Log #1727)

12- 50 - (620-51(b)): Reject

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Revise text as follows:

(b) Operation. No provision shall be made to open or close this disconnecting means from any other part of the premises. If sprinklers are installed in hoistways, machine <u>rooms, control</u> rooms, ~~or~~ machinery <u>spaces, or control</u> spaces, the disconnecting means shall be permitted to automatically open the power supply to the affected elevator(s) prior to the application of water. No provision shall be made to automatically close this disconnecting means. Power shall only be restored by manual means.

FPN: For additional...

SUBSTANTIATION: To harmonize with the terms used in the A17.1 Elevator Safety Code.

PANEL ACTION: Reject.

PANEL STATEMENT: See the panel action on Proposal 12-31.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney

EXPLANATION OF NEGATIVE:

DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #977)

12- 51 - (620-51(c)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(c) Location. The disconnecting means shall be located where it is ~~readily~~ accessible <u>only</u> to qualified persons.

SUBSTANTIATION: Editorial. Disconnecting means are generally required to be readily accessible by Section 380-8 and other sections without reference to qualified persons. "Accessible" appears to be the correct term and is used in sections which do refer to qualified persons, and the definition reference to locked doors, etc. supports that view. Additionally, the literal wording does not disallow unqualified persons.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal changes the meaning of the provision, it is not merely editorial. The substantiation does not provide any definitive technical reasons for the change. The submitter has not provided adequate substantiation to document problems with the existing language.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1728)

12- 52 - (620-51(c)(1)): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Revise second paragraph as follows:

Where the driving machine <u>of an electric elevator or the hydraulic machine of a hydraulic elevator</u> is located in a remote <u>machine room or remote</u> machinery space, a single means for disconnecting all ungrounded main power supply conductors shall be provided and be capable of being locked in the open position.

SUBSTANTIATION: To harmonize with the terms used in the A17.1 Elevator Safety Code. Wording added to clarify the driving machine of an electric elevator and the hydraulic machine of a hydraulic elevator.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1729)

12- 53 - (620-51(c)(2)): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Revise second paragraph as follows:

Where the driving machine or the motor-generator set is located in a remote <u>machine room or remote</u> machinery space, a single means for disconnecting all ungrounded main power supply conductors shall be provided and be capable of being locked in the open position.

SUBSTANTIATION: To harmonize with the terms used in the A17.1 Elevator Safety Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #3278)

12- 54 - (620-52(b)): Reject
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise 620-52(b) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.

(b) Warning Sign for Multiple Disconnecting Means. Where multiple disconnecting means are used and parts of the controllers remain energized from a source other than the one disconnected, a warning sign shall be mounted on or next to the disconnecting means. The sign shall be clearly legible ~~and shall read~~ with the following words or equivalent:

WARNING - PARTS OF THE CONTROLLER ARE NOT DE-ENERGIZED BY THIS SWITCH

SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.

The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposal 12-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1730)

12- 55 - (620-53): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise second paragraph as follows:

The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position and shall be located in the machine room or control room for that elevator car. Where there is no machine room or control room, the disconnecting means shall be located in the same space as the disconnecting means required by Section 620-51. ~~in the machinery space for that elevator car.~~

Third paragraph:

~~Where there is equipment for more than one elevator car in the machine room, the d~~Disconnecting means shall be numbered to correspond to the identifying number of the elevator car whose light source they control.
SUBSTANTIATION: Second paragraph: To harmonize with the terms used in the A17.1 Elevator Safety Code. To read similar to Section 620-51(a). The same safety concerns exist for the elevator car light, receptacle(s), and ventilation disconnects as for the elevator mainline disconnect.

Third paragraph: Editorial.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposal 12-31 with regard to the use of the term "control room". The proposal restricts the use of other disconnecting means permitted by the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1731)

12- 56 - (620-54): Reject
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Revise second paragraph as follows:

The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position and shall be located in the machine room or control room for that elevator car. Where there is no machine room or control room, the disconnecting means shall be located in the same space as the disconnecting means required by Section 620-51. ~~in the machinery space for that elevator car.~~

Third paragraph:

~~Where there is equipment for more than one elevator car in the machine room, the d~~Disconnecting means shall be numbered to correspond to the identifying number of the elevator car whose heating and air conditioning source they control.
SUBSTANTIATION: Second paragraph: To harmonize with the terms used in the A17.1 Elevator Safety Code. To read similar to Section 620-51(a). The same safety concerns exist for the elevator car heating and air conditioning disconnects as for the elevator mainline disconnect.

Third paragraph: Editorial.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposal 12-31 with regard to the use of the term "control room". The proposal restricts the use of other disconnecting means permitted by the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1732)

12- 57 - (620-55 (New)): Accept in Principle in Part
SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)
RECOMMENDATION: Add the following text:

620-55. Utilization Equipment Disconnecting Means. Each branch circuit for other utilization equipment (See Section 620-25), shall have a single means for disconnecting all ungrounded conductors.

The disconnecting means shall be capable of being locked in the open position and shall be located in the machine room or control room/machine space or control space.

Where there is more than one branch circuit for other utilization equipment, the disconnecting means shall be numbered to correspond to the identifying number of the equipment served.

The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device.
SUBSTANTIATION: To require a location for the disconnecting means of other utilization equipment branch circuits.
PANEL ACTION: Accept in Principle in Part.
Add the following text:

"620-55. Utilization Equipment Disconnecting Means. Each branch circuit for other utilization equipment shall have a single means for disconnecting all ungrounded conductors. The disconnecting means shall be capable of being locked in the open position and shall be located in the machine room/machinery space. Where there is more than one branch circuit for other utilization equipment, the disconnecting means shall be numbered to correspond to the identifying number of the equipment served. The disconnecting means shall be provided with a sign to identify the location of the supply side overcurrent protective device."
PANEL STATEMENT: See the Panel action on Proposal 12-31 with regard to the deletion of the terms "control room" and "control space". The term "machine" is changed to "machinery" for consistency with the remainder of this Article.

The reference to 620-25 is not in accordance with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

COMMENT ON AFFIRMATIVE:
DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #3154)

12- 58 - (620-62): Reject
SUBMITTER: George D. Gregory, Square D Company
RECOMMENDATION: Add new text to read as follows:
Where ground-fault protection is provided on the supply side of the individual driving machine disconnecting means, an additional step of ground-fault protection shall be installed at the driving machine disconnecting means and shall be selectively coordinated with the supply side protection.
SUBSTANTIATION: Selective coordination must include ground-fault protection as well as overcurrent protection. Supply-side ground-fault protection may be installed in accordance with Section 230-95 or 215-10 or for other reasons unique to the installation. Ground-fault conditions are at least as likely to occur as any form of overcurrent.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has offered no technical substantiation for the addition of ground fault protection of equipment (GFPE) at each driving machine disconnect. The requirements for GFPE on the line side is to prevent equipment failures on large services and feeders. There is no rationale to extend this requirement to branch circuits. Selectivity can be provided without GFPE requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #3443)

12- 59 - (620-62): Reject
SUBMITTER: Stan Price, Electric League of the Pacific Northwest
RECOMMENDATION: Revise text to read as follows:
620-62 Selective Coordination: When more than one driving machine disconnecting means is supplied by a single feeder, the overcurrent protective devices in each disconnecting means shall be selectively coordinated [revised text follows] outside the instantaneous range of one cycle (0.0167 seconds) [revised text ends] with any other supply side overcurrent protective devices.
SUBSTANTIATION: Elevators - Selectivity of Overcurrent Protective Devices.
A Summary of a survey of the National Electrical Code, supporting documents and related comments with regard to requirements for overcurrent protection for elevators follows:
1. The Current Code: The 1999 NEC 620-62, Selective Coordination, states " Where more than one driving machine disconnecting means is supplied by a single feeder, the overcurrent protective devices in each disconnecting means shall be selectively coordinated with the other supply side overcurrent protective devices."
2. The NEC Handbook Comments - Logic for Selectivity: The 1996 NEC Handbook provides the following logic for this code article, "Coordination of the overcurrent protective devices is important. For example, if a building contains three elevators and a fault occurs in one, only the overcurrent device ahead of the faulted elevator should open. This leaves the remaining two elevators in operation."
If the overcurrent devices in the elevator room do not have proper coordination with the feeder overcurrent device, all three elevators might be disconnected from the power source.
To selectively coordinate overcurrent protective devices, manufacturer's time-current curves, let-through and withstand capacity data, and the unlatching times data must be used when sizing or setting overcurrent devices."
3. Typical Modes of Motor Failure: The normal mode of failure for a motor is through an arcing fault. These types of faults typically have a relatively high impedance and, therefore, a fault current level far less than that associated with a bolted line-to-ground or line-to-line fault.
4. Designing and Inspecting in Compliance with this Code Article:
a. An example of a multi-machine elevator installation that may typically be encountered in the design of the electrical distribution system for a commercial office building includes a electrical main switchboard with a 4000A/3P main circuit breaker, a 600A/3P feeder breaker to a rooftop elevator panel and a 600A elevator panel equipped with four 150A/3P breakers each serving a 25 hp elevator motor.
b. The problem that we are facing is that these three breakers, the 4000A/3P Main Breaker, the 600A/3P elevator panel feeder breaker in the main switchboard and the 150A/3P breaker in the 600A rooftop elevator distribution panel will not coordinate in the instantaneous range should a bolted fault occur.
c. Based on the present wording of 620-62, the inspection community has concluded that selectivity does not exist across the entire range of possible fault current values, namely for bolted faults in the instantaneous range and, therefore, the circuit breaker designs typically will not comply with this code article.
d. Early versions of this code article made reference to both circuit breakers and fuses as overcurrent protective devices which seems to imply that circuit breakers with their potential lack of selectivity in the instantaneous range were considered to be acceptable for compliance.
e. One of the most logical steps that may be taken to comply with this code article is to minimize the number of overcurrent protective devices in series between the main switchboard and the individual elevator overcurrent device, thus reducing the number of devices that must be selectively coordinated. This becomes more difficult when the multi-elevator panel is supplied via an automatic transfer switch will back-up service from an emergency generator.
f. It appears from a survey of the past editions of the NEC and supporting documents that this code article was originally established as a maintenance issue, but has since been recognized as a safety issue also; not one of electrical safety, but rather elevator occupant safety of not being trapped in an elevator between floors.
5. Request for Clarification:
a. Is it the intent to require selectivity of all overcurrent protective devices between the main switchboard and the individual elevator disconnecting means located in the elevator machine room? Note that this selectivity will be difficult to achieve when standby generation to the elevators via an Automatic Transfer Switch is provided?
b. Since elevator failure modes are typically of the higher impedance arcing fault variety, selectivity both with fuses and circuit breakers is achievable because the probability of a bolted fault in this type of equipment is insignificant; therefore, fault currents in the instantaneous range of circuit breakers are not realistic. Is this statement considered valid by the code making panel?
c. If the answer to Question b above is no, is it the intent of this code article to only allow fuses for all overcurrent protective devices between the main switchboard and the individual elevator disconnecting means located in the elevator machine room?
6. History of the NEC re Elevators:
a. NFPA 70 - A92 Technical Committee Report or TCR Para 12-84-(620-51(a)) states that the reason for adding this article is essentially for maintenance purposes. "Should an electrical fault occur in the machine equipment room for the elevator, it is possible to not only trip the breaker or open the fuses in the machine room disconnecting means, but to also trip the breaker or open the fuses in the building's main distribution equipment. When the serviceman arrives to troubleshoot, he finds that he must locate the main distribution equipment to restore power, then he can begin to resolve the problem with the elevator equipment. Valuable time is lost to restore the elevators. The requirement for selective coordination will solve this dilemma. The fault will be localized."
b. NPFA 70 - 1993 Article 620-51(a) Type: Added new Para. 2 which states "The fuses or circuit breakers provided for in the disconnecting means shall be selectively coordinated with any and all other supply side overcurrent protective devices."
c. NFPA 70 - A95 Report on Proposals
(1) ROP 12-62-(620-51) which was accepted in principal amends Para. 2 to (a) Type to read "Where more than one driving machine disconnecting means is supplied by a single feeder, the overcurrent protective devices in each disconnecting means shall be selectively coordinated with an other supply side overcurrent protective devices."
Substantiation (for no longer being applicable to single elevator installations): Single elevator installations are typically located in low rise structures and the electrical service is close to the elevator equipment and would not create a problem for elevator maintenance personnel in locating supply side overcurrent devices. Also simplified compliance by use of all available types of overcurrent devices.
NEC 620-51(d), Identification & Signs, was added to set a requirement for labeling as follows, "The disconnecting means shall be provided with a sign to identify the location of the supply

side overcurrent protective device." The reason for this requirement was to "assist elevator mechanics to troubleshoot and help locate supply side overcurrent protective device in case of power loss."

Panel Action: Accept in Principle to "Relocate the second paragraph of Section 620-51(a) of Proposal 12-62 to become a new Section 620-62 titled "Selective Coordination."

(2) ROP 12-63-(620-51(a)): Proposed that the second paragraph with regard to elevator selectivity was a design consideration and was not a provision "considered necessary for safety". The panel rejected this proposal on the basis that this is a safety issue. "Restoration of elevator service is a safety concern, when elevators are stopped between floors."

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal is a design consideration. The submitter has not provided definitive technical substantiation that a problem exists with the current language. Request for clarification of provisions of the NEC should be submitted to the proper offices (NFPA Headquarters) and are not considered part of a code proposal.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #1733)

12- 60 - (620-71): Reject

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Revise text as follows:

620-71. Guarding Equipment. Elevator, dumbwaiter, escalator, and moving walk driving machines~~,~~, motor-generator sets~~,~~, motor controllers~~,~~, and disconnecting means shall be installed in a room or space ~~enclosure~~ set aside for that purpose unless otherwise permitted in (a) or (b). The room or space ~~enclosure~~ shall be secured against unauthorized access.

(a) Same as present.

(b) Same as present.

SUBSTANTIATION: To harmonize with the terms used in the A17.1 Elevator Safety Code.

PANEL ACTION: Reject.

PANEL STATEMENT: See the panel action on Proposal 12-31 regarding the term "control space". The term "space" cannot be secured against unauthorized access without an enclosure.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Kelly, Laney

EXPLANATION OF NEGATIVE:

DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #1735)

12- 61 - (620 Part H): Reject

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Revise text as follows:

H. Machine Rooms, Control Rooms, Machinery Spaces, and Control Spaces.

SUBSTANTIATION: To harmonize with the terms used in the A17.1 Elevator Safety Code.

PANEL ACTION: Reject.

PANEL STATEMENT: See the panel action on Proposal 12-31.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Kelly, Laney

EXPLANATION OF NEGATIVE:

DROSTE: The terminology used in Article 620 should reflect the terminology used in ASME A17.1, the American National Standard for Elevators and Escalators.

(Log #978)

12- 62 - (620-85): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Ground-fault Circuit-Interrupter Protection for Personnel. Each 125-volt, single-phase 15- and 20-ampere receptacle installed in pits, on elevator car tops, and in escalator and moving walk wellways shall be of the ground-fault circuit-interrupter type or be supplied through an adjacent readily accessible ground-fault circuit interrupter type receptacle that is in the same location.

SUBSTANTIATION: This would be a practical and safe alternative where more than one receptacle is installed in the same location.

PANEL ACTION: Reject.

PANEL STATEMENT: The wording "supplied through an adjacent readily accessible GFCI type receptacle...." is not in accordance with the NEC Style Manual ('adjacent' is vague and unenforceable). The submitter has not provided adequate technical substantiation to document problems with the current language.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #1734)

12- 63 - (620-85): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Revise first paragraph as follows:

620-85. Ground-Fault Circuit-Interrupter Protection for Personnel. Each 125-volt, single phase, 15- and 20-ampere receptacle installed in pits, in hoistways, on elevator car tops, and in escalator and moving walk wellways shall be of the ground-fault circuit-interrupter type.

Second and third paragraphs: Same as present wording.

SUBSTANTIATION: To provide GFCI protection for personnel working in the hoistway on elevator equipment furnished with "machine room-less" type systems. Requiring locally reset GFCI receptacles, will enhance safety by not having the worker climb out of the hoistway to reset a GFCI protected circuit at its protection source. This is the same reasoning as for requiring local reset devices for elevator pits, elevator car tops, and escalator and moving walk wellways.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

ARTICLE 625 — ELECTRIC VEHICLE CHARGING SYSTEM EQUIPMENT

(Log #565)

12- 64 - (625): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 625-17, replace "25 ft. (7.63 m)" with "7.5 m (25 ft.)".
2. In Section 625-22, replace 12 in. (305 mm)" with "300 mm (12 in.)".
3. In Section 625-29(b), replace "18 in. (457 mm)" with "450 mm (18 in.)".
4. In Section 625-29(b), replace "4 ft. (1.22 m)" with "1.2 m (4 ft.)".
5. In Section 625-30(b), replace "24 in. (610 mm)" with "600 mm (24 in.)".
6. In Section 625-30(b), replace "4 ft. (1.22 m)" with "1.2 m (4 ft.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1099)

12- 65 - (625-17): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 10" to "10 AWG" and "No. 8" to "8 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1890)

12- 66 - (625-17): Accept in Principle
SUBMITTER: Frank J. Cihak, American Public Transit Assoc./Rep. Nat'l Electric Transportation Infrastructure Working Council
RECOMMENDATION: Revise to read as follows:
625.17. Cable. The electric vehicle supply equipment cable shall be Type EV, EVJ, EVE, EVJE, EVT, or EVJT flexible cable as specified in Article 400 and Table 400-4. Ampacities shall be as specified in Table 400-5(a) for No. 10 and smaller and Table 400-5(B) for No. 8 and larger. The overall length of the cable shall not exceed 25 ft (7.63 m). Other cable types and assemblies listed as being suitable for the purpose, including optional hybrid communications, signal, and optical fiber cables, shall be permitted. Where the electric vehicle supply equipment cable is suspended from overhead, is longer than 25 feet (7.63 m), or is intended for portable use within the facility, it shall be equipped with a cable management system that is identified and listed as suitable for the purpose.
SUBSTANTIATION: The original intent of this language was to allow access to EV supply equipment located in residential garages/carports and in public parking spaces without creating a tripping hazard or circumstances that would lead to cord damage. The proposed revision recognizes that at commercial facilities and fleet operations EV supply equipment may be used to serve multiple parking spaces. The original intent can be preserved, while permitting multiple parking spaces to be served, using cord management equipment that is listed as suitable for this type of application to allow greater flexibility for site planning under these conditions.
PANEL ACTION: Accept in Principle.
Revise to read as follows:
"625.17. Cable. The electric vehicle supply equipment cable shall be Type EV, EVJ, EVE, EVJE, EVT, or EVJT flexible cable as specified in Article 400 and Table 400-4. Ampacities shall be as specified in Table 400-5(a) for No. 10 and smaller and Table 400-5(B) for No. 8 and larger. The overall length of the cable shall not exceed 7.5 m (25 ft). Where the electric vehicle supply equipment cable is suspended from overhead or is intended for portable use within the facility, the overall length of the cable shall be permitted to exceed 7.5 m (25 ft) if equipped with a cable management system that is identified and listed as suitable for the purpose. Other cable types and assemblies listed as being suitable for the purpose, including optional hybrid communications, signal, and optical fiber cables, shall be permitted."
PANEL STATEMENT: The proposal has been editorially revised for clarity. The revised language should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #4252)

12- 67 - (625-29(d)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Reformat the numbered paragraphs (and unnumbered ones) with coherent numbers and titles, and then delete the final paragraph, as follows:
(1) Table Values. For supply voltages and currents specified in Table 625-29(d), the minimum...
(2) Other Values. For supply voltages and currents other than specified in Table 625-29(d), the minimum...
(3) Engineered Systems. For an electric vehicle supply equipment ventilation system...
(4) Supply Circuits. The supply circuit to the mechanical ventilation equipment...
Delete the last paragraph.
SUBSTANTIATION: This proposal enhances editorial clarity and removes conflicting requirements due to a panel error in the 1999 cycle. What would become the last sentence in (4) is the correct wording because it references Section 625-15(c) which has more detailed marking rules than the old exception in the 1996 NEC. This exception survives as a conflicting final paragraph, and should be deleted.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #568)

12- 68 - (Table 625-29(d) (New)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Add the following table for conversion to cubic meters per m^3/min. this table should be in addition to the current table. (Table is shown on the next page)
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

Table 625-29(d) Minimum Ventilation Required in Cubic Meters per Minute (m^3/min) for Each of the Total Number of Electric Vehicles that Can Be Charged at One Time

	Branch-Circuit Voltage						
	Single Phase			3 Phase			
Branch-Circuit Ampere Rating	120V	208V	240V or 120/240V	208V or 208Y/120V	240V	480V or 480Y/277 V	600V or 600 Y/347 V
15	1.1	1.8	2.1	—	—	—	—
20	1.4	2.4	2.8	4.2	4.8	9.7	12
30	2.1	3.6	4.2	6.3	7.2	15	18
40	2.8	4.8	5.6	8.4	9.7	19	24
50	3.5	6.1	7.0	10	12	24	30
60	4.2	7.3	8.4	13	15	29	36
100	7.0	12	14	21	24	48	60
150	—	—	—	31	36	73	91
200	—	—	—	42	48	97	120
250	—	—	—	52	60	120	150
300	—	—	—	63	73	145	180
350	—	—	—	73	85	170	210
400	—	—	—	84	97	195	240

(Log #566)

12- 69 - (625-29(d)(1)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Delete the words "in cubic feet per minute (cfm)" in the first sentence.
SUBSTANTIATION: The specific units need only be indicated on the tables.
The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #CP1206)

12- 69a - (625-29(d)(1)): Accept
SUBMITTER: CMP 12
RECOMMENDATION: Delete the second sentence that reads: "This table allows for sufficient ventilation for any configuration of electric vehicle supply equipment and electric vehicle charging space."
SUBSTANTIATION: The statement is nonmandatory and unnecessary.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #567)

12- 70 - (625-29(d)(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In Section 625-29(d)(2), delete the words "in cubic feet per minute (cfm)".

(a) Single Phase:
$\text{Ventilation}_{\text{single phase}}$ in cubic meters per minute ($m^3/_{min}$) =

$$\frac{(\text{volts})(\text{amperes})}{1718}$$

$\text{Ventilation}_{\text{single phase}}$ in cubic feet per minute (cfm) =

$$\frac{(\text{volts})(\text{amperes})}{48.7}$$

(b) Three phase:
$\text{Ventilation}_{\text{three phase}}$ in cubic meters per minute ($m^3/_{min}$) =

$$\frac{1.732\ (\text{volts})(\text{amperes})}{1718}$$

$\text{Ventilation}_{\text{three phase}}$ in cubic feet per minute (cfm) =

$$\frac{1.732\ (\text{volts})(\text{amperes})}{48.7}$$

SUBSTANTIATION: The specific units are indicated in calculations (a) and (b).
The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

ARTICLE 630 — ELECTRIC WELDERS

(Log #569)

12- 71 - (630): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 630-42(a), replace "6 in. (152 mm)" with "150 mm (6 in.)".
2. In Section 630-42(c), replace "20 ft. (6.1 m)" with "6.0 m (20 ft.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelly, Laney

(Log #CP1210)

12- 71a - (630): Accept
SUBMITTER: CMP 12
RECOMMENDATION: Add titles to tables as follows:
Table 630-11(a): "Duty Cycle Multiplication Factors for Arc Welders".
Table 630-31(a)(2): "Duty Cycle Multiplication Factors for Resistance Welders."
SUBSTANTIATION: The proposal addresses NEC Style Manual issues.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelly, Laney

(Log #237)

12- 72 - (630-11): Accept in Principle
Note: The Technical Correlating Committee directs that the Panel revise the Panel Action relative to the Fine Print Note in accordance with 3.1 of the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
NOTE: The following proposal consists of Comment 12-56 on Proposal 12-95 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 12-95 was:
Revise text:
(New text shown by underline ; deleted text show by strikethrough)
630-11 Ampacity of Supply Conductors. The ampacity of conductors for ac transformers and dc rectifier arc welders shall be as follows:
(a) Individual Welders. The ampacity of the supply conductors shall not be less than the 11eff value on the rating plate. Alternatively, if the I1eff is not given, the ampacity of the supply conductors shall not be less than the current values value determined by multiplying the rated primary current in amperes given on the welder nameplate rating plate and the following factor based upon the duty cycle or time rating of the welder.
Duty Cycle
(percent).....100 90 80 70 60 50 40 30 20 orless
Multiplier for non-motor
-generator arc welders.....1.00 .95 .89 .84 .78 .71 .63 .55 .45
Multiplier for motor-generator
arc welders..... 1.00 .96 .91 .86 .81 .75 .69 .62 .55
For a welder having a time rating of 1 hour, the multiplying factor shall be 0.75
(b) Group of Welders. The ampacity of conductors that supply a group of welders shall be permitted to be less than the sum of the currents, as determined in accordance with (a) above, of the welders supplied. The conductor rating shall be determined in each case according to the welder loading based on the use to be made of each welder and the allowance permissible in the event that all the welders supplied by the conductors will not be in use at the same time. The load value used for each welder shall take into account both the magnitude and the duration of the load while the welder is in use.
(FPN): Conductor ratings based on 100 percent of the current, as determined in accordance with (a) above, of the two largest welders, 85 percent for the third largest welder, 70 percent for the fourth largest welder, and 60 percent for all remaining welders, can be assumed to provide an ample margin of safety under high-production conditions with respect to the maximum permissible temperature of the conductors. Percentage values lower than those given are permissible in cases where the work is such that a high-operating duty cycle for individual welders is impossible.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual relative to the use of mandatory language in the Fine Print Note.
SUBSTANTIATION: This is a direction from the National Electrical Code Technical Correlating Committee in accordance with 3-4.2 and 3-4.3 of the Regulations Governing Committee Projects.
PANEL ACTION: Accept in Principle.
In 630-11 (FPN) revise as follows:
Replace "are permissible" in the last sentence with "can be considered".
PANEL STATEMENT: The panel action should satisfy the request of the TCC by removing mandatory language from the FPN.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelly, Laney

(Log #4253)

12- 73 - (630-12(b)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Change "conductor rating" to "conductor ampacity."
SUBSTANTIATION: Proper terminology for this application; refer to the new style manual for clarification.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelly, Laney

(Log #979)

12- 74 - (630-13): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
~~A~~ An individual disconnecting means shall be provided in the supply circuit for each arc welder that is not equipped with a disconnect mounted as an integral part of the welder.
The disconnecting means shall be a switch or circuit breaker and its current rating shall not be less than ~~that necessary to accommodate overcurrent protection as specified under Section 630-12~~ 115 percent of the welder nameplate current rating.
SUBSTANTIATION: Editorial. An individual disconnect seems to be the intent, although a feeder disconnect with suitable overcurrent protection could be deemed to comply since a feeder is part of the supply circuit. Section 630-33 is more clear in indicating an individual disconnect is required. Present wording infers a fusible switch or circuit breaker must be used, whereas a nonfusible switch or molded-case switch should be suitable if supplied by a feeder with overcurrent protection in accordance with Section 630-12. The overcurrent protection specified in Section 630-12 could be 200 percent or any value less that function satisfactorily, and present wording is somewhat nonspecific. The proposed ampere rating correlates with Section 430-110(a).
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate technical substantiation to document problems with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 2 Kelly, Laney

(Log #3097)

12- 75 - (630-15): Accept in Principle in Part
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for comment.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add the following subarticle:
630-15. Grounding of Welding Secondary Circuit. When grounding of a welding secondary circuit is required by local regulation or when needed to minimize electromagnetic interference, such grounding shall be done by means of a direct connection from the welding workpiece to ground. Grounding by means of a direct connection from a secondary (output) terminal of a welding power source to the equipment grounding conductor is not permitted.
FPN: Grounding may also be done to a welding table or fixture, upon which the welding workpiece may be placed.
SUBSTANTIATION: RATIONALE: The intentional grounding of the secondary circuit work terminal of arc welding equipment by the method as stated in 11.2.3.3 of ANSI/ASC Z49.1-1998 introduces a potential safety hazard to the equipment grounding conductors of the

utility supply system. This method permits a direct connection between the work terminal of a welding power source and the power source frame.

The potential safety hazard is created when the welding work lead is not connected to the work piece, thus causing welding current to flow through the connections intended only for equipment grounding. Even with the connection of the welding work lead to the work, a parallel welding current path exists through the primary equipment ground connection to the work piece. This additional current path still leaves the potential for degradation of the equipment grounding system.

The original intent of 11.2.3.3 of ANSI/ASC Z49.1-1998 was to limit voltages of the secondary circuit due to lightning, line voltage surges, or unintentional contact with higher primary voltages because of transformer isolation failure. However, the grounding method proposed in 11.2.3.3 of ANSI/ASC Z49.1-9 does not follow the recommended practices of subarticles 250-20 and 250-30 of the NEC. These two subarticles, in summary, call for the grounding electrode conductor of the separately derived system, sized according to subarticle 250-66, to be connected to a grounding electrode as specified in subsection 250-30(a)(3). This method of grounding, as proposed by the NEC, eliminates the possibility of unwanted or excessive current flow in the equipment grounding conductor connections that are provided with the primary conductor connections of the transformer.

NEMA does not advocate the adoption and use of the NEC grounding methods. Figure 1 represents the basic NEC requirements necessary if work terminal grounding is done at the machine. Figure 2 illustrates the preferred method for grounding the work piece advocated by NEMA. If the NEC specifies the grounding method depicted in figure 2 as the preferred method, and disallows the method referenced in 11.2.3.3 of ANSI/ASC Z49.1-9, then the integrity of the equipment grounding conductor system will be assured.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept in Principle in Part.

Revise the proposal to read as follows:

"630-15 Grounding of Welder Secondary Circuit. The secondary circuit conductors of an arc welder, consisting of the electrode conductor and the work conductor, shall not be considered as premises wiring for the purpose of applying Article 250."

The panel did not accept the wording "as required by local regulation" or the entire fine print note.

PANEL STATEMENT: The submitter points out one of many problems that can occur if the secondary of an arc welder is considered a separately derived system, and the secondary conductors are considered premises wiring. There are two unique conditions that are normal in the arc welding process, which would be considered abnormal in equipment for general use. First, the secondary current, which flows normally during the arc welding process, would be considered a fault on equipment for general use. The arc welding process essentially short circuits the secondary, and this short circuit is part of the normal process, rather than a fault. Secondly, the workpiece, under equipment for general use standards, would be considered a non-current carrying metallic part likely to become energized. Under welding conditions, the workpiece becomes part of the secondary circuit.

If the welder secondary is considered a separately derived system, and the secondary conductors are considered premises wiring, then the following dilemma occurs. Article 630 modifies the overcurrent protection requirements for arc welders to prevent nuisance overcurrent device operation during normal welding conditions. Article 630 is presently silent on welder secondary grounding, so it could be construed that the grounding requirements of Chapters 1-4 apply without modification. The submitter's Figure 1 shows the application of the Chapter 1-4 requirements under these conditions. In many instances, the workpiece will be part of the metallic building structure, or will be electrically bonded to the metallic building structure. The premise of the Chapter 1-4 grounding and overcurrent protection methods is that contact between an ungrounded circuit conductor, and a grounded item represents a ground fault which should cause an overcurrent device to operate to clear the fault. Under arc welding conditions, contact between the ungrounded welding electrode conductor and the grounded workpiece is not a fault, and the overcurrent device will not operate. Under these conditions, objectionable current may flow in the equipment grounding conductor.

The solution proposed by the submitter will allow grounding of the workpiece without causing objectionable current flow in the equipment grounding conductors. Unfortunately, part of this solution is beyond the scope of the Code. According to 90-2, the scope of the Code is limited to installation requirements. In most instances, the connection of the work terminal conductor to the workpiece will be a work practice, rather than an installation, and as such, will be out of the jurisdiction of the Code. The panel action will remove the current barriers in the Code that could be interpreted as disallowing the grounding method proposed by the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 2 Kelly, Laney

(Log #980)

12- 76 - (630-32): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise last sentence:

Where the values as determined by this section do not correspond with the standard ampere ratings provided in Section 240-6 or the rating or setting specified results in unnecessary opening of the overcurrent device, ~~the~~ a ~~next~~ higher ~~standard~~ rating or setting that does not exceed the next higher standard ampere rating shall be permitted.

SUBSTANTIATION: Editorial. Present literal wording does not permit larger increment ratings which may be less than the next higher standard rating. Section 240-6 indicates nonstandard ratings shall be permitted.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 2 Kelly, Laney

(Log #2234)

12- 77 - (630-41): Reject

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."

SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

PANEL ACTION: Reject.

PANEL STATEMENT: See the panel action on Proposal 12-18.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15

VOTE ON PANEL ACTION:

AFFIRMATIVE: 13

NOT RETURNED: 2 Kelly, Laney

COMMENT ON AFFIRMATIVE:

PITTMAN: See comment by Ravindra H. Ganatra on Proposal 6-3.

ARTICLE 640 — AUDIO SIGNAL PROCESSING, AMPLIFICATION, AND REPRODUCTION EQUIPMENT

(Log #CP1608)

16- 1a - (640-3(a)): Accept

Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA Toxicity Advisory Committee for comment.

SUBMITTER: CMP 16

RECOMMENDATION: Revise 640-3(a) to read as follows:

"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables not intended for future use shall not be permitted to remain."

SUBSTANTIATION: The revised text is introduced to correlate with similar changes made in 725, 760, 770, 800, 820 and 830.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: The Society of the Plastics Industry abstains for the following reason:

"The plastics industry could not reach a consensus position on the proposals or Panel Actions taken at the Hilton Head meeting."

(Log #4148)

16- 2 - (640-3(l)): Accept

Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to delete the reference to Article 445. This action will be considered by the Panel as a Public Comment.

SUBMITTER: William Keezer, Bose Corp./Rep. Nat'l Systems Contractors Assn. (NSCA)

RECOMMENDATION: Add new subsection (l) to Section 640-3 as follows:

(l) Generators. Generators shall be installed in accordance with Article 445. Grounding of portable and vehicle-mounted generators shall be in accordance with Section 250-34.

SUBSTANTIATION: Problem:

1) If the reference to Article 445 is deleted from the proposed revision of 640-42(d), then the intent of that section to provide guidance on the proper utilization of portable and vehicle-mounted generators is lost.

2) If the reference to Article 445 is not deleted from the proposed revision of 640-42(d), this reference is still better located in Section 640-3 where all other section references are located.

3) Special grounding provisions for portable and vehicle-mounted generators used for audio systems are not readily apparent within Article 640.

Substantiation:

1) Inquiries to NSCA staff on the use of portable and vehicle-mounted generators suggest that even when Article 445 is cited, Section 250-34 is frequently hard to find or overlooked. This proposal remedies that situation.

2) Section 640-3 lists "Locations and Articles" applicable to circuits and equipment used for audio systems. This is the most appropriate location for references on the use of portable and vehicle-mounted generators.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #CP1603)

16- 2a - (640-6): Accept

SUBMITTER: CMP 16

RECOMMENDATION: Revise text to read as follows:

"Mechanical Execution of Work. Equipment and cabling shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceiling and sidewalls shall be supported by the structural components of the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d).

Also, delete the Fine Print Note."

SUBSTANTIATION: This proposal provides additional rules for the mechanical execution of the work. Since there are additional rules, the fine print note is not necessary. This provides parallel requirements to those used in Articles 725, 760, 770, 800, 820, and 830.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

JOHNSON: The requirement to support cables every 5 ft is overly specific. Repeatedly, I have heard in Panel meetings that the Code is not intended to serve as an Installation Manual. While attachment every 5 ft may be a good idea in many cases, it also may be overly restrictive and unnecessary in other cases.

(Log #3660)

16- 3 - (640-6): Accept

SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.

RECOMMENDATION: Delete the FPN associated with this section.

SUBSTANTIATION: Problem: The standards listed contain insufficient information to determine accepted industry practice for systems and equipment included in Article 640.

Substantiation: A detailed review of ANSI/EIA/TIA/568A-1995, ANSI/EIA/TIA/569-1990 , and ANSI/EIA/TIA/570-1991 was completed by the submitter and no significant information, guidance, or directives were found, that would be helpful to a user of this Article of the Code. These standards were developed by the telecom and computer industries. They provide the details covering telecommunication infrastructure such as cable pathways, equipment spaces, telephone grounding/bonding, and telecommunication administration. They are excellent standards but they do not address typical cabling installation issues such as:

(a) how to properly pull wire(s) above a lay in ceiling.

(b) when and where to support the wire in a building structure.

(c) how to dress various types of audio signal wires coming into and within an equipment cabinet.

(d) how and where to set up wire reels for riser cables in tall structures.

(e) how and where to dress audio speaker wire along a steel beam in a gymnasium or factory.

(f) what to watch out for when pulling a cable into a raceway.

These standards are purported to be the concept standards for guiding the users of the Code in determining appropriate mechanical execution of work and determination of acceptable industry practices. However, such is not the intent of the standards. For those who do not have a set of the standard available, the submitter has provided an Appendix that summarizes each section of each standard. The appendix will give you an overview of the contents of each section of each standard and enable you to gain a better understanding of what the standards cover.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept.

PANEL STATEMENT: The proposed recommendation has been incorporated by the panel action on Proposal 16-2(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

LANNI: After reviewing the NECA index No. 5037, I realized that there are very useful National Electrical Installation Standards available and a Fine Print Note is the appropriate way to guide the code user. I also feel that the panel did satisfy the original submitter when the Fine Print Note was incorporated into the code. Improving the references, instead of removing the Fine Print Note, would improve our original work. Installation documents are being produced all the time partially in response to our note in the code.

The panel could only answer one of the Submitter's concerns, namely, "when and where to support the wire in a building structure." Other issues are left unanswered. Good workmanship is an important component of a safe installation, but the code cannot address all these issues and other documents are more suited for the purpose.

ROMLEIN: It is clear to most knowledgeable individuals that all of the existing stove pipe transports associated with voice, video, fire alarm, industrial supervision, security and control information transports are converging on the data transport infrastructure. To a very large degree, the building wiring standards published as ANSI/TIA/EIA Buiding Wiring Standards have facilitated this migration.

One example of this migration to a uniform transport is a press release that shows the FCC using TIA standards as quality reference for wiring to access existing and advanced telecom services.

I feel that it is a disservice to our industry not to apprise our colleagues with information that will enable them to gain the the knowledge and provide the services needed.

Note: Supporting material available upon request at NFPA headquarters.

(Log #4020)

16- 4 - (640-6): Reject

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Revise the FPN to read: "One way to determine accepted industry practice is to refer to nationally recognized standards such as Commercial Building Telecommunications Cabling Standard, ANSI/EIA/TIA 568-A-1995; Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA/EIA 569-A-1997; and Residential ~~and Light Commercial~~ Telecommunications Cabling ~~Wiring~~ Standard, ~~ANSI/EIA/TIA 570-1991~~ ANSI/EIA/TIA 570-A-1999, ANSI/NECA/BICSI 568 or other ANSI-approved installation standards."

SUBSTANTIATION: A revision to the standard number and the title for residential cabling has been updated. Another standard is currently under review that will be focused at the installation of telecommunications cabling and connectors and will become an ANSI standard within the next year.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 640-6 has been revised to remove the FPN and provide specific installation requirements. A FPN is no longer necessary. Refer to the panel action and statement on Proposal 16-2(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

LANNI: After reviewing the NECA index No. 5037, I realized that there are very useful National Electrical Installation Standards available and a Fine Print Note is the appropriate way to guide the code user. I also feel that the panel did satisfy the original submitter when the Fine Print Note was incorporated into the code. Improving the references, instead of removing the Fine Print Note, would improve our original work. Installation documents are being produced all the time partially in response to our note in the code. The panel could only answer one of the Submitter's concerns, namely, "when and where to support the wire in a building structure." Other issues are left unanswered. Good workmanship is an important component of a safe installation, but the code cannot address all these issues and other documents are more suited for the purpose.

(Log #1100)

16- 5 - (640-7(a)): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change "No. 14" to "14 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #3656)

16- 6 - (640-9(a)(1), (2), (3)): Accept

SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.

RECOMMENDATION: Insert the following title for Section 640-9(a)(1): Power Wiring

Insert the following title for Section 640-9(a)(2): Separately Derived Power Systems

Insert the following title for Section 640-9(a)(3): Other Wiring.

SUBSTANTIATION: The new NEC Style Manual (April 1999), Section 2.1.5.2 requires that second level subdivisions shall have titles.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #4144)

16- 7 - (640-9(c)): Accept in Principle

SUBMITTER: William Keezer, Bose Corp./Rep. Nat'l Systems Contractors Assn. (NSCA)

RECOMMENDATION: The submitter proposes that the second, third, and fourth paragraphs of Section 640-9(c) be deleted as follows:

(c) Output wiring and Listing of Amplifiers. Amplifiers with output circuits carrying audio-program signals shall be permitted to employ Class 1, Class 2, or Class 3 wiring where the amplifier is listed and marked for use with the specific class of wiring method. Such listing shall assure the energy output is equivalent to the shock and fire risk of the same class as stated in Article 725. Overcurrent protection shall be provided and shall be permitted to be inherent to the amplifier.

~~Audio circuits wired using Class 1 wiring methods shall not occupy the same raceway or enclosure with other than audio circuits wired using Class 1 wiring methods.~~

~~Audio circuits wired using Class 2 wiring methods shall not occupy the same raceway or enclosure with other than audio circuits wired using Class 2 wiring methods.~~

~~Audio circuits wired using Class 3 wiring methods shall not occupy the same raceway or enclosure with other than audio circuits wired using Class 3 wiring methods.~~

FPN No. 1: Amplifiers for Fire Protective Signaling Systems, ANSI/UL 1711-1994 contains requirements for the listing of amplifiers used for fire alarm systems in compliance with NFPA 72-1996, National Fire Alarm Code.

FPN No. 2: Examples of requirements for listing amplifiers used in residential, commercial, and professional use are found in Commercial Audio Equipment, ANSI/UL 813-1992, Professional Video and Audio Equipment, ANSI/UL 1419-1992, Audio-Video Products and Accessories, ANSI/UL 1492-1992, or Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar Use, ANSI/UL 6500-1996.

SUBSTANTIATION: Problem:

1) These three paragraphs were added to the original proposal during CMP 16's meeting to act on comments during the 1999 Code cycle. These requirements go beyond the scope and intent of the original proposal and are not based upon any scientific evidence that there exists a shock or fire initiation hazard that would be mitigated by these requirements. The proper scientific reference for clarification of shock hazard under these conditions is IEC 60479-1, the same reference used by the submitter for substantiation of their original proposal.

2) Such an onerous and unsubstantiated change to the NEC should have been allowed public review before incorporation into the Code. Neither industry nor the original submitter was allowed to provide written objection to this change before publication. This appears to be inconsistent with the public review requirements of the consensus code process.

3) Class 2 audio circuits and Class 2 circuits in accordance with Article 725 have been permitted in the same enclosure or raceway ever since the Class 2 category for an audio circuit was established in 1956. No Code Panel member has submitted a single example of an injurious accident resulting from this 43-year old practice. As has already been substantiated before the CMP 16 committee, the 20

percent increase in permitted open-circuit voltage for a Class 2 audio circuit does not represent a significant or unacceptable decrease in circuit safety. To remove this formerly allowable wiring practice is unwarranted in the face of the evidence, and a significant financial penalty for the installer and premises owner without a commensurate improvement in safety.

Substantiation for Change:

1) Underwriters Laboratories (UL) has revised UL 813, Commercial Audio Equipment, in accordance with the provisions of the first paragraph of Section 640-9(c). In so doing, UL has determined that audio circuits wired in accordance with the listing requirements of that standard and the manufacturer's instructions are equivalent in shock and fire risk to a Class 1, 2, or 3 circuit as described in Article 725.

2) The Code currently permits circuits defined in Article 725 to co-mingle with other circuits determined to be of equivalent safety. See Subsection 725-54(b)(5). Many of the enumerated circuits in this subsection commonly exist with audio circuits in the same facility. They should not be prohibited from existing in the same enclosure or raceway. As with audio circuits defined in Section 640-9(c), the operating parameters of these circuits are not defined in Article 725 either, yet they are deemed of equivalent safety.

3) Class 1 and Class 3 audio amplifier output circuits as defined in UL 813 do not deviate from the voltage limits established for equivalent signal circuits as specified in Article 725. When these circuits are properly evaluated in accordance with the concept of crest factor, audio amplifier output circuits are inherently safer from shock hazard, not more dangerous, than equivalent Article 725 circuits.

4) The first paragraph of Section 640-9(c) states that audio amplifier output circuits shall be permitted to employ Class 1, Class 2, or Class 3 wiring methods. The deletion of Paragraphs 2, 3, and 4 does not absolve such circuits from the circuit separation requirements contained in those methods (those of Article 725). Eliminating these three paragraphs does not create the potential for shock or fire hazard from intermixing of different classes of circuits because, in accordance with the requirements of the first paragraph, audio and non-audio circuits of the same class designation ARE the same class from an installation, fire, and shock hazard point of view.

5) Section 640-9(c), first paragraph, specifically states "Class 1, Class 2, or Class 3 wiring," as well as "class of wiring method." The intent that is clear to any competent audio system installer is that both the class of wire, as well as the methods of installation permitted and prohibited for that class are applicable. Section 725-25 addresses Class 1 methods, and Section 725-52 addresses methods and materials for Class 2 and Class 3. These sections define in exquisite detail when different classes of circuits can and cannot be intermingled, all applicable to audio amplifier output circuits classified by UL as Class 1, 2, or 3.

6) Section 725-52 "Wiring methods and materials on the load side..." requires that conductors be installed in accordance with Sections 725-54 and 725-61. Therefore, concerns about separation from electric light, power, Class 1, etc. are all addressed. The first paragraph of 640-9(c) does not selectively choose which aspects of Class 1, 2, or 3 wiring methods can be ignored.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action on Proposal 16-8.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #4146)

16- 8 - (640-9(c)): Accept

SUBMITTER: William Keezer, Bose Corp./Rep. Nat'l Systems Contractors Assn. (NSCA)

RECOMMENDATION: The submitter proposes that the second, third, and fourth paragraphs of Section 640-9(c) be deleted and replaced with new text as follows:

(c) Output Wiring and Listing of Amplifiers. Amplifiers with output circuits carrying audio-program signals shall be permitted to employ Class 1, Class 2 or Class 3 wiring where the amplifier is listed and marked for use with the specific Class of wiring method. Such listing shall assure the energy output is equivalent to the shock and fire risk of the same Class as stated in Article 725. Overcurrent protection shall be provided and shall be permitted to be inherent to the amplifier.

~~Audio circuits wired using Class 1 wiring methods shall not occupy the same raceway or enclosure with other than audio circuits wired using Class 1 wiring methods.~~

~~Audio circuits wired using Class 2 wiring methods shall not occupy the same raceway or enclosure with other than audio circuits wired using Class 2 wiring methods.~~

~~Audio circuits wired using Class 3 wiring methods shall not occupy the same raceway or enclosure with other than audio circuits wired using Class 3 wiring methods.~~

Audio amplifier output circuits wired using Class I wiring methods shall be considered equivalent to Class I circuits and be installed in accordance with Section 725-25, where applicable.

Audio amplifier output circuits wired using Class 2 or Class 3 wiring methods shall be considered equivalent to Class 2 or Class 3 circuits respectively. They shall use conductors insulated at not less than the requirements of Section 725-71, and shall be installed in accordance with Sections 725-54 and 725-61.

FPN No. 1: Amplifiers for Fire Protective Signaling Systems ANSI/UL 1711-1994 contains requirements for the listing of amplifiers used for fire alarm systems in compliance with NFPA 72-1996 National Fire Alarm Code.

FPN No. 2: Examples of requirements for listing amplifiers used in residential, commercial and professional use are found in Commercial Audio Equipment ANSI/UL 813-1992, Professional Video and Audio Equipment ANSI/UL 1419-1992, Audio-Video Products and Accessories ANSI/UL 1492-1992 or Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar Use ANSI/UL 6500-1996.

SUBSTANTIATION: 1) The provisions of the paragraphs to be deleted create a financial and installation hardship for installers and customers of installed audio systems with no commensurate increase in safety. The traditional and well-accepted practice of allowing an amplifier output circuit which permits or requires a particular Class of wiring to occupy the same wireway or raceway as an equivalent Article 725 circuit is prohibited by these three paragraphs. This prohibition can even be interpreted as requiring the separation of these circuits from other nonamplifier audio circuits and audio control circuits of the same Class. No evidence has ever been presented to indicate that these constraints on circuit installation would have averted any documented case of injury or death resulting from the customary installation practices of code-compliant installers over the past 44 years.

2) The proposed additional text clarifies exactly which sections of Article 725 apply to the wiring methods and materials used for audio amplifier output circuits, and clearly states that an equivalency of these circuits to Article 725 circuits exists. The intent is to make sure that both circuit classes are treated in an identical manner and the same classes of both circuit types can be placed in the same enclosure, wireway or raceway.

Substantiation for Change:

1) The provisions of the paragraphs proposed to be deleted presume a shock or fire initiation hazard exists in audio amplifier output circuits which is unique from Class 1, 2, and 3 circuits as defined in Article 725. If such were the cases, then such circuits might correctly be segregated from circuits of different hazard potentials. After this text was entered into the code, UL and the majority of a CMP 16 task group have determined that there can be an equivalency such that the ouput of listed amplifiers may be considered equivalent to the same Class of circuit as defined in Article 725. This finding substantiates the proposed text deletion.

2) Underwriters Laboratories (UL) has revised UL 813, Commercial Audio Equipment in accordance with the provisions of the first paragraph of Section 640-9(c). In so doing, UL has determined that audio circuits wired in accordance with the listing requirements of that standard and the manufacturer's instructions are equivalent in shock and fire risk to a Class 1, 2 or 3 circuit as described in Article 725. This action substantiates that UL believes that the output of listed and labeled amplifiers does not represent a safety risk unique from classic Article 725 circuits of the same class designation. UL is by far the best qualified organization represented on the Technical Committee for having an innate understanding of the unique nature of audio circuits.

3) Class 1 and Class 3 audio amplifier output circuits as defined in UL 813 do not deviate from the voltage limits established for equivalent signal circuits as specified in Article 725. When these circuits are properly evaluated in accordance with the concept of crest factor, audio amplifier output circuits are inherently safer from shock

hazard, not more dangerous, than equivalent Article 725 circuits. For this reason, the submitter believes there should be no controversy about eliminating the segregation requirements from Class 1 and Class 3 audio amplifier output circuits. Based upon UL's findings and historical research, integral overcurrent protection adequate for protection against realistic fire initiation hazards exists in all listed amplifiers (and is required by the first paragraph of 640-9(c).

4) It has been argued that the proposed text deletion would allow unbridled intermingling of amplifier audio output circuits with other amplifier audio output circuits of differing Classes as well as with classic Article 725 circuits of any Class. The submitter respectfully disagrees. Section 640-9(c), first paragraph, specifically states "Class 1, Class 2, or Class 3 wiring," as well as "class of wiring method." The intent that is clear to any competent audio system installer is that both the class of wire, as well as the methods of installation permitted and prohibited for that class are applicable. Section 725-25 addresses Class 1 methods, and Section 725-52 addresses methods and materials for Class 2 and Class 3. These sections define in exquisite detail when different classes of circuits can and cannot be intermingled. All are clearly applicable to audio amplifier output circuits classified by UL as Class 1, 2 or 3.

5) The proposed additional text is intended to provide clarification on circuit equivalency. It is proposed as code text but could be considered a candidate for in conclusion in the code as a fine print note without subverting the intent of the submitter. It is felt that clarification is necessary in order to undo the confusion created by the text of the 1999 code. This text also clearly addresses which parts of Article 725 are applicable, and which are not.

6) It has been argued that the first paragraph does not sufficiently clarify separation requirements from Class I and light and power circuits. The submitter respectfully disagrees. Section 725-52 "Wiring methods and materials on the load side... "requires that conductors be installed in accordance with Sections 725-54 and 725-61. Concerns about separation from electric light, power, Class I etc. are all addressed in 725-54. The first paragraph of 640-9(c) does not selectively choose which aspects of Class I, 2, or 3 wiring methods can be ignored. The proposed additional text clarifies that Section 725-54 is directly applicable.

7) Technical substantiation for the shock hazard characteristics of audio amplifier output circuits is contained in the following documents submitted as appendices to this proposal:

7.1) Memo to Lee Hewitt from Walter Skuggevig dated January 8, 1997 addressing the proposed content of 640-9(c). This document was distributed by Lee Hewit of UL to CMP 16 members who were current in the Spring of 1997. It is submitted for distribution to newer panel members who were not on the original distribution. This memo supports the findings reported in the technical paper Electrical Shock Hazard and Audio System Installation by William J. Keezer

7.2) Technical paper Electrical Shock Hazard and Audio System Installations by William J. Keezer dated 12/13/96. A document which analyzes the realistic risks of electrical shock from audio amplifier output circuits. This document includes 7 appendices, all of which were distributed to all attending CMP 16 members at the 1998 NEC Committee Report on Proposals Annual Meeting - Cincinnati, Ohio. It is submitted for distribution to newer panel members who were not on the original distribution. The appendices to this paper are enumerated below and included in this submittal.

Appendix A — Report on the World Wide Web Search for Audio Amplifier Shock Hazards

Appendix B — References for Terminology and Use of the Term "Crest Factor."

Appendix C — Unedited Figure 1, and Edited Figures 2, 10, and 11 from IEC 479-1, third edition, 1994

Appendix D — Symmetrical and Asymmetrical Body Contact Areas for Audio System Hazard Analysis

Appendix E — Comparisons of Current and Proposed Amplifier Output Conditions

Appendix F — Finger Contact Area for Stripped Audio Cable

Appendix G — Electrical Shock and Audio Systems Installations and Their Acoustic Feedback

7.3) Copies of changed sections of UL 813 Commercial Audio Amplifiers, Seventh edition are submitted. These changes indicate that the safety issues of tis proposal have been adequately addressed.

8) UL was asked if it could provide a report on the fire initiation hazards of amplifier output circuits. UL could not supply a report because no history of such events exists in ULs records. This finding was further substantiated in Appendix A of the technical paper Electrical Shock Hazard and Audio System Installations. It is well known that it is possible to terminate any circuit (including a Class 2 circuit or a battery circuit exempt from Class 2 listing) in such a manner as to initiate a fire. But such a fire of not due to improper installation or faulty overcurrent protection, but to inappropriate or defective equipment at the point of circuit termination.

9) It has been argued that if a Class 2 audio amplifier output circuit is allowed in the same raceway or enclosure with other "Article 725" Class 2 circuits, a potential for damage to equipment exists should a wiring fault occur, especially due to inadequate dielectric strength of the cable. The submitter contends that this is an argument without merit or basis in code. UL has determined that Class 2 audio amplifier output circuits are of equivalent safety to "Article 725" Class 2 circuits without qualification. That determination can only address electrical performance characteristics as they pertain to life safety. No currently listed Class 2 source of power is required by the Code or by its listing to ensure that no functional damage will occur to a Class 2 device as a result of a wiring fault between circuits. Numerous Class 2 devices operating on a 3 volt supply could be damaged by 6 volts, 6 volt devices by 12 volts, a 12 volt DC device by a 12 AC supply, and all such devices might be irreparably damaged by a 24 volt listed supply. The code has no mandate to ensure that Class 2 devices remain functional under all conditions of faulty installation or cable.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #4147)

16- 9 - (640-9(c)): Reject

SUBMITTER: William Keezer, Bose Corp./Rep. Nat'l Systems Contractors Assn. (NSCA)

RECOMMENDATION: The submitter proposes that a paragraph be added to Section 640-9(c) as follows:

Audio amplifiers permitted to employ Class 2 or Class 3 wiring methods for their output circuits shall be permitted to specify the use of Power Limited Fire Alarm (PLFA) wiring and wiring methods when the amplifier is used in a voice/alarm or combination system in accordance with NFPA 72, 1999 National Fire Alarm Code. PLFA audio amplifier output circuits shall be installed in accordance with Sections 760-41(d), 760-42, 760-52, 760-54, 760-61 and 760-71 as applicable.

SUBSTANTIATION: 1) When an amplifier is used in a voice/alarm or combination system in accordance with NFPA 72, 1999 National Fire Alarm Code, the safety concerns for appropriately wiring such systems should be equivalent to those concerns for the installation of a nonemergency audio systems. Since Article 760 clearly considers PLFA circuits to be of equivalent safety to a Class 3 circuit as defined in Article 725, then an audio amplifier output circuits listed as permitting Class 2 or Class 3 wiring methods is clearly safe enough to employ PLFA wiring methods. This proposal would allow the listing standard to specify that the use of PLFA wiring methods is permitted when an amplifier meets the Class 2 or Class 3 listing requirements of Section 640-9(c).

2) The methods for determining the safety of PLFA Circuits as defined in Tables 12(a) and 12(b) in Chapter 9 are inappropriate for determining the safety of audio amplifier output circuits. Recent developments in the area of voice/alarm performance requirements in NFPA 72, 1999 suggest that some voice/alarm performance requirements would be best met through the use of commercial audio system components suitably listed for the fire alarm use. This proposal would permit the use of PLFA wiring methods for audio amplifier output circuits when the audio amplifier output circuit has been found to be of equivalent safety to a Class 2 or Class 3 circuit as defined in Article 725. The sections of Article 760 that would be applicable to amplifier output wiring materials and methods are clearly specified to avoid confusion.

Substantiation for Change:

1) The proposed additional text clarifies that an amplifier permitted to employ class 2 or Class 3 wiring methods may be considered to be of equivalent safety to a PLFA circuit. It also clarifies which sections of Article 760 are applicable to the wiring of such a circuit.

2) This proposal is made because as certain types of places of assembly are expected to achieve the intelligibility requirements of a voice/alarm system as specified in NFPA 72, 1999 National Fire Alarm Code, a sound system designed for full bandwidth music and voice reproduction my be the only appropriate system for the delivery of an intelligible voice message. Since such a system must perform two roles with equal safety, this proposal allows appropriately listed amplifiers to employ wiring methods better suited to the installation of such systems. NPLFA wiring methods are unnecessary for amplifier/loudspeaker circuits when they are found to be equivalent in safety to a Class 3 circuit. NPLFA wiring methods are also excessively complex and expensive when installing loudspeakers that require adjustable positioning in multi-speaker clusters prior to commissioning. It should be obvious that this proposal does not and is not intended to preclude the use of circuit integrity cable or NPLFA wiring methods where appropriate for circuit integrity or the mechanical protection of circuits.

3) This proposal does not introduce a lower standard of electrical safety than is currently expected of any Class 3 or PLFA circuit today. Nor does it permit the installation of a PLFA circuit in any location where a PLFA circuit is not currently permitted. It only permits the logical use of PLFA wiring and wiring methods where Class 3 wiring would be permitted for the same purpose in a nonemergency audio system.

4) No listed amplifier would be permitted to allow the use of PLFA wiring and wiring methods unless the output terminations meet the requirements for Class 3 wiring methods. thus, even an amplifier which met Class 2 wiring requirements would be required to have touch-proof output circuit terminations in accordance with Class 3 wiring methods in order to allow PLFA wiring methods.

Observations: It is recognized, that, should this proposal be adopted, audio amplifiers listed for use with Class 2 or Class 3 in accordance with Section 640-9(c) would be recognized as clearly meeting the circuit safety concerns for PLFA circuits. This does not mean at such amplifiers should be used in a fire alarm audio system unless the amplifier also meets certain additional performance criteria such as is found in Amplifiers for Fire Protection Signaling Systems ANSI/UL 1711-1994. It is anticipated that listing requirements consequent to this proposal would be addressed by UL through appropriate revision of UL 1711 or other applicable listing standards. These changes would require performance criteria appropriate for a fire alarm system in order to permit output labeling signifying compliance. The amplifier listing requirement thus prevents an amplifier from being "permitted to specify the use" unless the listing standard has determined such use is permitted.

Note to Correlating Committee: While this proposal could be independently adopted, it is suggested that a companion proposal by the same submitter to add a Section 760-41(d) be correlated with this one. That proposal similarly addresses the same issue, and refers back to Section 640-9(c) to establish reciprocity between the two articles on this issue. If this proposal is adopted independent of adoption of the companion proposal, then the reference to Section 760-41(d) must be deleted from the proposed text.

PANEL ACTION: Reject.

PANEL STATEMENT: Type PLFA Cable is one of the cables used for a fire alarm system. The proposed application is not a fire alarm system. The use of Type PLFA Cable does not result in the installed system being a fire alarm system. The proposed recommendation could result in a conflict with requirements of NFPA 72.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

WIERENGA: My reasons for a Negative vote are:

1. Building owners both private and governmental in the last few years have become increasingly aware of the need for intelligible voice evacuation systems. Large auditoriums, stadiums, and arenas because of their size and construction parameters now find that a sound system designed to accommodate their day to day functions may be the only logical and appropriate system to deliver that intelligible voice message.

2. This proposal does not introduce a lower standard of electrical safety. It permits the logical use of PLFA wiring and wiring methods where Class 3 wiring would be permitted for the same purpose in a non-emergency system.

3. No listed amplifier would be permitted to allow the use of PLFA wiring methods unless the output terminals met the requirements for Class 3 wiring methods (touchproof).

4. The Panel Statement says, "The proposed application is not a fire alarm system". If the house sound system is intended to provide voice intelligibility for a voice alarm or a combination system is it not part of the fire alarm system?

5. The Panel Statement in the last sentence states: "The proposed recommendation could result in a conflict with requirements of NFPA 72". The proposal states "when the amplifier is used in a voice/alarm or combination system in accordance with NFPA 72...auto amplifier output circuits shall be installed in accordance with Sections 750-41(d), 760-42, 760-52, 760-54, 760-61, and 760-71 as applicable". That does not look to me as being in conflict with NFPA 72, but rather an attempt to work in concert with NFPA and Article 760.

6. This proposal is an attempt to integrate rather than segregate. If an owner decides that they want to use their $500,000.00 sound system for a voice/alarm system or a combination system, what kind of wiring will be allowed if we do not clarify this matter? Does this Panel want the Authority Having Jurisdiction to decide for us? Or does CMP 16 want to provide guidance?

(Log #490)

16- 10 - (640-10(a)): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 640-10(a) - change "5 ft (1.52 m)" to "1.5 m (5 ft)" in two places.

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #42)

16- 11 - (640-11 (New)): Accept

Note: The Technical Correlating Committee advises that Article Scopes are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action. The Technical Correlating Committee intends for Code-Making Panel 20 to retain overall responsibility for equipment and wiring requirements for physical installations in and adjacent to pools, fountains, and similar installations. The Technical Correlating Committee intends for Panel 16 to retain overall responsibility for audio systems, including the requirements for system design features such as available energy levels on systems installed in and adjacent to pools. Members of each Code-Making Panel are encouraged to submit proposals to the other panel to address the issues raised.

NOTE: The following proposal consists of Comment 16-10 on Proposal 16-6 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 16-6 was:

The submitter proposes total replacement of the original Article 640.

Article 640 - - Audio Signal Processing, Amplification and Reproduction EquipmentContents

A. General

640-1. Scope.

640-2. Definitions.

640-3. Locations and Other Articles.

(a) Spread of Fire or Products of Combustion.

(b) Ducts, Plenums, and Other Air Handling Spaces.

(c) Cable Trays.

(d) Hazardous (Classified) Locations.

(e) Places of Assembly

(f) Theaters, Audience Areas of Motion Picture and Television Studios, and Similar Locations

(g) Carnivals, Circuses, Fairs and Similar Events.

(h) Motion Picture and Television Studios.

(i) Underwater Locations.

(j) Fire Alarm Systems
(k) Antennas.
640-4. Protection of Electrical Equipment
640-5. Access to Electrical Equipment Behind Panels Designed to Allow Access.
640-6. Mechanical Execution of Work.
640-7. Grounding.
(a) General
(b) Separately Derived Systems With 60 Volts to Ground.
(c) Isolated Ground Receptacles.
640-8. Grouping of Conductors.
640-9. Wiring Methods.
(a) Wiring to and Between Audio Equipment.
(b) Auxiliary Power Supply Wiring.
(c) Amplifier Output Wiring.
(d) Use of Audio Transformers and Autotransformers
640-10. Audio Systems Near Bodies of Water
(a) Equipment Supplied by Branch Circuit Power
(b) Equipment Not Supplied by Branch Circuit Power

B. Permanent Audio System Installations

640-21. Use of Flexible Cords and Cables.
(a) Between Equipment and Branch Circuit Power.
(b) Between Loudspeakers and Amplifiers, or Between Loudspeakers.
(c) Between Equipment.
(d) Between Equipment and Power Supplies Other Than Branch Circuit Power.
(e) Between Equipment Racks and Premises Wiring System.
640-22. Wiring of Equipment Racks,
640-23. Conduit or Tubing.
(a) Number of Conductors.
(b) Non-Metallic Conduit or Tubing, and Insulating Bushings.
640-24. Wireways, Gutters, and Auxiliary Gutters.
640-25. Loudspeaker Installation in Fire Resistance Rated Partitions, Walls, and Ceilings.

C. Portable and Temporary Audio System Installations.

640-41. Multipole Branch Circuit Cable Connectors
640-42. Use of Flexible Cords and Cables.
(a) Between Equipment and Branch Circuit Power.
(b) Between Loudspeakers and Amplifiers, or Between Loudspeakers.
(c) Between Equipment and/or Between Equipment Racks.
(d) Between Equipment, Equipment Racks, and Power Supplies Other Than Branch Circuit Power.
(e) Between Equipment Racks and Branch Circuit Power.
640-43. Wiring of Equipment Racks
640-44. Environmental Protection of Equipment.
640-45. Protection of Wiring
640-46. Equipment Access.

A. General

640-1. Scope This article covers equipment and wiring for audio signal generation, recording, processing, amplification and reproduction; distribution of sound, public address, speech-input systems, temporary audio system installations, and electronic organs or other electronic musical instruments. This also includes audio systems subject to Articles 517 Part F, 518, 520, 525, and 530.

(FPN No. 1): Examples of permanently installed distributed audio system locations include, but are not limited to, restaurant, hotel, business office, commercial and retail sales environments, churches and schools. Both portable and permanently installed equipment locations include, but are not limited to, residences, auditoriums, theaters, stadiums, movie and television studios. Temporary installations include, but are not limited to; auditoriums, theaters, stadiums (which use both temporary and permanently installed systems), and outdoor events such as fairs, festivals, circuses, public events and concerts.

(FPN No. 2): Fire and burglary alarm signaling devices are specifically not encompassed by this Article.

640-2. Definitions. For purposes of this article, the following definitions apply:

Audio Amplifier or Pre-Amplifier: Electronic equipment which increases the current and/or voltage potential of an audio signal intended for use by another piece of audio equipment. **Amplifier** is the term used to denote an audio amplifier within this Article..

Audio Autotransformer: A transformer with a single winding and multiple taps intended for use with an amplifier loudspeaker signal output.

Audio Signal Processing Equipment: Electrically operated equipment that produce and/or process electronic signals which, when appropriately amplified and reproduced by a loudspeaker, produce an acoustic signal within the range of normal human hearing (typically 20 - 20 kHz). Within this Article, the terms **equipment** and **audio equipment** are assumed to be equivalent to this term.

(FPN): This equipment includes, but is not limited to: loudspeakers; headphones; pre-amplifiers; microphones and their power supplies; mixers; MIDI (Musical Instrument Digital Interface) equipment or other digital control systems; equalizers, compressors and other audio signal processing equipment; audio media recording and playback equipment including turntables, tape decks and disk players (audio and multi-media), synthesizers, tone generators and electronic organs. Electronic organs and synthesizers may have integral or separate amplification and loudspeakers. With the exception of amplifier outputs, virtually all such equipment is used to process signals (utilizing analog or digital techniques) which have non-hazardous levels of voltage or current potential.

Audio System: Within this Article, the term audio system is interpreted to mean the totality of all equipment and interconnecting wiring used to fabricate a fully functional audio signal processing, amplification, and reproduction system.

Audio Transformer: A transformer with two or more electrically isolated windings and multiple taps intended for use with an amplifier loudspeaker signal output.

Equipment Rack: A framework for the support and/or enclosure of equipment. May be portable or stationary. See ANSI/EIA/310-D-92 *Cabinets, Racks, Panels and Associated Equipment*

Loudspeaker: Equipment which converts an AC electric signal into an acoustic signal. The term "speaker" is commonly used to mean loudspeaker.

Maximum Output Power: The maximum output power delivered by an amplifier into its rated load as determined under specified test conditions. This may exceed the manufacturer's rated output power for the same amplifier.

Mixer: Equipment used to combine and level match a multiplicity of electronic signals, such as from microphones, electronic instruments, and recorded audio.

Mixer-Amplifier: Equipment which combines the functions of a mixer and amplifier within a single enclosure.

Portable Equipment: Equipment fed with portable cords or cables intended to be moved from one place to another.

Powered Loudspeaker: Equipment which consists of a loudspeaker and amplifier within the same enclosure. Other signal processing may also be included.

Rated Load Impedance: The amplifier manufacturer's stated or marked speaker impedance into which an amplifier will deliver its rated output power. 2Ω, 4Ω, and 8Ω are typical ratings.

Rated Output Power: The amplifier manufacturer's stated or marked output power capability into its rated load.

Rated Output Voltage: For audio amplifiers of the "constant voltage type", this is the nominal output voltage when the amplifier is delivering full rated power. Used for determining approximate acoustic output in distributed speaker systems which typically employ impedance matching transformers. 25 volt, 70.7 volt and 100 volt are typical ratings.

Technical Power System: An electrical distribution system with grounding in accordance with Article 250-74, Exception 4, where the equipment grounding conductor is isolated from the premises grounded conductor except at a single grounded termination point within a branch circuit panelboard, the originating (main breaker) branch circuit panelboard, or at the premises grounding electrode.

Temporary Equipment: Portable wiring and equipment intended for use with events of a transient or temporary nature where all equipment is presumed to be removed at the conclusion of the event.

640-3. Locations and Other Articles. Circuits and equipment shall comply with (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), and (k) below, as applicable.

(a) Spread of Fire or Products of Combustion. Section 300-21

(b) Ducts, Plenums, and other Air Handling Spaces. Section 300-22, where installed in ducts or plenums or other space used for environmental air.

(FPN): NFPA 90A, *Installation of Air Conditioning and Ventilation Systems*, Section 2-3.10.1 (a), Exception 3, permits listed loudspeakers, loudspeaker assemblies and their accessories to be installed in other spaces used for environmental air (ceiling cavity plenums).

(c) Cable Trays. Cable trays shall be used in accordance with Article 318

(FPN): See Section 725-61(c) for the use of Class 2, Class 3, and PLTC cable in cable trays.

(d) Hazardous (Classified) Locations. Equipment used in hazardous (classified) locations shall comply with the applicable requirements of Chapter 5.

(e) Places of Assembly. Equipment used in places of assembly shall comply with Article 518

(f) Theaters, Audience Areas of Motion Picture and Television Studios, and Similar Locations. Equipment used in theaters, audience areas of motion picture and television studios, and similar locations shall comply with Article 520.

(g) Carnivals, Circuses, Fairs and Similar Events. Equipment used in carnivals, circuses, fairs and similar events shall comply with Article 525.

(h) Motion Picture and Television Studios. Equipment used in motion picture and television studios shall comply with Article 530.

(i) Swimming Pools, Fountains, and Similar Locations. Audio equipment used in or near swimming pools, fountains, and similar locations shall comply with Article 680.

(j) Fire Alarm Systems. Fire alarm systems, multi-purpose fire alarm/page and-or fire alarm/music systems shall comply with Article 760.

(1) Such systems shall also comply with NFPA 72-1996 *National Fire Alarm Code*.

(2) Multi-purpose fire alarm/page and-or fire alarm/music systems shall additionally comply with NFPA 101-1994 *Life Safety Code*, Article 7-6.3.9, Exception No. 1.

(k) Antennas. Equipment used in audio systems which contain an audio or video tuner and an antenna input shall comply with Article 810. Wiring other than antenna wiring which connects such equipment to other audio equipment shall comply with this Article.

640-4. Protection of Electrical Equipment. Amplifiers, loudspeakers, and other equipment shall be so located or protected as to guard against environmental exposure or physical damage, such as might result in fire, shock, or personal hazard.

640-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels, including suspended ceiling panels.

640-6. Mechanical Execution of Work. Equipment and cabling shall be installed in a neat and workmanlike manner. Cables for installed systems shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use.

640-7. Grounding.

(a) General. Wireways and auxiliary gutters shall be grounded and bonded in accordance with the requirements of Article 250. Where the wireway or auxiliary gutter does not contain power-supply wires, the equipment grounding conductor shall not be required to be larger than No. 14 copper or its equivalent. Where the wireway or auxiliary gutter contains power-supply wires, the equipment grounding conductor shall not be smaller than specified in Section 250-95.

(b) Separately Derived Systems With 60 Volts to Ground. Grounding of separately derived systems with 60 volts to ground shall be in accordance with Section 530-72

(c) Isolated Ground Receptacles. Isolated grounding type receptacles shall be permitted as described in Section 250-74, Exception No. 4, and for the implementation of other technical power systems in compliance with Article 250. For separately derived systems with 60 volts to ground, the branch-circuit equipment grounding conductor shall be terminated as required in Section 530-72 (b).

(FPN): See Section 410-56(c) for grounding type receptacles and required identification.

640-8. Grouping of Conductors.

Insulated conductors of different systems grouped or bundled so as to be in close physical contact with each other in the same raceway or other enclosure, or in portable cords or cables, shall comply with Section 300-3(c)(1).

640-9 Wiring Methods.

(a) Wiring to and Between Audio Equipment.

(1) Wiring and equipment from source of power to and between devices connected to the premises wiring systems shall comply with the requirements of Chapters 1 through 4, except as modified by this article.

(2) Separately derived systems shall comply with the applicable articles of this *Code* except as modified by this article. Separately Derived Systems With 60 Volts to Ground shall be permitted for use in audio system installations as specified in Article 530, Part G.

(3) All wiring not connected to the premises wiring system or to a wiring system separately derived from the premises wiring system shall comply with Article 725

(b) Auxiliary Power Supply Wiring. Equipment that has a separate input for an auxiliary power supply shall be wired in compliance with Article 725. Battery installation shall be in accordance with Article 480.

(FPN No. 1): This section does not apply to the use of UPS equipment, or other sources of supply which are intended to act as a direct replacement for the primary circuit power source and are connected to the primary circuit input.

(FPN No. 2): Refer to NFPA 72-1996, *National Fire Alarm Code*, where equipment is used for a fire alarm system.

(c) Amplifier Output Wiring. Amplifier output circuits carrying audio-program signals which do not exceed 120 volts under prescribed open-circuit test conditions shall be permitted to employ Class 2 or Class 3 wiring where listed for this use.

Exception: Listed amplifiers required to use Class 1 circuits as defined by Article 725.

(FPN No. 1): The requirement of 640-9(c) is based on amplifiers whose output voltage is 120 volts RMS or less when driven with a sinusoidal test signal of 100 Hz sufficient in amplitude to deliver maximum power into its rated load. Output voltage is determined after the load is removed.

It is well known that the RMS voltage of audio program material is typically 12dB lower (in voltage) than the amplifier's maximum potential output as determined above. This characteristic of audio program material is called crest factor. Thus, an amplifier which is 120 volts RMS or less under test conditions is capable of 170 volts peak output, which equates to an RMS voltage of 43 volts or less when reproducing program material. The term "dB" is a logarithmic method of expressing the ratio of the two values.

For reference: $-12\text{dB}_{\text{VOLTAGE}} = 1/4$ voltage.

(FPN No. 2): *Amplifiers for Fire Protective Signaling Systems*, ANSI/UL 1711-1994 contains requirements for the listing of amplifiers used for fire alarm systems in compliance with NFPA 72-1996 *National Fire Alarm Code*.

(FPN No. 3): Examples of requirements for listing amplifiers used in residential, commercial and professional use are found in *Commercial Audio Equipment*, ANSI/UL 813-1992, *Professional Video and Audio Equipment*, ANSI/UL 1419-1992, *Audio-Video Products and Accessories* ANSI/UL 1492-1992, or *Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar Use*, ANSI/UL 6500-1996.

(d) Use of Audio Transformers and Autotransformers. Audio transformers and autotransformers shall only be used for audio signals in a manner so as not to exceed the manufacturer's stated input or output voltage, impedance, or power limitations. The input or output wires of an audio transformer or autotransformer shall be allowed to connect directly to the amplifier or loudspeaker terminals.

No electrical terminal or lead shall be required to be grounded or bonded.

640-10. Audio Systems Near Bodies of Water. Audio systems near bodies of water, either natural or artificial, shall be subject to the following restrictions.

Exception: This section does not include audio systems intended for use on boats, yachts, or other forms of land or water transportation used near bodies of water, whether or not supplied by branch circuit power.

(FPN): See Section 680-23 for installation of underwater audio equipment.

(a) Equipment Supplied by Branch Circuit Power. Audio system equipment supplied by branch circuit power shall not be placed laterally within 5 ft. (1.52 m) of the inside wall of a pool, spa, hot tub or fountain, nor within 5 ft. (1.52 m) of the prevailing or tidal high water mark. The equipment shall be provided with branch circuit power protected by a ground-fault circuit-interrupter where required by other Articles.

(b) Equipment Not Supplied by Branch Circuit Power. Audio system equipment powered by a listed Class 2 power supply or by the output of an amplifier listed as permitting the use of Class 2 wiring shall only be restricted in placement by the manufacturer's recommendations.

(FPN): Placement of the power supply or amplifier, if supplied by branch circuit power, is still subject to 640-10(a).

B. Permanent Audio System Installations

640-21. Use of Flexible Cords and Cables

(a) Between Equipment and Branch Circuit Power. Power supply cords for audio equipment shall be suitable for the use and shall be permitted to be used where the interchange, maintenance, or repair of such equipment is facilitated through the use of a power supply cord.

(b) Between Loudspeakers and Amplifiers, or Between Loudspeakers. Cables used to connect loudspeakers to each other or to an amplifier shall comply with Article 725. Other listed cable types and assemblies, including optional hybrid communications, signal, and optical fiber cables, shall be permitted.

(c) Between Equipment. Cables used for the distribution of audio signals between equipment shall comply with Article 725. Other listed cable types and assemblies, including optional hybrid communications, signal, and optical fiber cables, shall be permitted. Other cable types and assemblies specified by the equipment manufacturer as acceptable for the use shall be permitted in accordance with Section 110-3(b).

(d) Between Equipment and Power Supplies Other Than Branch Circuit Power

(1) Storage batteries shall be installed and wired in accordance with the requirements of this *Code* for the voltage and power delivered.

(2) Transformers, transformer-rectifiers, and other AC or DC power supplies shall be installed and wired in accordance with the requirements of this *Code* for the voltage and power delivered.

(FPN): For some equipment, sources such as in (1) and (2) will serve as the only source of power. These could, in turn, be supplied with intermittent or continuous branch circuit power.

(e) Between Equipment Racks and Premises Wiring System. Flexible cords and cables shall be permitted for the electrical connection of permanently installed equipment racks to the premises wiring system to facilitate access to equipment or for the purpose of isolating the technical ground of the rack from the premises ground. Connection shall be made using either approved plugs and receptacles or by direct connection within an approved enclosure. Flexible cords and cables shall not be subjected to physical manipulation or abuse while the rack is in use.

640-22. Wiring of Equipment Racks. Equipment racks shall be fabricated of metal and grounded. Bonding shall not be required if the rack is connected to a technical power ground.

Equipment racks shall be wired in a neat and workmanlike manner. Wires, cables, structural components, or other equipment shall not be placed in such a manner as to prevent reasonable access to equipment power switches and resettable or replaceable circuit overcurrent protection devices.

Supply cords or cables, if used, shall terminate within the equipment rack enclosure in an identified connector assembly. The supply cords or cable (and connector assembly, if used) shall have sufficient ampacity to carry the total load connected to the equipment rack and shall be protected by overcurrent devices.

640-23. Conduit or Tubing.

(a) Number of Conductors. The number of conductors permitted in a single conduit or tubing shall not exceed the percentage fill specified in Table 1, Chapter 9.

(b) Non-Metallic Conduit or Tubing, and Insulating Bushings. The use of non-metallic conduit or tubing, and insulating bushings shall be permitted where a technical ground system is employed and shall comply with applicable articles.

640-24. Wireways, Gutters, and Auxiliary Gutters. The use of metallic and non-metallic wireways, gutters, and auxiliary gutters shall be permitted for use with audio signal conductors and shall comply with applicable articles with respect to permitted locations, construction and fill.

640-25. Loudspeaker Installation in Fire Resistance Rated Partitions, Walls, and Ceilings. Loudspeakers installed in a fire resistance rated partition, wall or ceiling shall be listed for the purpose or installed in an enclosure or recess which maintains the fire resistance rating.

(FPN): Fire-rated construction is the fire-resistive classification used in building codes. One method of determining fire rating is testing in accordance with Standard Methods of Tests of Fire Endurance of Building Construction and Materials, NFPA 251-1995.

C. Portable and Temporary Audio System Installations.

640-41 Multipole Branch Circuit Cable Connectors. Multipole branch circuit cable connectors, male and female, for power supply cords and cables shall be constructed so that tension on the cord or cable will not be transmitted to the connections. The female half shall be attached to the load end of the power supply cord or cable. The connector shall be rated in amperes and designed so that differently rated devices cannot be connected together. AC multipole connectors shall be polarized and comply with Sections 410-56(f) and 410-58. AC or DC multipole connectors utilized for connection between loudspeakers and amplifiers, or between loudspeakers, shall not be compatible with non locking 15 or 20 ampere rated connectors intended for branch circuit power, nor with connectors rated 250 volts or greater of either the locking or non locking type. Signal cabling not intended for such loudspeaker and amplifier interconnection shall not be permitted to be compatible with multipole branch circuit cable connectors of any accepted configuration.

(FPN): See Section 400-10 for pull at terminals.

640-42 Use of Flexible Cords and Cables

(a) Between Equipment and Branch Circuit Power. Power supply cords for audio equipment shall be listed and shall be permitted to be used where the interchange, maintenance, or repair of such equipment is facilitated through the use of a power supply cord.

(b) Between Loudspeakers and Amplifiers, or Between Loudspeakers. Flexible cords and cables used to connect loudspeakers to each other or to an amplifier shall comply with Article 400 and Article 725, respectively. Cords and cables listed for portable use, either hard or extra hard usage as defined by Article 400, shall also be permitted. Other listed cable types and assemblies, including optional hybrid communications, signal, and optical fiber cables, shall be permitted.

(c) Between Equipment and/or Between Equipment Racks. Flexible cords and cables used for the distribution of audio signals between equipment shall comply with Article 400 and Article 725, respectively. Cords and cables listed for portable use, either hard or extra hard service as defined by Article 400, shall also be permitted. Other listed cable types and assemblies, including optional hybrid communications, signal, and optical fiber cables, shall be permitted.

(d) Between Equipment, Equipment Racks, and Power Supplies Other Than Branch Circuit Power

(1) Storage batteries shall be installed and wired in accordance with the requirements of this *Code* for the voltage and power delivered.

(2) Transformers, transformer-rectifiers, and other AC or DC power supplies shall be installed and wired in accordance with the requirements of this *Code* for the voltage and power delivered.

(3) Generators shall be installed in accordance with Article 445

(e) Between Equipment Racks and Branch Circuit Power. The supply to a portable equipment rack shall be by means of listed extra-hard usage cords or cables, as defined in Article 400. For outdoor portable or temporary use, the cords or cables shall be further listed as being suitable for wet locations and sunlight resistant.

(1) Where equipment racks include audio and lighting and/or power equipment, Articles 520 and 525 shall apply as appropriate.

(2) The usage and construction of cable extensions, adapters, and breakout assemblies shall be in accordance with Article 520 or 525 as appropriate.

640-43. Wiring of Equipment Racks.
Equipment racks fabricated of metal shall be grounded. Non-metallic racks with covers (if provided) removed shall not allow access to Class 1, Class 3, or primary circuit power without the removal of covers over terminals or the use of tools.
Equipment racks shall be wired in a neat and workmanlike manner. Wires, cables, structural components, or other equipment shall not be placed in such a manner as to prevent reasonable access to equipment power switches and resettable or replaceable circuit overcurrent protection devices.
Wiring which exits the equipment rack for connection to other equipment or to a power supply shall be relieved of strain or otherwise suitably terminated such that a pull on the flexible cord or cable shall not increase the risk of damage to the cable or connected equipment such as to cause an unreasonable risk of fire or electric shock.

640-44. Environmental Protection of Equipment. Temporary outdoor, unsheltered placement or use of portable equipment not listed for the purpose shall be permitted only where appropriate protection of such equipment from adverse weather conditions is provided to prevent risk of fire or electrical shock. Where the system is intended to remain operable during adverse weather, arrangements shall be made for maintaining operation and ventilation of heat dissipating equipment.

640-45. Protection of Wiring. Where accessible to the public, flexible cords and cables laid or run on the ground or on the floor shall be covered with approved non-conductive mats. Cables and mats shall be arranged so as not to present a tripping hazard.

640-46. Equipment Access. Equipment likely to present a risk of fire, electrical shock or physical injury to the public shall be protected by barriers or supervised by qualified personnel such as to prevent public access.

SUBMITTER: William Keezer, Bose Corp./Rep. Nat'l Systems Contractors Assn.
RECOMMENDATION: Add a new section:
640-11 Underwater Audio Equipment
All underwater audio equipment shall be identified for the purpose.
(a) Speakers. Each speaker shall be mounted in an approved metal forming shell, the front of which is enclosed by a captive metal screen, or equivalent, that is bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to open for installation or servicing of the speaker. The forming shell shall be installed in a recess in the wall or floor of the pool.
(b) Wiring Methods. Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal or rigid nonmetallic conduit shall extend from the forming shell to a suitable junction box or other enclosure as provided in Section 680-21. Where rigid nonmetallic conduit is used, a No. 8 insulated copper conductor shall be installed in this conduit with provisions for terminating in the forming shell and the junction box. The termination of the No. 8 conductor in the forming shell shall be covered with, or encapsulated in, a suitable potting compound to protect such connection from the possible deteriorating effect of pool water.
(c) Forming Shell and Metal Screen. The forming shell and metal screen shall be of brass or other approved corrosion-resistant metal.
SUBSTANTIATION: CMP 20 correctly observed that many sections of proposal 16-6-(640) may have applicability in the vicinity of pools. Notwithstanding the claim that Article 680 has responsibility for audio equipment adjacent to pools, etc., it is clear that the entire contents of the proposed Article 640 should be replicated into Article 680 if CMP 20's suggestion that "The proposed revision of Article 640 dealing with audio equipment adjacent to pools etc. would be more appropriately contained in Article 680" is to be taken seriously. Conversely, Section 680-23 is the only place in Article 680 where audio equipment of ANY type is mentioned. It would appear to be more appropriate to place the contents of Section 680-23 within Article 640 where proposed.
Two examples of installation environments which could cause conflicting interpretations:
1) An outdoor area of a resort hotel. This area has a gazebo for amplified music and poetry readings. A natural brook flows through the area, and an ornamental fountain is also near the gazebo, the overflow from which is diverted into a second, imitation brook ending in a reflecting pool in which children wade to catch frogs. Loudspeakers are installed in the trees, on the grassy areas beside the walkways, and disguised as rocks and placed in rock formations at the sides of both brooks. When a concert takes place, an additional temporary sound system is installed consisting of loudspeakers on the stage and on tripods in the lawn area. Some are near the fountain, some near the natural brook, and some in the middle of the 3 acre site. Signal sources and amplification for the landscape system are in the hotel. It is a single amplifier circuit listed to permit the use of Class 2 wiring. The concert system is powered by a system located at the gazebo. No speakers of either system are IN a body of water, although many might be considered "adjacent". Where does 680 stop and 640 start? At what point do the speakers disguised to look like rocks fall under 680? What about the other speaker on the same circuit, 4 feet further away from the fountain but closer to the natural brook? Note the fundamental conflict between adjacency to natural bodies of water (ONLY addressed in the 16-6-(640) proposal) and artificial bodies of water (the claimed domain of Article 680), even though the issues of electrical safety are identical in both cases.
2) An upscale residence has all the audio goodies, including a background music system throughout the house and grounds, a pool, and a hot tub in a corner of the master bedroom. The background music system is on zones using multiple amplifiers under a master control. The entry hall foyer has a sculptured rock waterfall with one of the background music loudspeakers overhead, and spaced every 10 feet down the hall. In the master bedroom both the background music system and an independent, built-in A/V system which supports the bedroom TV are installed. A background music loudspeaker and the right rear A/V speaker are near the hot tub; one in the ceiling and one mounted on the wall. The pool area has background music speakers mounted in a patio roof which overhangs the pool. These speakers are on the same circuit as those in the garage and the loudspeakers hidden in the landscaping. A switch and a multitap audio auto-transformer are used to turn on and control the volume of the in-pool loudspeaker system. The entire system is a 70 volt "constant voltage" type using a single amplifier listed for use with Class 2 wiring.
As can be seen by these examples, the applicability of 680 is far from clear, yet in the absence of Article 680, Article 640 addresses every issue directly except for the mechanical aspects of underwater loudspeaker installation.
While very modestly expanding the content of Article 640, this proposal does nothing to expand its scope. This proposal also complies with the intent of the submitters of Article 640 in reducing confusion and the appearance of conflicting articles relating to the installation of audio systems.
This comment is a companion comment to a comment made in response to proposal 20-8-(680-3).
Since this comment involves the coordination of two Code Making Panels (16 and 20), it is respectfully suggested that the Technical Correlating Committee also review this comment and make a recommendation to either:
1) Accept or Accept in Principle proposal 20-81-(680-3) or
2) consider this and a companion Section 680-23 comment as a means of clarifying which Article best addresses the issues of audio system installation in general, as well as those adjacent to or in the vicinity of pools as defined in Article 680.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #3655)

16- 12 - (640-21(d)): Accept
SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.
RECOMMENDATION: Revise Section 640-21(d) as follows:
(d) Between Equipment and Power Supplies Other Than Branch-Circuit Power. The following power supplies other than branch-circuit power supplies shall be installed and wired between equipment in accordance with the requirements of this Code for the voltage and power delivered:
(1) Storage batteries
(2) Transformers
(3) Transformer rectifiers
(4) Other ac or dc power supplies

FPN: For some equipment, these sources such as in (1) through (4) will serve as the only source of power. These could, in turn, be supplied with intermittent or continuous branch-circuit power.
SUBSTANTIATION: The new NEC Style Manual (April 1999), Section 2.1.5.1 provides that lists are a method of structuring the items necessary to complete a rule.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2182)

16- 13 - (640-21(e)): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Flexible cords and cables shall be permitted for the electrical connection of permanently installed equipment racks to the premises wiring system to facilitate access to equipment or for the purpose of isolating the technical power system ~~ground~~ of the rack from the premises ground. Connection shall be made using either approved plugs and receptacles or by direct connection within an approved enclosure. Flexible cords and cables shall not be subjected to physical manipulation or abuse while the rack is in use.
SUBSTANTIATION: The term technical ground is undefined. The term technical power system is defined in 640-2 and this definition includes grounding of this system. Therefore, technical power system applies and should be used.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #3393)

16- 14 - (640-22): Accept
SUBMITTER: John H. Schmidt, ABC TV
RECOMMENDATION: Revise text to read as follows:
"640-22. Wiring of Equipment Racks and Enclosures. Metal e~~E~~quipment racks and enclosures shall be ~~fabricated of metal and~~ grounded...".
SUBSTANTIATION: Audio equipment is often mounted in consoles or other enclosures, rather than racks. This is particularly true in the television and recording industries. Historically, these enclosures are often made of Formica covered wood or other nonconductive material. Even racks are sometimes nonmetallic; particularly where weight is a concern. When the rack or enclosure is metal, it should be grounded. To require all equipment to be installed in metal racks is unrealistic; to require fabrication of consoles from metal is prohibitively expensive and unnecessary.
The equipment that is typically mounted in these racks or enclosures is manufactured and listed for use without any external enclosure. The enclosure provided by the manufacturer with the equipment is safe and adequate for tabletop usage. There is no history of problems with nonmetallic enclosures. The requirement for metal racks, which first appeared as a part of the general revision of Article 640 in the last code revision cycle, should be removed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2183)

16- 15 - (640-23(b)): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
The use of nonmetallic conduit or tubing and insulating bushings shall be permitted where a technical power ~~ground~~ system is employed and shall comply with applicable articles.
SUBSTANTIATION: The term technical ground system is undefined. The term technical power system is defined in 640-2 and this definition includes grounding of this system. Therefore, technical power system applies and should be used.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #3661)

16- 16 - (640-42(d)(1), (2)): Accept
Note: The Technical Correlating Committee understands this Proposal modifies Sections 640-42(b)(1) and (2).
SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.
RECOMMENDATION: Revise Section 640-21(d)(1), (2) as follows:
(d) Between Equipment, Equipment Racks, and Power Supplies Other Than Branch-Circuit Power. Wiring between the following power supplies, other than branch-circuit power supplies, shall be installed, connected, or wired in accordance with the requirements of this Code for the voltage and power required:
(1) Storage batteries
(2) Transformers
(3) Transformer rectifiers
(4) Other ac or dc power supplies.
SUBSTANTIATION: The new NEC Style Manual (April 1999), Section 2.1.5.1 provides that lists are a method of structuring the items necessary to complete a rule.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22
COMMENT ON AFFIRMATIVE:
BRUNSSEN: The submitter's reference to Section 640-21(d)(1), (2), in his recommendation is incorrect. The correct section is Section 640-42(d)(1), (2).

(Log #3662)

16- 17 - (640-42(d)(3)): Accept in Principle
SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.
RECOMMENDATION: Delete Section 640-2(d)(3).
SUBSTANTIATION: Problem: This section does not readily fit the use of either Section 2.1.5.1 List Formats, or 2.1.5.2, Subdivision Titles, of the revised 1999 NEC Style Manual.
Solution: This is a companion proposal to a proposal initiated by Mr. William Keezer for a new Section 640-3(l). Section 640-3 rightly provides a place to consolidate the information in Section 640-42(d)(3) and quickly provides guidance and direction to the end user. This change provides consistency of format as already provided for by Section 640-3(a) through (k).
PANEL ACTION: Accept in Principle.
Delete Section 640-42(d)(3).
PANEL STATEMENT: There is a typographical error in the recommendation. The change corrects this error.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #3663)

16- 18 - (640-42(e)(1), (2)): Accept
Note: The Technical Correlating Committee directs the Panel to clarify the Action on this Proposal relative to the reference to "Section 400," specifically what section number is to be included. The Technical Correlating directs that the Action on this Proposal be revised to comply with the NEC Style Manual 4.1.1 regarding referencing an entire article. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.
RECOMMENDATION: Revise Section 640-42(e) as follows:
(e) Between Equipment Racks and Branch-Circuit Power. The supply to a portable equipment rack shall be by means of listed extra-hard usage cords or cables, as defined in Section 400. For outdoor portable or temporary use, the cords or cables shall be further listed as being suitable for wet locations and sunlight resistant. Articles 520 and/or 525 shall apply as appropriate when the following conditions exist:
(1) Where equipment racks include audio and lighting and/or power equipment.
(2) When using or constructing cable extensions, adapters, and breakout assemblies.

SUBSTANTIATION: The new NEC Style Manual (April 1999), Section 2.1.5.1 provides that lists are a method of structuring the items necessary to complete a rule.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

ARTICLE 645 — INFORMATION TECHNOLOGY EQUIPMENT

(Log #620)

12- 78 - (645-1): Reject

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Bruce Fairweather, Electrical Safety Inc.
RECOMMENDATION: Fourth line, after the word units, replace the remaining sentence with "in information technology equipment rooms, and rooms containing semiconductor manufacturing and test areas."
SUBSTANTIATION: One only has to visit a major semiconductor manufacturing facility to see that much of the manufacturing and testing is accomplished in rooms with raised floors. The raised floors in these rooms are plenum areas dedicated to environmental air and meet the requirements of 645-2 a thru f. The inclusion of the term manufacturing and test will leave no room for doubt as to Article 645's scope of inclusion. Where manufacturing and testing is performed in non-raised floor areas that do not meet 645-2 a thru f the article would not apply.
PANEL ACTION: Reject.
PANEL STATEMENT: Scoping issues are under the jurisdiction of the TCC. The panel recommends the TCC does not expand the scope of Article 645 to include semiconductor manufacturing and test facilities.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #2532)

12- 79 - (645-1, FPN; 645-2):

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action. The Technical Correlating Committee rejects the Panel Action on that part of the proposal pertaining to Section 645-1 because the Fine Print Note contains a statement of intent and repeats information contained in 90-3. The remainder of the proposal pertaining to Sections 645-2(b), (c), and (e) continue to be accepted in accordance with the Panel Action.
SUBMITTER: Technical Committee on Electronic Computer Systems
RECOMMENDATION: 645-1: Revise the Fine Print Note to read: Because of particular operating and installation conditions required of equipment located within an information technology equipment room, often referred to as a "computer room", amendments to the requirements in Chapters 1-4 of the Code are necessary. The intent of this Article is to allow the use of the special equipment, grounding and wiring requirements described herein if all the conditions of Section 645-2 are met.
Equipment, grounding and wiring installed in information technology rooms not as described in Section 645-2 are subjected to Chapters 1-4 of the Code without these amendments. For further information, see Standard for the Protection of Electronic Computer/Data Processing Equipment, NFPA 75-1999, which provides occupancy requirements for both the information technology (computer) room and the more encompassing computer area.
645-2:
645-2(b) Revise the Fine Print Note to read: For further information, see Standard for the Protection of Electronic Computer/Data Processing Equipment, NFPA 75-1999, Chapter 8, Paragraphs 8-1, 8-1.1, 8-1.2, and 8-1.3.
645-2(c) Delete the Fine Print Note.
645-2(e) Add a Fine Print Note to read: For further information on room construction requirements, see Standard for the Protection of Electronic Computer/Data Processing Equipment, NFPA 75-1999, Chapter 3.
SUBSTANTIATION: 1. Need for correlation between NFPA 70 and NFPA 75 - Standards Council requirement.
2. Refer readers of NFPA 70 to the occupancy recommendations included in NFPA 75.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #33)

12- 80 - (645-2): Reject

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 12-79. See Technical Correlating Committee action on Proposal 12-79. This Proposal is a Comment that was Held for Further Study during the processing of the 1999 NEC. As such, the Technical Correlating Committee directs that the Panel act upon this Proposal based on its merits. This action will be considered by the Panel as a Public Comment.
NOTE: The following proposal consists of Comment 12-57 on Proposal 12-108 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 12-108 was:
This section is broken down into six subdivisions (1, 2, 3, 4, 5, and 6).
The proposed change is to relabel the six subdivisions as (a, b, c, d, e, and f).
SUBMITTER: Technical Committee on Electronic Computer Systems
RECOMMENDATION: Replace 645-2 with the following:
645-2. Special Requirements for Information Technology Equipment Room. This article applies, provided all the following conditions are met:
1.
(8-1) Heating, Ventilating, and Air Conditioning (HVAC). An air conditioning system shall be provided for the computer room/media storage room and shall comply with one of the following:
(a) An HVAC system that is dedicated for electronic computer/data processing equipment use and is separated from other areas of occupancy shall be used.
(b) Any HVAC system that serves other occupancies shall also be permitted to serve the computer room/media storage room. The air ducts shall be provided with automatic fire and smoke dampers.
(8-1.1) Dampers in HVAC systems serving computer rooms/media storage rooms shall operate upon activation of smoke detectors and by operation of the disconnecting means required by 8-4.7.
(8-1.2) Air ducts serving other rooms either shall not pass through the electronic equipment rooms, or fire dampers shall be provided in the ducts.
(8-1.3) All duct insulation and linings, including vapor barriers and coatings, shall be noncombustible.
(8-1.4*) Air filters for use in air conditioning systems shall be noncombustible and installed in accordance with manufacturer's instructions.
2.
(5-1) Computer Equipment.
(5-1.1) Equipment and replacement parts shall meet the requirements of UL 478, Standard for Electronic Data-Processing Units and Systems, or UL 1950, Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
(5-1.2) Listed equipment shall be considered as meeting the requirements of 5-1.3.

(5-1.3*) Each individual unit shall be constructed in such a way that by limiting combustible materials, or by use of enclosures, fire is not likely to spread beyond the unit where the source of ignition is located. Automatic protection shall be provided for all units not so constructed.
(5-1.4) Enclosures of floor-standing equipment having external surfaces of combustible materials of such size that might contribute to the spread of an external fire shall have a flame-spread rating of 50 or less. (See NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.)
(5-1.4.1) Equipment conforming to the requirements of UL 478, Standard for Electronic Data-Processing Units and Systems, or UL 1950, Standard for Safety of Information Technology Equipment Including Electrical Business Equipment, shall be considered as meeting the requirement of 5-1.4.
(5-2) Construction Features.
(5-2.1*) Cables. Interconnecting cables and wiring between units, power cords, plugs, and connectors shall be listed. They shall be considered as part of the computer system and suitable for installation on the floor or under a raised floor as described in Section 3-4.
(5-2.2) Cords. Approved flexible cord and plug assemblies used for connecting computer equipment to the branch circuit to facilitate interchange shall not exceed 15 ft (4.57m) in length.
(5-2.3) Filters. Air filters for use in the cooling systems of individual units shall be listed. They shall be arranged in such a way that they can be readily removed, inspected, cleaned, or replaced when necessary.

(5-2.4) Liquids. If the design of the unit is such that oil or equivalent liquid is required for lubrication, cooling, or hydraulic purposes, it shall have a closed-cup flash point of 300°F (149°C) or higher, and the container shall be of a sealed construction, incorporating automatic pressure relief devices.
(5-2.5) Acoustical Materials. All sound-deadening material used inside of computer equipment shall be of such material, or so arranged, that it does not increase the potential of fire damage to the unit or the potential of fire propagation from the unit.
3.
(3-1*) Building Construction.
(3-1.1) The computer area shall be housed in one of the following:
(a) A building constructed in accordance with NFPA 220, Standard on Types of Building Construction, Type I (443) or (332), or Type II (222) or (111).
(b) A single story building constructed in accordance with NFPA 220, Standard on Types of Building Construction, Type II (000).
Exception: A computer area that is housed in a fully sprinklered building in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.
(3-1.2*) Protection for the building housing the computer area shall be provided where it is subject to damage from external exposure.
(3-1.3*) The computer area shall be separated from other occupancies within the building (including atria or other open-space construction) by fire-resistant rated construction. The computer room shall be separated from other occupancies in the computer area by fire-resistant rated construction. The fire resistance rating shall be commensurate with the exposure but not less than one hour for both. (See Appendix B.)
(3-1.3.1) The fire-resistant rated enclosures shall extend from the structural floor to the structural floor above or to the roof.
(3-2*) Location of Computer Area within the Building.
(3-2.1*) The computer area shall not be located above, below, or adjacent to areas or other structures where hazardous processes are located unless adequate protective features are provided.
(3-3) Computer Area Interior Construction Materials.
(3-3.1) All interior wall and ceiling finishes in the computer area shall have a Class A rating. (See NFPA 101®, Life Safety Code®.)
Exception: Interior wall and ceiling finishes in fully sprinklered computer areas shall be permitted to be Class B.
(3-3.1.1) Interior floor finishes used in computer areas shall be Class I. (See NFPA 101, Life Safety Code.)
Exception: Interior floor finishes in fully sprinklered computer areas shall be permitted to be Class II.
(3-3.1.2) Exposed cellular plastics shall not be used in computer area construction.
Exception: Plastics within a fire-rated assembly are permitted.
(3-3.2*) A structural floor where a computer system is located, or that supports a raised floor installation, shall incorporate provisions for drainage from domestic water leakage, sprinkler operation, coolant leakage, or fire-fighting operations.
(3-4*) Raised Floors.
(3-4.1) Structural supporting members for raised floors shall be of noncombustible material.
(3-4.2) Decking for raised floors shall be noncombustible.
Exception No. 1: Pressure-impregnated, fire-retardant treated lumber having a flame-spread rating of 25 or less shall be permitted. (See NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.)
Exception No. 2: Wood or similar core material that is encased on the top and bottom with sheet, cast, or extruded metal, with all openings or cut edges covered with metal or plastic clips or grommets so that none of the core is exposed, and that has an assembly flame-spread rating of 25 or less shall be permitted. (See NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.)
(3-4.3) Access sections or panels shall be provided in raised floors so that all the space beneath is accessible.
(3-4.3.1) Tools needed to provide access to the underfloor space shall be located in the room and their location shall be well marked.
(3-4.4*) Electric cable openings in floors shall be made smooth or shall be otherwise protected to preclude the possibility of damage to the cables.
(3-5) Cable Openings and Other Penetrations.
(3-5.1) Cable openings or other penetrations through required fire-rated assemblies shall be fire stopped with a properly installed listed fire-stopping material that has a fire resistance rating equal to the fire resistance rating of the penetrated barrier when tested with a minimum positive furnace pressure differential of 0.01 in. of water (2.5 Pa) under ASTM E814, Standard Method of Fire Tests of Through-Penetration Fire Stops.
(3-5.2) Where any openings (e.g., pass-throughs or windows) are installed in any fire-rated wall of a computer area, each opening shall be equipped with an automatic fire-rated shutter. The shutter shall be operated automatically by the presence of either smoke or fire on either side of the wall.
Exception: Fire-rated windows of equal rating to the wall shall be permitted.
(3-6) Air Space. Where the air space below a raised floor or above a suspended ceiling is used to recirculate computer room/computer area environmental air, the wiring shall conform to Article 645 of NFPA 70, National Electrical Code®.
SUBSTANTIATION: There is a need for correlation between NFPA 70 and 75 as outlined in the Standards Council Guideline on Potential Jurisdictional (scope) Issues Between Committees Developing Occupancy Standards and Committees Developing Installation Standards. The material may have to be renumbered to suit the NEC format. This material is to be identified as extracted text from NFPA 75, 1995 edition.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel action on Proposal 12-79 supersedes this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #621)

12- 81 - (645-2): Reject
SUBMITTER: Bruce Fairweather, Electrical Safety Inc.
RECOMMENDATION: Second line. After "Equipment" add an "s," to Room and add "and rooms containing semi-conductor manufacturing and test areas."
SUBSTANTIATION: This modification to 645-2 should make the changes to the scope of 645-1 more cohesive. Because listed information technology equipment computer terminals are part and parcel with semiconductor manufacturing equipment changes to the wording of 645-2 (c) & (d) are not required.
PANEL ACTION: Reject.
PANEL STATEMENT: Semiconductor manufacturing and test areas are not within the scope of Article 645.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #3329)

12- 82 - (645-2(a)): Reject
SUBMITTER: Roger Witt, State Farm Ins. Co./Rep. State Farm Mutual Auto Insurance
RECOMMENDATION: Delete entire paragraph 645-2(a)
~~(a) Disconnecting means complying with Section 645-10 are provided.~~
SUBSTANTIATION: The disconnecting means requirement presents a problem with accidental or malicious activation and in some cases presents problems to equipment and processes external to the data room. Accidental or malicious shutdown of a data center causes a large economic hardship on businesses that rely heavily on data processing centers. The two issues addresed by the "disconnecting means" the shutdown of the electrical source and air supply to the room are addressed in other parts of the NEC and NFPA. Identification of power source locations are covered in NEC Sections 230-2(e) and 700-8. With this knowledge, the power source can be located and disconnected. With smoke detectors installed on the ceiling of the data room, under the raised floor, and in air handling systems of 2000 cfm or more (NFPA 90-4), the shut down of the air handling system is addressed. Also, requirements for using cable types meeting flame test under the raised floor by either the NFPA or model building codes help in reducing the propagation of fire and smoke. In some data rooms automatic fire sprinklers are required adding yet another means to help reduce the destructive affects of a fire. With the power source locations identified and the installation of smoke detectors, fan shutdown systems upon the sensing of smoke, fire sprinklers, and flame spread rated cables, it seems that protection is provided without the need for a single switch that will turn off the power to the entire data room.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is sensitive to the issue of economic hardship, however, no definitive technical substantiation has been submitted to document problems in this area. The requirements for the installation of a disconnecting means in accordance with 645-10 is a necessary requirement consistent with the purpose of the NEC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney
COMMENT ON AFFIRMATIVE:
JONES: I asked for input from the members of NFPA 75 and received ten responses. All ten were in favor of having a disconnecting means; however, no one could document an instance when it was used in an actual emergency. Several committee members could remember accidental activation of the disconnecting means. Neither the NEC nor NFPA 75 prohibits the use of shields or other means to prevent accidental activation. Hopefully, NFPA 75 will discuss the need for this disconnecting means and give guidelines for its installations.

(Log #3328)

12- 83 - (645-2(b)): Reject
SUBMITTER: Roger Witt, State Farm Ins. Co./Rep. State Farm Mutual Auto Insurance
RECOMMENDATION: Delete the text identified as "and also by operation of the disconnecting means required by Section 645-10."
645-2(b) A separate heating/ventilaing/air-conditioning (HVAC) system is provided that is dedicated for information technology equipment use and is separated from other areas of occupancy. Any HVAC system that serves other occupancies shall be permitted to also serve the information technology equipment room if fire/smoke dampers are provided at the point of penetration of the room boundary. Such dampers shall operate on activation of smoke detectors. ~~and also by operation of the disconnecting means required by Section 645-10.~~
SUBSTANTIATION: The disconnecting means requirement presents a problem with accidental or malicious activation and in some cases presents problems to equipment and processes external to the data room. Accidental or malicious shutdown of a data center causes a large economic hardship on businesses that rely heavily on data processing centers. The two issues addresed by the "disconnecting means" the shutdown of the electrical source and air supply to the room are addressed in other parts of the NEC and NFPA. Identification of power source locations are covered in NEC Sections 230-2(e) and 700-8. With this knowledge, the power source can be located and disconnected. With smoke detectors installed on the ceiling of the data room, under the raised floor, and in air handling systems of 2000 cfm or more (NFPA 90-4), the shut down of the air handling system is addressed. Also, requirements for using cable types meeting flame test under the raised floor by either the NFPA or model building codes help in reducing the propagation of fire and smoke. In some data rooms automatic fire sprinklers are required adding yet another means to help reduce the destructive affects of a fire. With the power source locations identified and the installation of smoke detectors, fan shutdown systems upon the sensing of smoke, fire sprinklers, and flame spread rated cables, it seems that protection is provided without the need for a single switch that will turn off the power to the entire data room.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposal 12-82.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #2117)

12- 84 - (645-2(b), FPN): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete FPN reference to NFPA 75 after 645-2(b).
SUBSTANTIATION: NFPA 75 standard is referenced after Section 645-1, Scope; is applicable to the whole Article; and does not need to be referenced again.
PANEL ACTION: Reject.
PANEL STATEMENT: The reference to NFPA 75 was expanded by the action taken on Proposal 12-79 to meet the Standards Council request to correlate the two documents.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
POCH: I disagree with the panel becuase this is a chance to simplify the code by elimination of duplication of material already in Section 645-10, and currently also in Section 645-2(a). If it is a requirement in Section 645-10, why does it have to appear as a condition for applying Article 645 (for computer rooms) again in Section 645-2(a)?

(Log #2118)

12- 85 - (645-2(c), FPN): Accept
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete FPN reference to NFPA 75 after 645-2(c).
SUBSTANTIATION: NFPA 75 standard is referenced after Section 645-1, Scope; is applicable to the whole Article; and does not need to be referenced again.
PANEL ACTION: Accept.
PANEL STATEMENT: This action is consistent with the action on Proposal 12-79.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1897)

12- 86 - (645-2(d) and FPN): Reject
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Delete 645-2(d) and its fine print note in their entirety.
SUBSTANTIATION: Not a requirement for a safe installation. This requirement would be better served as a requirement in NFPA 75-1999.
PANEL ACTION: Reject.
PANEL STATEMENT: The special requirements for information technology rooms are based on occupancy by only those personnel needed for the maintenance and functional operation of installed equipment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
JONES: I voted for this proposal and agree with the submitter that this requirement has nothing to do with the purpose of the NEC.

(Log #2119)

12- 87 - (645-2(d), FPN): Accept
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete FPN reference to NFPA 75 after 645-2(d).
SUBSTANTIATION: NFPA 75 standard is referenced after Section 645-1, Scope; is applicable to the whole Article; and does not need to be referenced again.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1898)

12- 88 - (645-2(f)): Accept
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Delete 645-2(f) in its entirety.
SUBSTANTIATION: Not a requirement under jurisdiction of electrical installation code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1899)

12- 89 - (645-5(b)): Accept
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Delete title "Connecting Cables" and substitute new title "Cord and Plug Connections."
SUBSTANTIATION: The terminology "Cord and Plug Connections" is better suited for connections to branch circuit wiring.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1900)

12- 90 - (645-5(b)(1)): Accept
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Delete 645-5(b)(1) in its entirety.
SUBSTANTIATION: Computer/data processing cable and attachment plug cap is not an accurate description of proper wiring to a branch circuit wiring system.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1901)

12- 91 - (645-5(b)(2)): Accept in Principle
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Renumber to 645-5(b)(1) and revise to read:
Flexible cord and attachment plug cap not to exceed 15 ft in length.
SUBSTANTIATION: To correlate with NFPA 75-1999, Chapter 5, paragraph 5-2.2.
PANEL ACTION: Accept in Principle.
Accept the proposal as modified by inserting the metric conversion: 4.5 m (15 ft).
PANEL STATEMENT: The metric conversion is added to comply with the NFPA Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1902)

12- 92 - (645-5(b)(3)): Accept
SUBMITTER: Charles M. Trout, Maron Electric Co. Inc.
RECOMMENDATION: Renumber 645-5(b)(3) to 645-5(b)(2).
SUBSTANTIATION: To correlate with revised numbering.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #601)

12- 93 - (645-5(d)): Reject
SUBMITTER: Rick Zupan, Lake Oswego, OR
RECOMMENDATION: Revise 645-5(d) to read as follows:
(d) Under Raised Floors. Power cables, communication cables, connecting cables, and receptacles associated with the information technology equipment shall be permitted <u>to be run through and</u> under a raised floor, provided the following.
SUBSTANTIATION: It is necessary to recognize that in order to run a cord under a raised floor it is necessary to run it through the floor despite Section 400-8(2).
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concerns are addressed in 645-5(d)(4).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
POCH: I disagree with the panel in rejecting this proposal because I think its changed wording clarifies the intention of Proposal 12-93, helping to eliminate differences among Authorities Having Jurisdiction in their interpretation. Also Section 645-5(d)(4) is more concerned with abrasions to cables and debris on the subfloor.

(Log #2121)

12- 94 - (645-5(d)(1), FPN): Accept
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete FPN reference to NFPA 75 after 645-5(d)(1).
SUBSTANTIATION: NFPA 75 standard is referenced after Section 645-1, Scope; is applicable to the whole Article; and does not need to be referenced again.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #599)

12- 95 - (645-5(d)(2)): Reject
SUBMITTER: Rick Zupan, Lake Oswego, OR
RECOMMENDATION: Revise 645-5(d)(2) to read as follows:
(2) The branch-circuit supply conductors to receptacles or field-wired equipment are in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, metal wireway, surface metal raceway with metal cover, ~~flexible metal conduit, liquidtight flexible metal or nonmetallic conduit type MI cable, type MC cable, or type AC cable.~~ These supply conductors shall be installed in accordance with the requirements of Section 300-11.
SUBSTANTIATION: There is an apparent conflict between this section and Section 645-5(e). This change and the accompanying change should resolve this and recognize existing practice of running liquidtight flexible conduit unsecured under the floor.
PANEL ACTION: Reject.

PANEL STATEMENT: Liquidtight flexible conduit cannot be installed unsecured unless it is a part of or for listed information technology equipment (645-5(e)). The substantiation submitted is incomplete as it refers only to liquidtight flexible conduit and offers no definitive technical documentation for the proposed change. The submitter provides no substantiation documenting a problem with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #2522)

12- 96 - (645-5(d)(2)): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the actions on Proposals 12-97, 12-98, and 12-99. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Lorena Orbanic, Carlon, Lamson & Sessions
RECOMMENDATION: Revise as follows:
(2) The branch-circuit supply conductors to receptacles or field-wired equipment are in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, electrical nonmetallic tubing, metal wireway, surface metal raceway with metal cover, flexible metal conduit, liquid-tight flexible metal or nonmetallic conduit, Type MI cable, Type MC cable, or Type AC cable. These supply conductors shall be installed in accordance with the requirements of Section 300-11.
SUBSTANTIATION: Electrical Nonmetallic Tubing can be used in most places where Electrical Metallic Tubing can be used with a few exceptions. Thus, if EMT can be used in this application, ENT should also be able to be used in this application. Also, under the floor is not an area subject to physical damage, thus there shouldn't be a concern for that type of mechanical protection. In addition, ENT is subject to the provisions of Article 300-11 just as EMT is. Furthermore, Under Raised Floor is not considered a plenum area as defined by definitions in Article 100 and per 645-5(d)(3), and 300-22, thus it would not exclude ENT.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
POCH: Introducing nonmetallic tubing means introducing more combustible material, or material that could give off more fumes or smoke. Therefore, I disagree with the panel's action to accept this proposal.

(Log #2565)

12- 97 - (645-5(d)(2)): Accept
SUBMITTER: Lorena Orbanic, Carlon, Lamson & Sessions
RECOMMENDATION: Revise as follows:
(2) The branch-circuit supply conductors to receptacles or field-wired equipment are in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, metal wireway, surface metal raceway with metal cover, nonmetallic surface raceway, flexible metal conduit, liquidtight flexible metal or nonmetallic conduit, Type MI cable, Type MC cable, or Type AC cable. These supply conductors shall be installed in accordance with the requirements of Section 300-11.
SUBSTANTIATION: With respect to nonmetallic surface raceway, it serves the same purpose as surface metal raceway. Thus nonmetallic surface raceway should also be permitted to be used in this situation. In addition, under the floor is not an area subject to physical damage, thus there shouldn't be a concern for that type of mechanical protection. Furthermore, under raised floor is not considered a plenum area as defined by definitions in Article 100, per 300-22, and per 645-5(d)(3), so this should eliminate any concerns of relation to this.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
POCH: I suppose, to be consistent with their acceptance of Proposal 12-96, the panel had to accept this proposal, but my concerns about increased fuel load and/or smoke/fumes still exists, so I disagree with the panel action to accept this proposal. Also, see my Explanation of Negative Vote on Proposal 12-96.
COMMENT ON AFFIRMATIVE:
JONES: In the first sentence the last cable type should be AC not AS.

(Log #2566)

12- 98 - (645-5(d)(2)): Accept
SUBMITTER: Lorena Orbanic, Carlon, Lamson & Sessions
RECOMMENDATION: Revise as follows:
(2) The branch-circuit supply conductors to receptacles or field-wired equipment are in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, metal wireway, nonmetallic wireway, surface metal raceway with metal cover, flexible metal conduit, liquidtight flexible metal or nonmetallic conduit, Type MI cable, Type MC cable, or Type AC cable. These supply conductors shall be installed in accordance with the requirements of Section 300-11.
SUBSTANTIATION: Nonmetallic wireway serves the same purpose as metal wireway. Thus nonmetallic wireway should also be permitted to be used in this situation. In addition, under the floor is not an area subject to physical damage, thus there shouldn't be a concern for that type of mechanical protection. Furthermore, under raised floor is not considered a plenum area as defined by definitions in Article 100, per 645-5(d)(3), and 300-22, thus this should eliminate any concerns about using nonmetallic in this application.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
POCH: See my Explanation of Negative Vote on Proposals 12-96 and 12-96.

(Log #2978)

12- 99 - (645-5(d)(2)): Accept
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text to read as follows:
(2) The branch-circuit supply conductors to receptacles or field-wired equipment are in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, metal wireway, surface metal raceway with metal cover, flexible metal conduit, liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit, Type MI cable, Type MC cable, or Type AC cable. These supply conductors shall be installed in accordance with the requirements of Section 300-11.
SUBSTANTIATION: This proposal clarifies that the liquidtight flexible nonmetallic conduit is an approved wiring method. The original text is confusing.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #4254)

12- 100 - (645-5(d)(3)): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise by adding the following sentence at the end:
The ventilation system shall be so arranged, with approved smoke detection devices, that upon the sensation of fire or products of combustion in the underfloor space the circulation of air will cease.

SUBSTANTIATION: Cables that will meet the required smoke resistance characteristics of the building codes for plenum areas, under presently available technology, do not all have acceptable electrical characteristics for these areas. Another approach is to provide a mechanism to sense and stop the circulation of air upon the sensation of smoke. This approach utilizes easily available devices interconnected with the drop-out relaying already in place under these floors.

The model building codes continue to classify these spaces as plenums. However, responsible officials in these organizations recognize the electrical problems involved. In general, the model building codes, including BOCA, will drop the plenum classification upon a showing that under fire conditions the spaces will no longer act as plenums, i.e., the circulation of air will stop.

In Massachusetts this approach has ended the conflict with the building code, which also changed with a correlating amendment. We used to have building inspectors failing jobs that electrical inspectors had passed, and both inspectors were correct. This approach has ended that problem.

In the prior code cycle, CMP 12 said that we hadn't identified a technical problem with the present code. If the building codes condemn the wiring under a computer floor as improper for an air-handling space, you can't operate the equipment. That sounds like a major technical difficulty to me. The point is to meet them half way. The way do do this is to assure that the floor won't actually be air handling during a fire condition. We can live with this, and we've eliminated the problem of confounding inspections by different disciplines.

PANEL ACTION: Accept in Principle.

Accept the proposal as modified by replacing the term "sensation" with "detection".

PANEL STATEMENT: The proposal is modified for consistency with terminology used in NFPA 72, National Fire Alarm Code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #598)

12- 101 - (645-5(d)(5)): Reject

SUBMITTER: Rick Zupan, Lake Oswego, OR

RECOMMENDATION: Revise as follows:

645-5(d)(5) Cable, other than those covered in (b) and (2) and those complying with (a), (b) and (c) below, shall be listed as type DP cable having adequate fire-resistant characteristics suitable for use under raised floors of an information technology equipment room.

SUBSTANTIATION: The local authority having jurisdiction has decided that barring explicit language allowing it flexible cords cannot be used to plug into underfloor receptacles, this should correct this.

PANEL ACTION: Reject.

PANEL STATEMENT: Requirements for the use of listed DP cable were put into the NEC because of the panel's concerns that cables under the raised floor should pass the vertical flame test. Permitting other than DP cables would not fall within the purpose of the Code as outlined in 90-1. The Code already contains explicit language prohibiting the use of other than DP-type cable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NEGATIVE: 2

NOT RETURNED: 2 Kelly, Laney

EXPLANATION OF NEGATIVE:

BURKE: The panel should consider that the submitter was attempting to address an inconsistency between the technical content of the present code and the actual application of the code in the field. Although a technical reading of the present code does not permit flexible cords to be routed from the ITE situated above the raised floor to receptacles mounted under the floor, this installation practice is common in many ITE (computer) rooms. The practice is common in part because equipment in an ITE room sometimes must be relocated, and flexible cord better allows for this. Furthermore, due to trip hazards and similar concerns, it often is impractical to locate receptacles above the raised floor. Also, modern servers and similar ITE more commonly are designed to be installed in either a computer room or an office/business environment. Since much of this ITE connects to 15/125V, 20A/125V or 30A/125V branch circuits, it is cost prohibitive to design for, and often impractical to require two different wiring methods for the same equipment depending on the application, i.e., flexible cord if used in a non-ITE room application and some other Article 645 compatible wiring method for ITE room applications. When considering both the total volume of the underfloor area of an ITE room and the other protective features required of ITE rooms by both NEC Article 645 and NFPA 75, the presence of limited amounts of flexible cord under the raised floor would seem to have a minimal impact.

POCH: I disagree with the panel action to reject this proposal, because the proposal would have eliminated the problem of some Authorities Having Jurisdiction not allowing power cords to be plugged into underfloor receptacles. I think the panel statement that only DP cables, but not flexible cords, are permitted under raised floors, is historically incorrect for the following reasons:

1. The allowance of receptacles beneath raised floors, Section 645-5(d)(2), prior to the development of DP cables, had always implied flexible cords would be permitted below raised floors in order to plug into those receptacles.
2. DP cables have not been intended for use as power cords. They were introduced recently to the code and ITE standards for use as interconnecting cables.
3. Type DP cables are not present in Article 400, are not hard service cord types, and, therefore, would not be usable for power cords on machines outside computer rooms. Manufacturers would have to either market two machine types or replace cords in the field. Field rewiring is significantly less safe and dependable than that done and tested in manufacturing facilities.
4. During the introduction of DP cables, it was never mentioned that DP cables are required to replace flexible power cords. Prohibiting using these flexible power cords, if desired by this panel, should be the topic of a new proposal with full consideration of its impact on current installations and the timetable for implementation.
5. No current products or installations use DP cables for power cords since such construction is not allowed by UL 1950 (which only permits the following types for mounted floor equipment: SJ, SJE, SJO, SJOO, SJT, SJTO, SVTOO, S, SE, SO, SOO, ST, STO, AND STOO).
6. The interpretation that only DP cables could be used for power cordage below raised floors would result in placement of receptacles and power cords on the raised floor, resulting in possible increases in tripping hazards and damage risks to the cords.
7. Rejecting this proposal with the publication of the current panel statement would have the result of a change to the code and current usage.
8. Standard power cords run below raised floors constitutes almost 100 percent of current usage, and has not been shown to be a problem.

Therefore, I recommend accepting Proposal 12-101 as a correction or improvement in the current code.

COMMENT ON AFFIRMATIVE:

WHITE: The panel statement read that only DP cables are allowed under the raised floor. It should also refer to Section 645-5(d)(5)(c) which allows for types: TC, CL2, CL3, PLTC, NPLF, FPL, OFC, OFN, CM, MP, CATV. These designations shall be permitted to have an additional letter P or R or G. Green insulated single conductor cables, No. 4 and larger, marked "for use in cable trays" or "for CT use" shall be permitted for equipment grounding.

(Log #570)

12- 102 - (645-5(d)(5), FPN): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Replace "4 ft. 11 in. (1.5 m)" with "1.5 m (4 ft. 11 in.)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #535)

12- 103 - (645-5(d)(5)c): Accept

Note: The Technical Correlating Committee directs that the Panel clarify the action on this Proposal with regard to the term "Green/Yellow." See Section 250-119 for the identification of equipment grounding conductors. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Paul Petit, American Insulated Wire Corp.

RECOMMENDATION: Third sentence reads "Green" should read: "Green or Green/Yellow."

SUBSTANTIATION: Grounding conductors can be colored either all green or green/yellow.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #1101)

12- 104 - (645-5(d)(5)c): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change "No. 4" to "4 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #2120)

12- 105 - (645-5(d)(5)(c)): Reject

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: Add cable type designation ITC (Article 727) to the first sentence.

SUBSTANTIATION: Cable type ITC was added to the 1996 NEC and inadvertently left out here. ITC cable is being used in these areas as a safe application. Construction of ITC and PLTC is similar as to their characteristics which are applicable to this application.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided any technical substantiation that verifies this cable is acceptable for this use. The panel requires further information to be able to properly evaluate this product for this use.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Kelly, Laney

EXPLANATION OF NEGATIVE:

WHITE: The panel statement asks for additional information about ITC cable. ITC cable, per Section 727-6, shall be insulated conductors in sizes No. 22 through 12. The conductor material shall be copper or thermocouple alloy. Insulation on the conductor shall be rated 300 volts. Shielding shall be permitted. The cable shall be listed as being resistant to the spread of fire. The outer jacket shall be sun light and moisture resistant. Where a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armour is applied over the nonmetallic sheath, an overall nonmetallic jacket shall be permitted to be applied, but not required.

In Section 727-4, under "Uses Permitted" No. 7 states: "ITC cable is permitted under raised floors in control rooms and rack rooms where arranged to prevent damage to the cable."

Code-Making Panel 16 accepted Proposal 16-102 to allow ITC cable under raised floors in information technology rooms' equipment rooms in accordance with Section 645-5(d)(5)(c).

(Log #4135)

12- 106 - (645-5(d)(6) (New)): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 16-80. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Marcelo M. Hirschler, GBH Int'l, Inc./Rep. Plenum Cable Assn.

RECOMMENDATION: Revise as follows:

645-5. Supply Circuits and Interconnecting Cables.

(d) Under raised floors. Power cables, communications cables, connecting cables, interconnecting cables, and receptacles associated with the information technology equipment shall be permitted under a raised floor, provided the following:

(6) Abandoned cables, not intended for future use, shall not be permitted to remain.

SUBSTANTIATION: There is a significant amount of information indicating that the amount of cables installed in plenums, and other air-handling spaces, is increasing rapidly. An understanding of cabling practices indicates that the most common way in which cable installation is carried out is by disconnecting existing cable and leaving it abandoned in place, while introducing the cable needed to perform the additional functions. This creates an increased fuel load in plenums and other air-handling spaces, which is best controlled. There is, as yet, no indication that the additional cable in plenums causes an added fire hazard, and the fire record of cables in concealed spaces, both above ceilings and below floors, remain excellent. In fact, plenum cables, which meet the fire test requirements of NFPA 262, have been shown to have extremely good fire performance and to spread flame only very slowly, if at all. However, this type of preventive measure is worthwhile.

PANEL ACTION: Accept in Part.

Accept the proposal as modified by deleting: "not intended for future use," so the statement reads:

(6) Abandoned cables shall not be permitted to remain.

PANEL STATEMENT: The phrase "not intended for future use" is not enforceable. Such a statement defeats the purpose of the requirement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 2 Kelly, Laney

EXPLANATION OF NEGATIVE:

WHITE: I am voting negative on the panel action to "Accept in Part". The proposal should be accepted. Code-Making Panel 16 is recommending in Proposal 16-80 that the term "Abandoned Cable" be defined as follows: "Cable that is neither terminated at both ends, at a connector, or other equipment, nor identified for future use with a tag." This defines what abandoned cable is for the Authority Having Jurisdiction, and also allows for users to have adequate spare capacity that could be utilized in emergencies and for future expansion.

(Log #600)

12- 107 - (645-5(e)): Reject

SUBMITTER: Rick Zupan, Lake Oswego, OR

RECOMMENDATION: Revise 645-5(e) read as follows::

(e) Securing in Place. Power cables, flexible metal conduit, liquidtight flexible metal or nonmetallic conduit, type MI cable, type MC cable, type AC cable, communications cables, connecting cables, interconnecting cables and associated boxes, connectors, plugs and receptacles that are listed as part of or for, information technology equipment shall not be required to be secured in place.

SUBSTANTIATION: There is an apparent conflict between this section and Section 645-5(d)(2). This change and the accompanying change to 645-5(d)(2) should resolve this.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no conflict between the two sections. 645-5(e) pertains to listed equipment. 645-5(d)(2) is for field-wired equipment.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 2 Kelly, Laney

(Log #3331)

12- 108 - (645-10): Reject
SUBMITTER: Roger Witt, State Farm Ins. Co./Rep. State Farm Mutual Auto Insurance
RECOMMENDATION: Delete Section 645-10 in its entirety.
SUBSTANTIATION: The disconnecting means requirement presents a problem with accidental or malicious activation and in some cases presents problems to equipment and processes external to the data room. Accidental or malicious shutdown of a data center causes a large economic hardship on businesses that rely heavily on data processing centers. The two issues addresed by the "disconnecting means" the shutdown of the electrical source and air supply to the room are addressed in other parts of the NEC and NFPA. Identification of power source locations are covered in NEC Sections 230-2(e) and 700-8. With this knowledge, the power source can be located and disconnected. With smoke detectors installed on the ceiling of the data room, under the raised floor, and in air handling systems of 2000 cfm or more (NFPA 90-4), the shut down of the air handling system is addressed. Also, requirements for using cable types meeting flame test under the raised floor by either the NFPA or model building codes help in reducing the propagation of fire and smoke. In some data rooms automatic fire sprinklers are required adding yet another means to help reduce the destructive affects of a fire. With the power source locations identified and the installation of smoke detectors, fan shutdown systems upon the sensing of smoke, fire sprinklers, and flame spread rated cables, it seems that protection is provided without the need for a single switch that will turn off the power to the entire data room.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposals 12-82 and 12-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #3377)

12- 109 - (645-10): Reject
SUBMITTER: Dale P. Missey, Mesa, AZ
RECOMMENDATION: Designate the existing paragraph as (a). Add a second paragraph, after the Exception as (b) Selective Coordination.
"The overcurrent protective devices in each disconnecting means shall be selectively coordinated with any other supply side overcurrent protective device."
SUBSTANTIATION: Continuity of service is critical for information technology rooms and equipment. This is evidenced by the use of UPS systems, standby generators, etc. These alternate sources of power are useless if a fault on one piece of equipment shuts down the entire system on the load side of the alternate source of power. This proposal will assure that information technology equipment will not be needlessly shut down due to a lack of selective coordination.
PANEL ACTION: Reject.
PANEL STATEMENT: The disconnecting means required by 645-10 does not require overcurrent protection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #4255)

12- 110 - (645-10): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Insert the following sentence at the end of the paragraph.
Where a push button is used as a means to disconnect power, pushing the button in shall disconnect the power.
SUBSTANTIATION: This proposal imposes a very realistic rule grounded in the human expectation that a button is to be pushed in an emergency rather than pulled out. The substantiation is even more compelling based on the original submitter's actual field experience, which he unsuccessfully used in a public comment (#12-63) to CMP 12 in the prior code cycle. Furthermore, a pull-to-off E-Stop button implicitly violates Section 13.1.3 of NFPA 79 calling for mushroom head or extended operators on push buttons used for stop functions on industrial machinery. Although the literal text does not exclude a pull-to-off, the former chair of NFPA 79 (Dale Deming) assures me that the intent of that wording was to assure operability even if an operator's finger had been injured. In fact, Mr. Deming suggested that Massachusetts consider making something similar to this submittal as a proposal to the next edition of NFPA 79 so that no one ever attempts to finagle a pull-to-off button for something like this. Remember, there are lift covers that effectively preclude inadvertent operation.
There is, unfortunately, a long sorry history in the computer equipment business of evading national safety standards based on an attitude of "if we ship all the field wiring coiled in barrels, we can pretend the whole thing is an appliance." Several cycles back, this was done repeatedly in an attempt to avoid interconnections with the grounding electrode system in the building, under the mistaken assumption that the equipment wouldn't work if it were subject to pollution from other ground currents. It took a concerted effort by Bill Summers, Warren Lewis, Joe McPartland, this writer and many others to finally stop that. One of the ways we did it was by simply insisting that if it looked like field wiring after it was installed, it probably was indeed field wiring and as such had to comply with the separately derived system rules in the code.
This issue does not have the same significance, admittedly. However, I am perhaps uniquely sensitized to the idea that a manufacturer can ship a prewired Chapter 3 wiring method coiled in a barrel and then say that the installation provisions of the code don't apply; only the manufacturer's instructions apply. I don't think we can stand for that as a matter of policy. In fact, shifting a set of contacts on the device can be done by the field installer if need be. This proposal need not cause any manufactures any significant expense.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 2
NOT RETURNED: 2 Kelly, Laney
EXPLANATION OF NEGATIVE:
JONES: This requirement should not be placed in this section. In my opinion this will add confusion and some authorities having jurisdiction will insist on push buttons without protective shields at these locations.
WHITE: There have been too many shutdowns of critical processes due to accidental contact with emergency push buttons that are pushed in to disconnect power. Computer systems now control very critical processes that when inadvertently shut down result in personnel injury and/or environmental releases. This is unacceptable.
A push to disconnect push button with a cover, as is suggested in the proposal, requires two hands to operate, whereas a pull to disconnect power button can still be operated with one hand.

(Log #CP1207)

12- 110a - (645-11): Accept
Note: The Technical Correlating Committee understands that this Proposal is modified by the action on Proposal 12-112.
SUBMITTER: CMP 12
RECOMMENDATION: Revise 645-11 to read as follows:
"645-11. Uninterruptible Power Supplies (UPS). Unless otherwise permitted in (a) or (b), UPS systems installed within the information technology room, and their supply and output circuits, shall comply with Section 645-10. The disconnecting means shall also disconnect the battery from its load.
(a) Installations qualifying under the provisions of Article 685.
(b) Power sources capable of supplying 750 volt-amperes or less derived either from UPS equipment or from battery circuits integral to electronic equipment, provided all other requirements of Section 645-11 are met."
SUBSTANTIATION: The proposal addressed NEC Style Manual issues .
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #3330)

12- 111 - (645-11): Reject
SUBMITTER: Roger Witt, State Farm Ins. Co./Rep. State Farm Mutual Auto Insurance
RECOMMENDATION: Delete Section 645-11 in its entirety.
SUBSTANTIATION: The disconnecting means requirement presents a problem with accidental or malicious activation and in some cases presents problems to equipment and processes external to the data room. Accidental or malicious shutdown of a data center causes a large economic hardship on businesses that rely heavily on data processing centers. The two issues addresed by the "disconnecting means" the shutdown of the electrical source and air supply to the room are addressed in other parts of the NEC and NFPA. Identification of power source locations are covered in NEC Sections 230-2(e) and 700-8. With this knowledge, the power source can be located and disconnected. With smoke detectors installed on the ceiling of the data room, under the raised floor, and in air handling systems of 2000 cfm or more (NFPA 90-4), the shut down of the air handling system is addressed. Also, requirements for using cable types meeting flame test under the raised floor by either the NFPA or model building codes help in reducing the propagation of fire and smoke. In some data rooms automatic fire sprinklers are required adding yet another means to help reduce the destructive affects of a fire. With the power source locations identified and the installation of smoke detectors, fan shutdown systems upon the sensing of smoke, fire sprinklers, and flame spread rated cables, it seems that protection is provided without the need for a single switch that will turn off the power to the entire data room.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposals 12-82 & 12-83.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #2122)

12- 112 - (645-11(b)): Accept in Principle
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Delete the "11" in the last line and revise as follows:
"...provided all other requirements of ~~Section~~ Article 645~~-11~~ are met."
SUBSTANTIATION: This is an editorial revision. The reference to Section 645-11 creates a meaningless loop since there are no other 645-11 requirements and this rule should apply to all of Article 645.
PANEL ACTION: Accept in Principle.
Revise 645-11(b) by deleting the following:
"provided all other requirements of Section 645-11 are met."
PANEL STATEMENT: Compliance with Article 645 is understood. The Panel action should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

ARTICLE 650 — PIPE ORGANS

(Log #1102)

16- 19 - (650-5(a)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change:
"No. 28" to "28 AWG"
"No. 26" to "26 AWG"
"No. 14" to "14 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2235)

16- 20 - (650-5(d)): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested" and change "fireproof" to "listed."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
A "listed" tape for the purpose could be evaluated for not only its capability to meet an applicable flame test requirement but other physical and electrical properties that may be necessary for this application.
PANEL ACTION: Accept in Principle.
Revise 650-5(d) to read as follows:
"(d) Cable Covering. Each cable shall be provided with an outer covering, either overall or on each of any subassemblies of grouped conductors. Tape shall be permitted in place of a covering. Where not installed in metal raceway, the covering shall be resistant to flame spread or the cable or each cable subassembly shall be covered with a closely wound listed fireproof tape.
FPN: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in the Reference Standard for Electrical Wires, Cables and Flexible Cords, ANSI/UL 1581-1991."
PANEL STATEMENT: The panel has changed the term "flame retardant" to "resistant to flame spread" and added a FPN for explanation. This will correlate with Articles 725 and others. The term "listed" was added to insure that the tape used is listed for the purpose.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #981)

16- 21 - (650-7): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Overcurrent Protection. Circuits shall be so arranged that ~~all~~ No. 26 and No. 28 conductors shall be protected by an overcurrent device rated at not more than 6 amperes. Other conductor sizes shall be protected in accordance with their ampacity.
Exception: ~~The main supply conductors and the~~ A common return conductor shall not require overcurrent protection.
SUBSTANTIATION: Editorial. The syntax indicates all conductors shall be protected by one overcurrent device. Where larger than No. 26 or 28 conductors are used (Section 650-5(a)) other ratings should be permitted. The exception permits the proposed rule to apply to supply conductors and provides a complete sentence, while exempting a common return conductor.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation to read as follows:
"Overcurrent Protection. Circuits shall be so arranged that No. 26 and No. 28 conductors shall be protected by an overcurrent device rated at not more than 6 amperes. Other conductor sizes shall be

protected in accordance with their ampacity. A common return conductor shall not require overcurrent protection."
PANEL STATEMENT: The exception has been included as part of the main text as requested in Proposal 16-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2567)

16- 22 - (650-7, Exception): Accept in Principle
SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.
RECOMMENDATION: Delete the exception.
Change the text to read as follows:
Circuits, other than those for the main supply conductors and the common return conductors, shall be arranged so that all conductors shall be protected from overcurrent by an overcurrent device rated at not more than 6 amperes.
SUBSTANTIATION: There are numerous exceptions in the NEC which can be expressed in positive code language. This proposal converts the exception into the section text without altering its intent.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-21 which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

ARTICLE 660 — X-RAY EQUIPMENT

(Log #1103)

12- 113 - (660-9): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 18 or 16" to "18 or 16 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

ARTICLE 665 — INDUCTION AND DIELECTRIC HEATING EQUIPMENT

(Log #1454)

12- 114 - (665): Accept
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: John H. Mortimer, Inductotherm Industries, Inc.
RECOMMENDATION: Delete entire Article 665 "Induction and Dielectric Heating" and replace with new Article 665 as proposed:
Article 665 Induction and Dielectric Heating Equipment
A. General
665-1. Scope. This article covers the construction and installation of dielectric heating, induction heating, induction melting, induction welding equipment and accessories for industrial and scientific applications. Medical or dental applications, appliances, or line frequency pipeline and vessel heating are not covered in this article.
FPN See Article 427, Part E, for line frequency induction heating of pipelines and vessels.
665-2. Definitions.
Dielectric Heating. Dielectric heating is the heating of a nominally insulating material due to its own dielectric losses when the material is placed in a varying electric field.
Heating Equipment. The term heating equipment as used in this article includes any equipment used for heating purposes whose heat is generated by induction or dielectric methods.
Induction Heating, Melting and Welding. The heating, melting or welding of a nominally conductive material due to its own I^2R losses when the material is placed in a varying electromagnetic field.
Converting Device. The converting device is that part of the heating equipment that converts input mechanical or electrical energy to the voltage, current and frequency suitable for the heating applicator. A converting device shall consist of equipment using mains frequency, all static multipliers, oscillator-type units using vacuum tubes, inverters using solid state devices or motor generator equipment.
Heating Equipment Applicator. The heating equipment applicator is the device used to transfer energy between the output circuit and the object or mass to be heated.
665-3. Other Articles. Unless specifically amended by this article, wiring from the source of power to the heating equipment shall comply with Chapters 1 through 4.
665-4. Hazardous (Classified) Locations. Heating equipment shall not be installed in hazardous (classified) locations as defined in Article 500 unless the equipment and wiring are designed and approved for the hazardous (classified) locations.
665-5. Output Circuit. The output circuit shall include all output components external to the converting device, including contactors, switches, bus bars, and other conductors. The current flow from the output circuit to ground under operating and ground fault conditions shall be limited to a value which does not cause more than 50 volts to ground to appear on any accessible part of the heating equipment and its load. The output circuit shall be permitted to be isolated from ground.
665-7. Remote Control.
(a) Multiple Control Points. Where multiple control points are used for applicator energization, a means shall be provided and interlocked so that the applicator can be energized from only one control point at a time. A means for de-energizing the applicator shall be provided at each control point.
(b) Foot Switches. Switches operated by foot pressure shall be provided with a shield over the contact button to avoid accidental closing of a foot switch.
665-10. Ampacity of Supply Conductors. The ampacity of supply conductors shall be determined by (a) or (b).
(a) Nameplate Rating. The ampacity of conductors supplying one or more equipments shall not be less than the sum of the nameplate ratings for the largest group of machines capable of simultaneous operation, plus 100 percent of the standby currents of the remaining machines. Where standby currents are not given on the nameplate, the nameplate rating shall be used as the standby current.
(b) Motor Generator Equipment. The ampacity of supply conductors for motor generator equipment shall be determined in accordance with Article 430, Part B.
665-11. Overcurrent Protection. Overcurrent protection for the heating equipment shall be provided as specified in Article 240. This overcurrent protection shall be permitted to be provided separately or as a part of the equipment.
665-12. Disconnecting Means. A readily accessible disconnecting means shall be provided to disconnect each heating equipment from its supply circuit. The disconnecting means shall be located within sight from the controller or be capable of being locked in the open position. The rating of this disconnecting means shall not be less than the nameplate rating of the heating equipment. Motor-generator equipment shall comply with Article 430, Part J. The supply circuit disconnecting means shall be permitted to serve as the heating equipment disconnecting means where only one heating equipment is supplied.
B. Guarding, Grounding, and Labeling
665-19. Component Interconnection. The interconnection components required for a complete heating equipment installation shall be guarded.

665-20. Enclosures. The converting device (excluding the component interconnections) shall be completely contained within an enclosure(s) of non-combustible material.

665-21. Control Panels. All control panels shall be of dead-front construction.

665-22. Access to Internal Equipment. Access doors or detachable access panels shall be employed for internal access to heating equipment. Access doors to internal compartments containing equipment employing voltages from 150 volts to 1000 volts ac or dc shall be capable of being locked closed or shall be interlocked to prevent the supply circuit from being energized while the door(s) is open. Access doors to internal compartments containing equipment employing voltages exceeding 1000 volts ac or dc shall be provided with a disconnecting means equipped with mechanical lockouts to prevent access while the heating equipment is energized or the access doors shall be capable of being locked closed and interlocked to prevent the supply circuit from being energized while the door(s) is open. Detachable panels not normally used for access to such parts shall be fastened in a manner that will make them inconvenient to remove.

665-23. Warning Labels or Signs. Warning labels or signs that read "DANGER -- HIGH VOLTAGE -- KEEP OUT" shall be attached to the equipment and shall be plainly visible where persons might come in contact with energized parts, when doors are open or closed, or when panels are removed from compartments containing over 150 volts ac or dc.

665-24. Capacitors. The time and means of discharge shall be in accordance with Section 460-6 for capacitors rated 600 volts nominal and under. The time and means of discharge shall be in accordance with Section 460-28 for capacitors rated over 600 volts nominal. Capacitor internal pressure switches connected to a circuit-interruptor device shall be permitted for capacitor overcurrent protection.

665-25. Dielectric Heating Applicator Shielding. Protective cages or adequate shielding shall be used to guard dielectric heating applicators. Interlock switches shall be used on all hinged access doors, sliding panels or other easy means of access to the applicator. All interlock switches shall be connected in such a manner as to remove all power from the applicator when any one of the access doors or panels is open.

665-26. Grounding and Bonding. Grounding or inter-unit bonding, or both, shall be used wherever required for circuit operation, for limiting to a safe value radio frequency potentials between all exposed noncurrent-carrying parts of the equipment and earth ground, between all equipment parts and surrounding objects, and between such objects and earth ground. Such grounding and bonding shall be installed in accordance with Article 250 Parts B and E.

FPN: Under certain conditions contact between the object being heated and the applicator will result in an unsafe condition, such as eruption of heated materials. This unsafe condition may be prevented by grounding of the object being heated and ground detection.

665-27. Marking. Each heating equipment shall be provided with a nameplate giving the manufacturer's name and model identification and the following input data: line volts, frequency, number of phases, maximum current, full-load kilovolt-amperes (kVA), and full-load power factor. Additional data shall be permitted.

SUBSTANTIATION: The present Article 665 is outdated and in many areas obsolete. New technologies have not been addressed. In many instances, present requirements are vague and do not give a clear indication of procedures required for a safe installation.

The article was rewritten to conform to the style manual.

The addition of induction melting and induction welding processes are an important element of this proposal. These processes are widely used in today's technological industrial applications. Definitions have been added to widely enhance the installer's knowledge of induction and dielectric heating equipment. References to other articles in this code have been made more specific to assist users of the code in conforming to the requirements for installation and construction of these types of heating equipment. Motor-Generator converters will continue to be addressed to accommodate the use of older equipment still being used.

National Electric Code Panel 12 Chairman, Charles M. Trout, appointed John H. Mortimer, member of Panel 12, to form a Task Group to re-write and update this standard. The Task Group was widely based and consisted of many experts in their field in the design, manufacture and use of induction and dielectric heating equipment. This Task Group met on three separate occasions for two day meetings over a period of one year, apart from many correspondences and other communications. The members of the Task Group are shown in part 5.

SUMMARY OF SUBSTANTIATION

Article 665 Induction and Dielectric Heating Equipment

Added “Equipment” since this is for the equipment, not the heating process.

665-1. Scope. Added terms “dielectric heating,” “induction melting,” and “induction welding” for word searching.

Reworded for style.

665-2. Definitions. - Amended 3rd definition, added 4th and 5th definitions.

Added Melting and Welding for word searching and clarity.

Added Definition for clarity.

Added Definition for clarity.

665-3. Other Articles- Clarified text.

665-4. Hazardous (Classified) Locations. - Removed “induction and dielectric” because “Heating Equipment” per definition covers all heating equipment using induction or dielectric methods.

665-5. Output Circuit. -New Article. Combines intent of Articles 665-44(a) and 665-64(a) and makes it so testing can be accomplished.

665-7. Remote Control. -New Article - Combines 665-47 and 665-68 and clarified intent.

665-10. Ampacity of Supply Conductors. - New Article. Consolidates 665-41 and 665-61 into one part and clarified intent / removed redundancies.

665-11. Overcurrent Protection .- New Article. Consolidates 665-42 and 665-62 into one article.

665-12. Disconnecting Means. -New Article. Consolidates 665-43 and 665-63 into one article and clarified style.

665-19. Component Interconnection. - Consolidates 665-44(b) and 665-64(b)

665-20. Enclosures. Revised to clarify intent and style and made consistent with article 19. Articles 19 and 20 are all inclusive for all equipment in an installation

665-21. Control Panels. Revised (was “panel controls”) Clarifies intent as panel is dead front.

665-22. Access to Internal Equipment. - Revised wording for style and clarified intent. Change from 500 to 150 volts allows removal of 665-28. Reduces redundancies.

665-23. Warning Labels or Signs. Revised wording for style and clarified intent. Change from 500 to 150 volts allows removal of 665-28. Reduces redundancies.

665-24. Capacitors. Revised wording and added capacitors over 600 volts. This makes discharge conform to section 460 requirements. Pressure switch is new technology which greatly increases the safety of the equipment.

Explanation: A 5000 KVAR capacitor rated at 2500 volts will have a full load current of 2000 amperes. During a resistive failure of 100 ohms, between polarities, the resistive component of the current will be 25 amps. The I^2R losses are 62,500 watts. The total rms current is 2000.16 amps. No fuse or other overcurrent device can protect from case rupture (explosion) and still function at full load current.

665-25. Dielectric Heating Applicator Shielding. Rewritten specifically for dielectric heating. All induction systems are covered by 665-5 requirement of less than 50 volts under all conditions.

665-26. Grounding and Bonding. Added AParts B and E@

Added FPN for informational material.

665-27. Marking. Revised. Allows additional data such as standby currents on the data tag.

665-28. Delete - Covered by Change to 665-22.

665-40. Replaced by 665-2 - Included in definition for converting device.

665-41. Replaced by 665-10.

665-42. Replaced by 665-11.

665-43. Replaced by 665-12.

665-44. Replaced by 665-5 for (a) and 665-19 for (b).

665-47. Replaced by 665-7.

665-60. Replaced by 665-2.

665-61. Replaced by 665-10.

665-62. Replaced by 665-11.

665-63. Replaced by 665-12.

665-64. Replaced by 665-5 for (a) and 665-19 for (b)

665-66. Removed. Obsolete.

665-67. Replaced - Covered by 665-5.

665-68. Replaced by 665-.
Members of the Task Group were as follows:
Andrew Cartal; Raymond L. Cook P.E.,Vice President Engineering, Inductoheat; Daniel K. Green Ph.D., ABB Metallurgy, Inc.; Robert A. Jones *, Independent Electric. Contr.; Louis J. Moliterno, Director Production Engineering, Ajax Magnethermic, Gary Moore, Manager of Engineering, INTAT Precision Inc.; John H. Mortimer P.E.*, Task Group Chairman, Inductotherm; Ronald L. Purvis *, Georgia Power Co.; Rafik Ramjee, Senior Technical Advisor, Pillar Industries; Raymond J. Roberts P.E., Consarc Corporation; Paul F. Scott, Ph.D., V.P. Technology; L. J. Schell, HiTecMetal Group; Ronald Tobar, Sr. Electrical Engineer, Arvin Central Tubing Facility; Charles M. Trout, Chairman *, Code-Making Panel No. 12; Robert C. Turner P.E. **, Inductotherm Corp.; Gregg Warner, Radyne Inc.; Robert A. Watson P.E., ABB Metallurgy, Inc.
* Member Code-Making Panel No. 12
** Alternate Member Code-Making Panel No. 12.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #3279)

12- 115 - (665-23): Reject
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise 665-23 with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
665-23. Warning Labels or Signs. Warning labels or signs ~~that read~~ with the following words or equivalent: "DANGER - HIGH VOLTAGE - KEEP OUT" shall be attached to the equipment and shall be plainly visible where unauthorized persons might come in contact with energized parts, even when doors are open or when panels are removed from compartments containing over 250 volts ac or dc.
SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.
The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.
PANEL ACTION: Reject.
PANEL STATEMENT: See the panel action on Proposal 12-25.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #1104)

12- 116 - (665-28): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 18" to "18 AWG" in two places.
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel action is consistent with the action taken on Proposal 12-20. If the panel action on Proposal 12-114 is accepted, 665-28 will no longer exist.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

(Log #571)

12- 117 - (665-64(b)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Replace "2 ft. (610 mm)" with "600 mm (2 ft.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
NOT RETURNED: 2 Kelly, Laney

ARTICLE 668 — ELECTROLYTIC CELLS

(Log #572)

12- 118 - (668): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In Section 668-10(1), replace "96 in. (2.44 m)" with "2.5 m (96 in.)".
In Section 668-10(2), replace "96 in. (2.44 m)" with "2.5 m (96 in.)".
In Section 668-10(3), replace "42 in. (1.07 m)" with "1.0 m (42 in.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #CP1208)

12- 118a - (668-3(c)): Accept
SUBMITTER: CMP 12
RECOMMENDATION: Add titles as follows:
668-3(c)(1) Conductors.
668-3(c)(2) Overcurrent Protection.
668-3(c)(3) Grounding.
668-3(c)(4) Working Zone.
SUBSTANTIATION: The proposal addresses NEC Style Manual issues.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #982)

12- 119 - (668-21(a)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise second sentence to read as follows:
Power for these circuits shall be supplied through isolating transformers with an ungrounded secondary.
SUBSTANTIATION: This section does not clearly specify the secondary to be ungrounded. The secondary of an isolating transformer can be grounded (as required in Section 250-26). Subsection (c) clearly indicates an isolating transformer with an

ungrounded secondary but doesn't mandate such secondary. The phrase "isolating transformer" is not synonymous with either a grounded or ungrounded secondary. Circuit (conductor) can be ungrounded yet supplied from a grounded system, such as a 2-wire 240-volt circuit from a 120/240 volt grounded system. See Sections 210-10, 215-7.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's concern is clearly addressed by the last sentence of 668-21(a). The submitter has not provided adequate substantiation to document problems with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

ARTICLE 670 — INDUSTRIAL MACHINERY

(Log #559)

11- 105 - (670): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 670-5, replace "21/2 ft. (762 mm)" with "750 mm (2 1/2 ft.)".
2. In Section 670-5 Exception, replace "2 1/2 ft (762 mm)" with "750 mm (2 1/2 ft.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
GARVEY: The conversion was improperly made. Section 670-5 contains requirements that address the depth of the workplace. The section reduces the minimum depth of 3-feet required by Table 110-26(a) under certain conditions. When the conversion was made, the Technical Correlating Committee rounded down. The conversion should be exact. When the issue is safe workplace every millimeter counts.

(Log #3419)

11- 106 - (670-1): Reject
SUBMITTER: Nicholas T. Abbatiello, Spencerport, NY
RECOMMENDATION: Add to scope to include paragraph 670-5, Clearances.
SUBSTANTIATION: Make scope more accurately describe requirements of Article 670, Industrial Machinery.
PANEL ACTION: Reject.
PANEL STATEMENT: It is not necessary to revise the scope of Article 670 to apply 670-5.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3095)

11- 107 - (670-3): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise the text to read as follows:
(a) Permanent Nameplate. A permanent nameplate that lists supply voltage, phase, frequency, full-load current, the maximum ampere rating of the short-circuit and ground-fault protective device, ampere rating of largest motor or load, short-circuit interrupting ~~capacity~~ rating of the machine overcurrent protective device, if furnished, and diagram number shall be attached to the control equipment enclosure or machine where plainly visible after installation.
SUBSTANTIATION: The rating applied to an overcurrent protective device is an interrupting rating, which is defined in the NEC. For correleation, the the definition of "interrupting rating" in Article 100 and Sections 110-9, 240-60(c) and 240-83(c).
PANEL ACTION: Accept.
PANEL STATEMENT: The panel action applies to the first paragraph only.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2843)

11- 108 - (670-3(a)): Accept in Principle
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Revise the second paragraph second sentence by inserting the words: "…or permit under-sizing conductors…" as indicated:
670-3. Machine Nameplate Data.
(a) Permanent Nameplate. A permanent nameplate that lists supply voltage, phase, frequency, full-load current, the maximum ampere rating of the short-circuit and ground-fault protective device, ampere rating of largest motor or load, short-circuit interrupting capacity of the machine overcurrent-protective device, if furnished, and diagram number shall be attached to the control equipment enclosure or machine where plainly visible after installation.
The full-load current shown on the nameplate shall not be less than the sum of the full-load currents required for all motors and other equipment that may be in operation at the same time under normal conditions of use. Where unusual type loads, duty cycles, etc., require oversized conductors or permit under-sizing conductors, the required capacity shall be included in the marked "full-load current." Where more than one incoming supply circuit is to be provided, the nameplate shall state the above information for each circuit.
(b) Overcurrent Protection. Where overcurrent protection is provided in accordance with Section 670-4(b), the machine shall be marked "overcurrent protection provided at machine supply terminals."
SUBSTANTIATION: Not all unusual loads or duty cycles require over-sizing, and this will allow machine application of Sections 310-15(a) and 430-26. For instance, in many instances motors and related equipment selection is based upon torque values to provide break-away capability and then run the remainder of the time barely above no-load current values.
PANEL ACTION: Accept in Principle.
Change recommended wording to "or permit reduced size conductors."
PANEL STATEMENT: In this situation, the conductors would not be undersized. The panel action on Proposal 11-107 changes the first paragraph of 670-3(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3420)

11- 109 - (670-3(a)): Reject
SUBMITTER: Nicholas T. Abbatiello, Spencerport, NY
RECOMMENDATION: The paragraph is long and should be itemized to make more understandable. Additionally, the requirement for heater loads needs to be provided so the ampacity can be calculated based on 125 percent of continuous heater load current.
SUBSTANTIATION: The ampacity of the supply conductors requires the load current of heaters to be known since ampacity is based on 125 percent of that value.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not include any recommended text in accordance with 4-3.3(c) of the NFPA Regulations Governing Committee Projects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #3421)

11- 110 - (670-3(a)): Reject
SUBMITTER: Nicholas T. Abbatiello, Spencerport, NY
RECOMMENDATION: Add Exception to the requiring the ampere rating of the largest motor or load providing that the ampacity value of the supply conductors is provided.
SUBSTANTIATION: The ampacity of the supply conductors requires the load current of heaters to be known since ampacity is based on 125 percent of that value and 125 percent of the largest motor load in addition to all other loads. In many cases, the installers need to do the calculations to determine the value. The exception would eliminate the need for the installer to do if already done by the manufacturer of the industrial machinery. The end result is the same and there is less chance of disagreement with code enforcement personnel, especially if the machinery has to be Listed or Labeled.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel agrees that the end result would (or should) be the same, and notes that application of the Code requires frequent calculations by the installer. The ampacity of the supply conductors is a permitted marking.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2844)

11- 111 - (670-4(a)): Accept
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Revise to add the following words: "…based on their duty cycle…"
(a) Size. The size of the supply conductor shall be such as to have an ampacity not less than 125 percent of the full-load current rating of all resistance heating loads plus 125 percent of the full-load current rating of highest rated motor plus the sum of the full-load current ratings of all other connected motors and apparatus based on their duty cycle that may be in operation at the same time.
FPN: See the 0–2000-volt ampacity tables of Article 310 for ampacity of conductors rated 600 volts and below.
SUBSTANTIATION: A machine operating cycle may involve numerous load-no-load conditions for a given operation. These are determined under engineering supervision and do not vary much over the life of the unit. This will allow machine application of what Sections 310-15(a) and 430-26 presently permit for facilities.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #2845)

11- 112 - (670-4(b)): Reject
SUBMITTER: Melvin K. Sanders, Ankeny, IA
RECOMMENDATION: Revise the second and third sentence of Section 6670-4(b):
(b) Overcurrent Protection. A machine shall be considered as an individual unit and therefore shall be` provided with a disconnecting means. ~~The~~ This disconnecting means shall be permitted to be supplied by branch circuits protected by either fuses or circuit breakers. The disconnecting means shall not be required to incorporate overcurrent protection. Where furnished as part of the machine, overcurrent protection shall consist of a single circuit breaker or set of fuses~~,~~ and the machine shall bear the marking required in Section 670-3~~, and the supply conductors shall be considered either as feeders or taps as covered by Section 240-21~~.
SUBSTANTIATION: "The" changed to "This" in the second sentence to clarify this applies to the machine disconnecting means being supplied by a branch circuit. Supply conductors to machines meet the definition of branch-circuits in Article 100, as supplying power to an outlet as it is defined in Article 100. These loads may be further sub-divided within or on the machine and at that point provided with additional overcurrent protection as provided for in Section 240-10 that is unique for proper machine operation.
PANEL ACTION: Reject.
PANEL STATEMENT: The supply conductors to industrial machinery are permitted to be feeders or feeder taps. The proposed change would allow the use of supplementary overcurrent devices where branch circuit overcurrent protective devices are required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

(Log #1197)

11- 113 - (670-5, Exception): Reject
SUBMITTER: Collins Jaskowiak, BOC Edwards
RECOMMENDATION: Add note as to minimum door opening, about 45°.
SUBSTANTIATION: Better clarification of exception.
PANEL ACTION: Reject.
PANEL STATEMENT: The exception does not reduce the 90 degree requirement of the basic rule and the submitter has provided no substantiation to reduce this value.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 15
VOTE ON PANEL ACTION:
AFFIRMATIVE: 15

ARTICLE 675 — ELECTRICALLY DRIVEN OR CONTROLLED IRRIGATION MACHINES

(Log #525)

19- 154 - (675): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Section 675-4(a), replace "30 mils (762 µm)" with "0.76 mm (30 mils)"; "8 mils (203 µm)" with "0.20 mm (8 mils)"; and "50 mils (1.27 mm)" with "1.27 mm (50 mils)".
2. In Section 675-4(c), replace "4 ft (1.22 m)" with "1.2 m (4 ft)".
3. In Section 675-8(b), replace "50 ft (15.2 m)" with "15 m (50 ft)".
4. In Section 675-10(a)(3), replace "25 ft (7.62 m)" with "7.5 m (25 ft.)".
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
In Item 1, the SI units are not rounded since the values are product-related and specify a minimum safety level.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #4404)

19- 155 - (675): Reject
Note: The Technical Correlating Committee advises that the deletion of an Article is the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.
SUBMITTER: Richard W. Becker, Engineered Electrical Systems, Inc.
RECOMMENDATION: Delete this article in its entirety.
SUBSTANTIATION: This article is very specific and is basically a "design manual" contrary to Article 90(c). The NEC adequately covers wet locations, wiring methods, and grounding. It is troublesome that electrical industry personnel carry this information with them in the NEC when very few in the industry would have any involvement in this equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The inclusion or exclusion of articles in the Code is outside of the Panel scope.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #2236)

19- 156 - (675-4(a)): Reject
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Revise to read:
The cable used to interconnect enclosures on the structure of an irrigation machine shall be ~~an~~ a flame tested assembly of stranded, insulated conductors with nonhygroscopic and nonwicking filler in a core of ~~moisture- and flame-resistant~~ moisture-resistant nonmetallic material overlaid with a metallic covering and jacketed with a moisture-, corrosion-, and sunlight-resistant nonmetallic material.
The conductor insulation shall be of a type listed in Table 310-13 for an operating temperature of 75°C (167°F) and for use in wet locations. The ~~core insulating material thickness shall not be less than 30 mils (762 µm), and the~~ metallic overlay thickness shall not be less than 8 mils (203 µm). The jacketing material thickness shall not be less than 50 mils (1.27 mm).
A composite of power, control, and grounding conductors in the cable shall be permitted.
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
Construction requirements for conductors listed in Table 310-13 are addressed in Table 310-13. No need to repeat those here.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing Code language is adequate. The TCC may want to review this issue on a Code wide basis. A specific flame test was not indicated in the recommendation. Additionally, criteria were not given on what would be done with the results of the flame test.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #1105)

19- 157 - (675-10(a)(3)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 14" to "14 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: The NEC Style of Manual does not specify the language used one way or another. The NFPA Stle of Manual,1M seems to prefer 10AWG. Product standards use 10 AWG or 10 AWG 110-6 says that the conductor sizes are expressed in AWG or in circular mils so the AWG is implied The Panel recognizes that the TCC may desire to take a different action to be consistent with the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

(Log #983)

19- 158 - (675-15, Exception (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception: Compliance with resistance requirements of Section 250-56 shall not be required.
SUBSTANTIATION: Resistance requirements for this application of a grounding electrode, usually a rod or pipe, do not appear warranted.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation for the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 8
VOTE ON PANEL ACTION:
AFFIRMATIVE: 8

ARTICLE 680 — SWIMMING POOLS, FOUNDAINTS, AND SIMILAR INSTALLATIONS

(Log #528)

20- 29 - (680): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 1. In Section 680-4. Definitions. Permanently Installed Swimming, Wading, and Therapeutic Pools., replace "42 in. (1.07 m)" with "1.0 m (42 in.)".

2. In Section 680-4. Definitions. Storable Swimming or Wading Pool., replace "42 in. (1.07 m)" with "1.0 m (42 in.)".

3. In Section 680-6(a)(1), replace "5 and 10 ft (1.52 m and 3.05 m)" with "1.5 and 3.0 m (5 and 10 ft)" and replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

4. In Section 680-6(a)(2), replace "10 ft (3.05 m)" with "3.0 m (10 ft)"; "20 ft (6.08 m)" with "6.0 m (20 ft)"; and "6 ft 6 in. (1.98 m)" with "2.0 m (6 ft 6 in.)".

5. In Section 680-6(a)(3), replace "20 ft (6.08 m)" with "6.0 m (20 ft)".

6. In Section 680-6(b)(1), replace "5 ft (1.52 m)" with "1.5 m (5 ft)" and replace "12 ft (3.66 m)" with "3.7 m (12 ft)".

7. In Section 680-6(b)(2), replace "5 ft (1.52 m)" with "1.5 m (5 ft)" throughout.

8. In Section 680-6(b)(3)(c), replace "7 ft 6 in. (2.29 m)" with "2.3 m (7 ft 6 in.)".

9. In Section 680-6(b)(4), replace "5 ft (1.52 m)" with "1.5 m (5 ft)" throughout and replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

10. In Section 680-6(b)(4), replace "16 ft (4.88 m)" with "4.9 m (16 ft)".

11. In Section 680-6(c), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

12. In Section 680-7, replace "3 ft (914 mm)" with "900 mm (3 ft)".

13. In Section 680-8(1), replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

14. In Section 680-8 second paragraph, replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

15. In Section 424-35, replace "3 in. (76 mm)" with "75 mm (3 in.)".

16. In Section 424-36, replace "2 in. (50.8 mm)" with "50 mm (2 in.)" throughout.

17. In Section 680-12, replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

18. In Section 680-20(a)(3), replace "18 in. (457 mm)" with "450 mm (18 in.)" and replace "4 in. (102 mm)" with "100 mm (4 in.)".

19. In Section 680-21(a)(5), replace "4 in. (102 mm)" with "100 mm (4 in.)"; "8 in. (203 mm)" with "200 mm (8 in.)"; and "4 ft (1.22 m)" with "1.2 m (4 ft)".

20. In Section 680-21(a)(5)(b), replace "4 ft (1.22 m)" with "1.2 m (4 ft)".

21. In Section 680-21(b)(5), replace "4 in. (102 mm)" with "100 mm (4 in.)"; "8 in. (203 mm)" with "200 mm (8 in.)"; and "4 ft (1.22 m)" with "1.2 m (4 ft)".

22. In Section 680-22(a)(3), replace "4 in. (102 mm)" with "100 mm (4 in.)" and replace "1 in. (25.4 mm)" with "25 mm (1 in.)".

23. In Section 680-22(a)(5), replace "5 ft (1.52 m)" with "1.5 m (5 ft)" and replace "12 ft (3.66 m)" with "3.7 m (12 ft)".

24. In Section 680-24(3), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

25. In Section 680-25(b)(3) Exception, replace "6 ft (1.83 m)" with "1.8 m (6 ft)" and replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

26. In Section 680-26(a), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

27. In Section 680-27, replace "20 ft (6.1 m)" with "6.0 m (20 ft)".

28. In Section 680-27(a), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

29. In Section 680-27(b), replace "5 ft (1.52 m)" with "1.5 m (5 ft)" and replace "12 ft (3.66 m)" with "3.7 m (12 ft)".

30. In Section 680-38, replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

31. In Section 680-40(a), replace "6 ft (1.83 m)" with "1.8 m (6 ft)" and replace "15 ft (4.57 m)" with "4.5 m (15 ft)".

32. In Section 680-41(a), replace "5 ft (1.52 m)" with "1.5 m (5 ft)" and replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

33. In Section 680-41(a)(1), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

34. In Section 680-41(a)(2), replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

35. In Section 680-41(b)(1), replace "5 ft (1.52 m)" with "1.5 m (5 ft)"; "7 ft 6 in. (2.29 m)" with "2.3 m (7 ft 6 in.)"; and "12 ft (3.66 m)" with "3.7 m (12 ft)".

36. In Section 680-41(b)(2), replace "7 ft 6 in. (2.29 m)" with "2.3 m (7 ft 6 in.)".

37. In Section 680-41(c), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

38. In Sections 680-41(d)(3), (4) and (5), replace "5 ft (1.52 m)" with "1.5 m (5 ft)" throughout.

39. In Section 680-41(f)(1), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

40. In Section 680-50, replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

41. In Section 680-51(e), replace "10 ft (3.05 m)" with "3.0 m (10 ft)".

42. In Section 680-54(1), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

43. In Section 680-57(c), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

44. In Sections 680-62(c)(3), (4) and (5), replace "5 ft (1.52 m)" with "1.5 m (5 ft)" throughout.

45. In Section 680-62(e)(1), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

46. In Section 680-62(g), replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

47. In Section 680-70, replace "5 ft (1.52 m)" with "1.5 m (5 ft)".

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #1106)

20- 30 - (680):

Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Accept" to correlate with the action on Proposal 1-222. This action will be considered by the Panel as a Public Comment.

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise Article 680 as follows:

680-7 - change "No. 12" to "12 AWG"

680-20(b)(1) - change "a No. 8" to "an 8 AWG" and "the No. 8" to "the 8 AWG"

680-22 - change "No. 8" to "8 AWG"

680-22(b) - change "No. 8" to "8 AWG"

680-22(b)(3) - change "No. 8" to "8 AWG"

680-23(b) - change "a No. 8" to "an 8 AWG" and "the No. 8" to "the 8 AWG"

680-25(b)(1) - change "No. 12" to "12 AWG"

680-25(b)(5) - change "No. 16" to "16 AWG"

680-25(c) - change "No. 12" to "12 AWG" in the 1st and 3rd paragraphs

680-25(d) - change "No. 12" to "12 AWG" and "No. 8" to "8 AWG"

680-41(e)(3) - change "No. 8" to "8 AWG"

680-62(d)(4) - change "No. 8" to "8 AWG"

680-73 - change "No. 8" to "8 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel believes that, with reference to Section 110-6, it is understood that conductor sizes are specified in AWG. To repeat "AWG" would be redundant.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 1

NOT RETURNED: 1 Ryan

EXPLANATION OF NEGATIVE:

EGAN: Even though AWG references are inherent throughout the code, specific reference to AWG is useful in field code application.

(Log #CP2001)

20- 30a - (680): Accept

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: CMP 20

RECOMMENDATION: ARTICLE 680—Swimming Pools, Fountains, and Similar Installations

I General

680.1 Scope

The provisions of this article apply to the construction and installation of electrical wiring for and equipment in or adjacent to all swimming, wading, therapeutic, and decorative pools, fountains, hot tubs, spas, and hydromassage bathtubs, whether permanently installed or storable, and to metallic auxiliary equipment, such as pumps, filters, and similar equipment.

680.2 Definitions.

Cord- and Plug-Connected Lighting Assembly. A lighting assembly consisting of a lighting fixture intended for installation in the wall of a spa, hot tub, or storable pool, and a cord- and plug-connected transformer.

Dry-Niche Lighting Fixture. A lighting fixture intended for installation in the wall of a pool or fountain in a niche that is sealed against the entry of pool water.

Equipment—Fixed. Equipment that is fastened or otherwise secured at a specific location.

Equipment—Portable. Equipment that is actually moved or can easily be moved from one place to another in normal use.

Equipment—Stationary. Equipment that is not easily moved from one place to another in normal use.

Forming Shell. A structure designed to support a wet-niche lighting fixture assembly and intended for mounting in a pool or fountain structure.

Fountain. Fountains, ornamental pools, display pools, and reflection pools. The definition does not include drinking fountains.

Hydromassage Bathtub. A permanently installed bathtub equipped with a recirculating piping system, pump, and associated equipment. It is designed so it can accept, circulate, and discharge water upon each use.

Maximum Water Level. The highest level that water can reach before it spills out.

No-Niche Lighting Fixture. A lighting fixture intended for installation above or below the water without a niche.

Packaged Spa or Hot Tub Equipment Assembly. A factory-fabricated unit consisting of water-circulating, heating, and control equipment mounted on a common base, intended to operate a spa or hot tub. Equipment can include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Packaged Therapeutic Tub or Hydrotherapeutic Tank Equipment Assembly. A factory-fabricated unit consisting of water-circulating, heating, and control equipment mounted on a common base, intended to operate a therapeutic tub or hydrotherapeutic tank. Equipment can include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Permanently Installed Decorative Fountains and Reflection Pools. Those that are constructed in the ground, on the ground, or in a building in such a manner that the fountain cannot be readily disassembled for storage, whether or not served by electrical circuits of any nature. These units are primarily constructed for their aesthetic value and are not intended for swimming or wading.

Permanently Installed Swimming, Wading, and Therapeutic Pools. Those that are constructed in the ground or partially in the ground, and all others capable of holding water in a depth greater than 1.1 m (42 in.), and all pools installed inside of a building, regardless of water depth, whether or not served by electrical circuits of any nature.

Pool. Manufactured or field-constructed equipment designed to contain water on a permanent or semi-permanent basis and used for swimming, wading, or purposes.

Pool Cover, Electrically Operated. Motor-driven equipment designed to cover and uncover the water surface of a pool by means of a flexible sheet or rigid frame.

Self-Contained Spa or Hot Tub. Factory-fabricated unit consisting of a spa or hot tub vessel with all water-circulating, heating, and control equipment integral to the unit. Equipment can include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Self-Contained Therapeutic Tubs or Hydrotherapeutic Tanks. A factory-fabricated unit consisting of a therapeutic tub or hydrotherapeutic tank with all water-circulating, heating, and control equipment integral to the unit. Equipment may include pumps, air blowers, heaters, light controls, sanitizer generators, etc.

Spa or Hot Tub. A hydromassage pool, or tub for recreational or therapeutic use, not located in health care facilities, designed for immersion of users, and usually having a filter, heater, and motor-driven blower. It may be installed indoors or outdoors, on the ground or supporting structure, or in the ground or supporting structure. Generally, a spa or hot tub is not designed or intended to have its contents drained or discharged after each use.

Storable Swimming or Wading Pool. Those that are constructed on or above the ground and are capable of holding water to a maximum depth of 1.0 m (42 in.), or a pool with nonmetallic, molded polymeric walls or inflatable fabric walls regardless of dimension.

Through-Wall Lighting Assembly. A lighting assembly intended for installation above grade, on or through the wall of a pool, consisting of two interconnected groups of components separated by the pool wall.

Wet-Niche Lighting Fixture. A lighting fixture intended for installation in a forming shell mounted in a pool or fountain structure where the fixture will be completely surrounded by water.

680.3 Other Articles

Except as modified by this article, wiring and equipment in or adjacent to pools and fountains shall comply with other applicable provisions of this Code, including those provisions identified in Table 680.3.

Table 680.3 Other Articles

Topic	Section or Article
Wiring	Chapters 1 - 4
Junction box support	370.23
Rigid nonmetallic conduit	347.3
Audio Equipment	Article 640, Parts I and II
Adjacent to pools and fountains	640.10
Underwater speakers*	

*Note: Underwater loudspeakers shall be installed in accordance with 680.27(A).

680.4 Approval of Equipment

All electrical equipment installed in the water, walls, or decks of pools, fountains, and similar installations shall comply with the provisions of this article.

680.5 Ground-Fault Circuit Interrupters.

Ground-fault circuit interrupters (GFCI) shall be self-contained units, circuit-breaker or receptacle types, or other listed types.

680.6 Grounding.

Electrical equipment shall be grounded in accordance with Parts V, VI, and VII of Article 250 and connected by wiring methods of Chapter 3, except as modified by this article. The following equipment shall be grounded:

(1) Through-wall lighting assemblies and underwater lighting fixtures, other than those low-voltage systems listed for the application without a grounding conductor

(2) All electrical equipment located within 1.5 m (5 ft) of the inside wall of the pool or fountain

(3) All electrical equipment associated with the recirculating system of the pool or fountain

(4) Junction boxes

(5) Transformer enclosures

(6) Ground-fault circuit interrupters

(7) Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the pool or fountain

680.7 Cord- and Plug-Connected Equipment.

Fixed or stationary equipment ~~rated 20 amperes or less~~, other than an underwater lighting fixture for a permanently installed pool, shall be permitted to be connected with a flexible cord to facilitate the removal or disconnection for maintenance or repair.

(A) Length. For other than storable pools, the flexible cord shall not exceed 900 mm (3 ft) in length.

(B) Equipment Grounding. The flexible cord shall have a copper equipment grounding conductor sized in accordance with 250.122 but not smaller than No. 12. The cord shall terminate in a grounding-type attachment plug.

(C) Construction. The equipment grounding conductors shall be connected to a fixed metal part of the assembly. The removable part shall be mounted on or bonded to the fixed metal part.

680.8 Overhead Conductor Clearances.

(A) Power. With respect to service drop conductors and open overhead wiring, swimming pool and similar installations shall comply with the minimum clearances given in Table 680.8 and illustrated in Figure 680.8.

Table 680.8 Overhead Conductor Clearances

	Insulated Supply or Service Drop Cables, 0–750 Volts to Ground, Supported on and Cabled Together with an Effectively Grounded Bare Messenger or Effectively Grounded Neutral Conductor		All Other Supply or Service-Drop Conductors Voltage to Ground			
			0 through 15 kV		Over 15 through 50 kV	
	m	ft	m	ft	m	ft
A Clearance in any direction to the water level, edge of water surface, base of diving platform, or permanently anchored raft	6.7	22	7.5	25	8.0	27
B Clearance in any direction to the observation stand, tower, or diving platform ~~or tower~~.	4.3	14	5.2	17	5.5	18
C Horizontal limit of clearance measured from inside wall of the pool	This limit shall extend to the outer edge of the structures listed in A and B of this table but not less than 3 m (10 ft).					

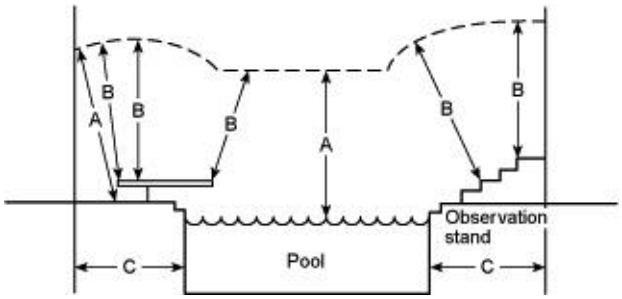


Figure 680.8 Clearances from Pool Structures

(B) Communications Systems. Communication, radio, and television coaxial cables covered by Articles 800 through 820 shall be permitted at a height of not less than 3.0 m (10 ft) above swimming and wading pools, diving structures, and observation stands, towers, or platforms.

(C) Network-Powered Broadband Communications Systems. The minimum clearances for overhead network-powered broadband communications systems conductors from pools or fountains shall comply with the provisions in Table 680.8 for conductors operating at 0 to 750 volts to ground.

Table 680.10 Minimum Burial Depths

Wiring Method	Minimum Burial	
	mm	in.
Rigid metal conduit	150	6
Intermediate metal conduit	150	6
Nonmetallic raceways listed for direct burial without concrete encasement	450	18
Other approved raceways*	450	18

* Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 50 mm (2 in.) thick.

680.9 Electric Pool Water Heaters.

All electric pool water heaters shall have the heating elements subdivided into loads not exceeding 48 amperes and protected at not over 60 amperes. The ampacity of the branch-circuit conductors and the rating or setting of overcurrent protective devices shall not be less than 125 percent of the total nameplate-rated load.

680.10 Underground Wiring Location.

Underground wiring shall not be permitted under the pool or within the area extending 1.5 m (5 ft) horizontally from the inside wall of the pool unless this wiring is necessary to supply pool equipment permitted by this article. Where space limitations prevent wiring from being routed a distance 1.5 m (5 ft) or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be as given in Table 680.10.

680.11 Equipment Rooms and Pits.

Electric equipment shall not be installed in rooms or pits that do not have drainage that adequately prevents water accumulation during normal operation or filter maintenance.

680.12 Maintenance Disconnecting Means.

One or more disconnecting means from all ungrounded conductors shall be provided for all utilization equipment other than lighting. Each means shall be accessible and within sight from its equipment.

II Permanently Installed Pools

680.20 General.

Electrical installations at permanently installed pools shall comply with the provisions of Part I and Part II.

680.21 Motors.

(A) Wiring Methods.

(1) General. The branch circuits for pool-associated motors shall be installed in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or Type MC cable listed for the location. Other wiring methods and materials shall be permitted in specific locations or applications as covered in this section. Any wiring method employed shall contain a copper equipment grounding conductor sized in accordance with 250.122 but not smaller than No. 12.

(2) On or Within Buildings. Where installed on or within buildings, electrical metallic tubing shall be permitted.

(3) Flexible Connections. Where necessary to employ flexible connections at or adjacent to the motor, liquidtight flexible metal or nonmetallic conduit with approved fittings shall be permitted.

(4) One-Family Dwellings. In the interior of one-family dwellings, or in the interior of accessory buildings associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code shall be permitted that comply with the provisions of this paragraph. Where run in a raceway the equipment grounding conductor shall be insulated. Where run in a cable assembly, the equipment grounding conductor shall be permitted to be uninsulated, but it shall be enclosed within the outer sheath of the cable assembly.

(5) Cord- and Plug-Connections. Pool-associated motors shall be permitted to employ cord- and plug-connections. The flexible cord shall not exceed 900 mm (3 ft) in length. The flexible cord shall include an equipment grounding conductor sized in accordance with Section 250.122 and shall terminate in a grounding-type attachment plug.

(B) Double Insulated Pool Pumps. A listed cord- and plug-connected pool pump incorporating an approved system of double insulation that provides a means for grounding only the internal and nonaccessible, noncurrent-carrying metal parts of the pump shall be connected to any wiring method recognized in Chapter 3 that is suitable for the location.

680.22 Area Lighting, Receptacles, and Equipment.

(A) Receptacles.

(1) Circulation and Sanitation System, Location. Receptacles that provide power for water-pump motors or for other loads directly related to the circulation and sanitation system shall be located at least 3.0 m (10 ft) from the inside walls of the pool, or not less than 1.5 m (5 ft) from the inside walls of the pool if they meet all of the following conditions:

(1) Consist of single receptacles
(2) Employ a locking configuration
(3) Are of the grounding type
(4) Have GFCI protection

(2) Other Receptacles, Location. Other receptacles shall be not less than 3.0 m (10 ft) from the inside walls of a pool.

(3) Dwelling Unit(s). If a permanently installed pool is installed at a dwelling unit(s), no fewer than one 125-volt 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located not less than 1.5 m (5 ft) from and not more than 6.0 m (20 ft) from the inside wall of the pool. This receptacle shall be located not more than 2.0 m (6 ft 6 in.) above the floor, platform, or grade level serving the pool.

(4) Restricted Space. Where a pool is within 3.0 m (10 ft) of a dwelling and the dimensions of the lot preclude meeting the required clearances, not more than one receptacle outlet shall be permitted if not less than 1.5 m (5 ft) measured horizontally from the inside wall of the pool.

(5) GFCI Protection. All 125-volt receptacles located within 6.0 m (20 ft) of the inside walls of a pool or fountain shall be protected by a ground-fault circuit interrupter. Receptacles supplying pool pump motors rated 15 or 20 amperes, 120 volt through 240 volt, single phase, shall be provided with GFCI protection.

(6) Measurements. In determining the dimensions in this section addressing receptacle spacings, the distance to be measured shall be the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier.

(B) Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans.

(1) New Outdoor Installation Clearances. In outdoor pool areas, lighting fixtures, lighting outlets, and ceiling-suspended (paddle) fans installed above the pool or the area extending 1.5 m (5 ft) horizontally from the inside walls of the pool shall be installed at a height not less than 3.7 m (12 ft) above the maximum water level of the pool.

(2) Indoor Clearances. For installations in indoor pool areas, the clearances shall be the same as for outdoor areas unless modified as provided in this paragraph. If the branch circuit supplying the equipment is protected by a ground-fault circuit-interrupter, the following equipment shall be permitted at a height not less than 2.3 m (7 ft 6 in). above the maximum pool water level:

(1) Totally enclosed fixtures.
(2) Ceiling-suspended (paddle) fans identified for use beneath ceiling structures such as provided on porches or patios.

(3) Existing Installations. Existing lighting fixtures and lighting outlets located less than 1.5 m (5 ft) measured horizontally from the inside walls of a pool shall be not less than 1.5 m (5 ft) above the surface of the maximum water level, shall be rigidly attached to the existing structure, and shall be protected by a ground-fault circuit interrupter.

(4) GFCI Protection in Adjacent Areas. Lighting fixtures, and lighting outlets, and ceiling-suspended (paddle) fans installed in the area extending between 1.5 m (5 ft) and 3.0 m (10 ft) horizontally from the inside walls of a pool shall be protected by a ground-fault circuit interrupter unless installed not less than 1.5 m (5 ft) above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool.

(5) Cord- and Plug-Connected Lighting Fixtures. Cord- and plug-connected lighting fixtures shall comply with the requirements of Section 680.7 where installed within 4.9 m (16 ft) of any point on the water surface, measured radially.

(C) Switching Devices. Switching devices shall be located at least 1.5 m (5 ft) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall, or other permanent barrier. Alternatively, a switch that is listed as being acceptable for use within 1.5 m (5 ft) shall be permitted.

680.23 Underwater Lighting Fixtures.

This section covers all lighting fixtures installed below the normal water level of the pool.

(A) General.

(1) Fixture Design, Normal Operation. The design of an underwater lighting fixture supplied from a branch circuit either directly or by way of a transformer meeting the requirements of this section shall be such that, where the fixture is properly installed without a ground-fault circuit interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping).

(2) Transformers. Transformers used for the supply of underwater fixtures, together with the transformer enclosure, shall be listed for the purpose. The transformer shall be an isolated winding type with an ungrounded seconary that has a grounded metal barrier between the primary and secondary windings.

(3) GFCI Protection, Relamping. A ground-fault circuit interrupter shall be installed in the branch circuit supplying fixtures operating at more than 15 volts, so that there is no shock hazard during relamping. The installation of the ground-fault circuit interrupter shall be such that there is no shock hazard with any likely fault-condition combination that involves a person in a conductive path from any ungrounded part of the branch circuit or the fixture to ground.

(4) Voltage Limitation. No lighting fixtures shall be installed for operation on supply circuits over 150 volts between conductors.

(5) Location, Wall Mounted Fixtures. Lighting fixtures mounted in walls shall be installed with the top of the fixture lens not less than 450 mm (18 in.) below the normal water level of the pool, unless the lighting fixture is listed and identified for use at lesser depths. No fixture shall be installed less than 100 mm (4 in.) below the normal water level of the pool.

(6) Bottom-Mounted Fixtures. A lighting fixture facing upward shall have the lens adequately guarded to prevent contact by any person.

(7) Dependence on Submersion. Fixtures that depend on submersion for safe operation shall be inherently protected against the hazards of overheating when not submerged.

(8) Compliance. Compliance with these requirements shall be obtained by the use of a listed underwater lighting fixture, and by installation of a listed ground-fault circuit interrupter in the branch circuit or a listed transformer for fixtures operating at not more than 15 volts.

(B) Wet-Niche Fixtures.

(1) Forming Shells. Forming shells shall be installed for the mounting of all wet-niche underwater fixtures and shall be equipped with provisions for conduit entries. Metal parts of the fixture and forming shell in contact with the pool water shall be of brass or other approved corrosion-resistant metal. All forming shells used with nonmetallic conduit systems, other than those that are part of a listed low-voltage lighting system not requiring grounding, shall include provisions for terminating a No. 8 copper conductor.

(2) Wiring Extending Directly to the Forming Shell. Conduit shall be installed from the forming shell to a suitable junction box or other enclosure located as provided in 680.24. Conduit shall be rigid metal, intermediate metal, liquidtight flexible nonmetallic, or rigid nonmetallic.

(a) Metal Conduit. Metal conduit shall be approved, and shall be of brass or other approved corrosion-resistant metal.

(b) Nonmetallic Conduit. Where a nonmetallic conduit is used, a No. 8 insulated solid or stranded copper equipment grounding conductor shall be installed in this conduit unless a listed low-voltage lighting system not requiring grounding is used. The

equipment grounding conductor shall be terminated in the forming shell, junction box or transformer enclosure, or ground-fault circuit-interrupter enclosure The termination of the No. 8 equipment grounding conductor in the forming shell shall be covered with, or encapsulated in, a listed potting compound to protect the connection from the possible deteriorating effect of pool water.

(3) Equipment Grounding Provisions for Cords. Wet-niche lighting fixtures that are supplied by a flexible cord or cable shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of the cord or cable. This grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure. The grounding conductor shall not be smaller than the supply conductors and not smaller than No. 16.

(4) Fixture Grounding Terminations. The end of the flexible-cord jacket and the flexible-cord conductor terminations within a fixture shall be covered with, or encapsulated in, a suitable potting compound to prevent the entry of water into the fixture through the cord or its conductors. In addition, the grounding connection within a fixture shall be similarly treated to protect such connection from the deteriorating effect of pool water in the event of water entry into the fixture.

(5) Fixture Bonding. The fixture shall be bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to remove the fixture from the forming shell. Bonding shall not be required for fixtures that are listed for the application and have no noncurrent-carrying metal parts.

(C) Dry-Niche Fixtures.

(1) Construction. A dry-niche lighting fixture shall be provided with a provision for drainage of water and a means for accommodating one equipment grounding conductor for each conduit entry.

(2) Junction Box. A junction box shall not be required but, if used, shall not be required to be elevated or located as specified in 680.24(A)(2), if the fixture is specifically identified for the purpose.

(D) No-Niche Fixtures. A no-niche fixture shall meet the construction requirements of 680.23(B)(3) and be installed in accordance with the requirements of 680.23(B). Where connection to a forming shell is specified, the connection shall be to the mounting bracket.

(E) Through-Wall Lighting Assembly. A through-wall lighting assembly shall be equipped with a threaded entry or hub, or a nonmetallic hub listed for the purpose, for the purpose of accommodating the termination of the supply conduit. A through-wall lighting assembly shall meet the construction requirements of 680.23(B)(3) and be installed in accordance with the requirements of 680.23. Where connection to a forming shell is specified, the connection shall be to the conduit termination point.

(F) Branch-Circuit Wiring.

(1) Wiring Methods. Branch circuit wiring on the supply side of enclosures and junction boxes connected to conduits run to wet-niche and no-niche fixtures, and the field wiring compartments of dry-niche fixtures, shall be installed using rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Where installed on buildings, electrical metallic tubing shall be permitted, and where installed within buildings, electrical nonmetallic tubing or electrical metallic tubing shall be permitted.

FPN: For requirements of electrical nonmetallic tubing, see Article 331.

Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted to be used when installed in accordance with Article 351. The length shall not exceed 6 ft (1.83 m) for any one length, nor exceed 10 ft (3.05 m) in total length used.

(2) Equipment Grounding. Through-wall lighting assemblies, wet-niche, dry-niche, or no-niche lighting fixtures shall be connected to an insulated copper equipment grounding conductor installed with the circuit conductors. The equipment grounding conductor shall be installed without joint or splice except as permitted in (a) and (b). The equipment grounding conducor shall be sized in accordance with Table 250.122 but shall not be smaller than No. 12.

Exception: An equipment grounding conductor between the wiring chamber of the secondary winding of a transformer and a junction box shall be sized in accordance with the overcurrent device in this circuit.

(a) If more than one underwater lighting fixture is supplied by the same branch circuit, the equipment grounding conductor, installed between the junction boxes, transformer enclosures, or other enclosures in the supply circuit to wet-niche fixtures, or between the field-wiring compartments of dry-niche fixtures, shall be permitted to be terminated on grounding terminals.

(b) If the underwater lighting fixture is supplied from a transformer, ground-fault circuit interrupter, clock-operated switch, or a manual snap switch that is located between the panelboard and a junction box connected to the conduit that extends directly to the underwater lighting fixture, the equipment grounding conductor shall be permitted to terminate on grounding terminals on the transformer, ground-fault circuit interrupter, clock-operated switch enclosure, or an outlet box used to enclose a snap switch.

(3) Conductors. Conductors on the load side of a ground-fault circuit interrupter or of a transformer, used to comply with the provisions of 680.23(A)(8), shall not occupy raceways, boxes, or enclosures containing other conductors unless one of the following conditions applies:

(1) The other conductors are protected by ground-fault circuit interrupters.

(2) The other conductors are grounding conductors.

(3) The other conductors are supply conductors to a feed-through type ground-fault circuit interrupter.

(4) Ground-fault circuit interrupters shall be permitted in a panelboard that contains circuits protected by other than ground-fault circuit interrupters.

680.24 Junction Boxes and Enclosures for Transformers or Ground-Fault Circuit Interrupters.

(A) Junction Boxes. A junction box connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche fixture shall meet the requirements of this section.

(1) Construction. The junction box shall be listed and labeled for the purpose and:

(1) Equipped with threaded entries or hubs or a nonmetallic hub listed for the purpose.

(2) Comprised of copper, brass, suitable plastic, or other approved corrosion-resistant material.

(3) Provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper, brass, or other approved corrosion-resistant metal that is integral with the box.

(2) Installation. Where the fixture operates over 15 volts, the junction box location shall comply with (a) and (b). Where the fixture operates at less than 15 volts, the junction box location shall be permitted to comply with (c).

(a) Vertical Spacing. The junction box shall be located not less than 100 mm (4 in.), measured from the inside of the bottom of the box, above the ground level, or pool deck, or not less than 200 mm (8 in.) above the maximum pool water level, whichever provides the greater elevation.

(b) Horizontal Spacing. The junction box shall be located not less than 1.2 m (4 ft) from the inside wall of the pool, unless separated from the pool by a solid fence, wall, or other permanent barrier.

(c) Flush Deck Box. If used on a lighting system operating at 15 volts or less, a flush deck box shall be permitted if both of the following apply:

(1) An approved potting compound is used to fill the box to prevent the entrance of moisture, and

(2) The flush deck box is located not less than 1.2 m (4 ft) from the inside wall of the pool.

(B) Other Enclosures. An enclosure for a transformer, ground-fault circuit interrupter, or a similar device connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche fixture shall meet the requirements of this section.

(1) Construction. The enclosure shall be listed and labeled for the purpose and meet the following requirements:

(1) Equipped with threaded entries or hubs or a nonmetallic hub listed for the purpose.

(2) Comprised of copper, brass, suitable plastic, or other approved corrosion-resistant material.

(3) Provided with an approved seal, such as duct seal at the conduit connection, that prevents circulation of air between the conduit and the enclosures

(4) Provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper, brass, or other approved corrosion-resistant metal that is integral with the box.

(2) Installation.

(a) Vertical Spacing. The enclosure shall be located not less than 100 mm (4 in.), measured from the inside of the bottom of the box, above the ground level, or pool deck, or not less than 200 mm (8 in.) above the maximum pool water level, whichever provides the greater elevation.

(b) Horizontal Spacing. The enclosure shall be located not less than 1.2 m (4 ft) from the inside wall of the pool, unless separated from the pool by a solid fence, wall, or other permanent barrier.

(C) Protection. Junction boxes and enclosures mounted above the grade of the finished walkway around the pool shall not be located in the walkway unless afforded additional protection, such as by location under diving boards, adjacent to fixed structures, and the like.

(D) Grounding Terminals. Junction boxes, transformer enclosures, and ground-fault circuit-interrupter enclosures connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche fixture shall be provided with a number of grounding terminals that shall be no fewer than one more than the number of conduit entries.

(E) Strain Relief. The termination of a flexible cord of an underwater lighting fixture within a junction box, transformer enclosure, ground-fault circuit interrupter, or other enclosure shall be provided with a strain relief.

(F) Grounding. The junction box, transformer enclosure, or other enclosure in the supply circuit to a wet-niche or no-niche lighting fixture and the field-wiring chamber of a dry-niche lighting fixture shall be grounded to the equipment grounding terminal of the panelboard. This terminal shall be directly connected to the panelboard enclosure.

680.25 Feeders.

These provisions shall apply to any feeder on the supply side of panelboards supplying branch circuits for pool equipment covered in Part II and on the load side of the service equipment or the source of a separately derived system.

(A) Wiring Methods. Feeders shall be installed in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Electrical metallic tubing shall be permitted where installed on or within a building, and electrical nonmetallic tubing shall be permitted where installed within a building.

Exception: An existing feeder between an existing remote panelboard and service equipment shall be permitted to run in flexible metal conduit or an approved cable assembly with an insulated or covered equipment grounding conductor.

(B) Grounding. An insulated equipment grounding conductor shall be installed with the feeder conductors between the grounding terminal of the pool equipment panelboard and the grounding terminal of the applicable service equipment or source of a separately derived system.

(1) Size. This conductor shall be sized in accordance with 250.122 but not smaller than No. 12. On separately derived systems, this conductor shall be sized in accordance with Table 250.66 but not smaller than No. 8.

(2) Separate Buildings. A panelboard at a separate building shall be permitted to supply swimming pool equipment if the feeder meets the requirements for grounding in 250.32. Where installed, a separate equipment grounding conductor shall be an insulated conductor.

680.26 Bonding.

(A) Performance. The bonding required by this section shall be installed to eliminate voltage gradients in the pool area as prescribed.

FPN: This section does not require that the No. 8 or larger solid copper bonding conductor be extended or attached to any remote panelboard, service equipment, or any electrode.

(B) Bonded Parts. The following parts shall be bonded together.

(1) Metallic Structural Components. All metallic parts of the pool structure, including the reinforcing metal of the pool shell, coping stones, and deck, shall be bonded. The usual steel tie wires shall be considered suitable for bonding the reinforcing steel together, and welding or special clamping shall not be required. These tie wires shall be made tight. If reinforcing steel is effectively insulated by an encapsulating nonconductive compound, at the time of manufacture and installation, it shall not be required to be bonded.

(2) Underwater Lighting. All forming shells, and mounting brackets of no-niche fixtures, shall be bonded unless a listed low-voltage lighting system with nonmetallic forming shells is used, not requiring bonding.

(3) Metal Fittings. All metal fittings within or attached to the pool structure shall be bonded. Isolated parts that are not over 100 mm (4 in.) in any dimension and do not penetrate into the pool structure more than 25 mm (1 in.) shall not require bonding.

(4) Electrical Equipment. Metal parts of electrical equipment associated with the pool water circulating system, including pump motors and metal parts of equipment associated with pool covers, including electric motors, shall be bonded. Metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded.

Where a double-insulated water-pump motor is installed under the provisions of this rule, a solid No. 8 copper conductor that is of sufficient length to make a bonding connection to a replacement motor shall be extended from the bonding grid to an accessible point in the motor vicinity. Where there is no connection between the swimming pool bonding grid and the equipment grounding system for the premises, this bonding conductor shall be connected to the equipment grounding conductor of the motor circuit.

(5) Metal Wiring Methods and Equipment. Metal-sheathed cables and raceways, metal piping, and all fixed metal parts except those separated form the pool by a permanent barrier, shall be bonded that are within the following distances of the pool:

(1) Within 1.5 m (5 ft) horizontally of the inside walls of the pool

(2) Within 3.7 m (12 ft) measured vertically above the maximum water level of the pool, or any observation stands, towers, or platforms, or any diving structures.

(C) Common Bonding Grid. The parts specified in 680.26(B) shall be connected to a common bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than No. 8. Connection shall be made by exothermic welding or by pressure connectors or clamps that are labeled as being suitable for the purpose and are of the following material: stainless steel, brass, copper, or copper alloy. The common bonding grid shall be permitted to be any of the following:

(1) The structural reinforcing steel of a concrete pool where the reinforcing rods are bonded together by the usual steel tie wires or the equivalent.

(2) The wall of a bolted or welded metal pool.

(3) A solid copper conductor, insulated, covered, or bare, not smaller than No. 8.

(4) Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal conduit.

(D) Connections. Where structural reinforcing steel or the walls of bolted or welded metal pool structures are used as a common bonding grid for nonelectrical parts, the connections shall be made in accordance with 250.8.

(E) Pool Water Heaters. For pool water heaters rated at more than 50 amperes that have specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded, and only those parts designated to be grounded shall be grounded.

680.27 Specialized Pool Equipment

(A) Underwater Audio Equipment. All underwater audio equipment shall be identified for the purpose.

(1) Speakers. Each speaker shall be mounted in an approved metal forming shell, the front of which is enclosed by a captive metal screen, or equivalent, that is bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to open for installation or servicing of the speaker. The forming shell shall be installed in a recess in the wall or floor of the pool.

(2) Wiring Methods. Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal, liquidtight flexible nonmetallic conduit (LFNC-B) or rigid

nonmetallic conduit shall extend from the forming shell to a suitable junction box or other enclosure as provided in 680.24. Where rigid nonmetallic conduit or liquidtight flexible nonmetallic conduit (LFNC-B) is used, a No. 8 insulated solid or stranded copper equipment grounding conductor shall be installed in this conduit. The equipment grounding conductor shall be terminated in the forming shell and the junction box. The termination of the No. 8 equipment grounding conductor in the forming shell shall be covered with, or encapsulated in, a listed potting compound to protect such connection from the possible deteriorating effect of pool water.

(3) Forming Shell and Metal Screen. The forming shell and metal screen shall be of brass or other approved corrosion-resistant metal. All forming shells shall include provisions for terminating a No. 8 copper conductor.

(B) Electrically Operated Pool Covers.

(1) Motors and Controllers. The electric motors, controllers, and wiring shall be located not less than 1.5 m (5 ft) from the inside wall of the pool unless separated from the pool by a wall, cover, or other permanent barrier. Electric motors installed below grade level shall be of the totally enclosed type.

FPN No. 1: For cabinets installed in damp and wet locations, see 373.2(A).

FPN No. 2: For switches or circuit breakers installed in wet locations, see 380.4

FPN No. 3: For protection against liquids, see 430.11.

(2) Protection. The electric motor and controller shall be connected to a circuit protected by a ground-fault circuit interrupter.

(C) Deck Area Heating. These provisions of this section shall apply to all pool deck areas, including a covered pool, where electrically operated comfort heating units are installed within 6.0 m (20 ft) of the inside wall of the pool.

(1) Unit Heaters. Unit heaters shall be rigidly mounted to the structure and shall be of the totally enclosed or guarded types. Unit heaters shall not be mounted over the pool or within the area extending 1.5 m (5 ft) horizontally from the inside walls of a pool.

(2) Permanently Wired Radiant Heaters. Radiant electric heaters shall be suitably guarded and securely fastened to their mounting device(s). Heaters shall not be installed over a pool or within the area extending 1.5 m (5 ft) horizontally from the inside walls of the pool and shall be mounted at least 3.7 m (12 ft) vertically above the pool deck unless otherwise approved.

(3) Radiant Heating Cables Not Permitted. Radiant heating cables embedded in or below the deck shall not be permitted.

III Storable Pools

680.30 General. Electrical installations at storable pools shall comply with the provisions of Part I and Part III.

680.31 Pumps.

A cord-connected pool filter pump shall incorporate an approved system of double insulation or its equivalent and shall be provided with means for grounding only the internal and nonaccessible noncurrent-carrying metal parts of the appliance.

The means for grounding shall be an equipment grounding conductor run with the power-supply conductors in the flexible cord that is properly terminated in a grounding-type attachment plug having a fixed grounding contact member.

680.32 Ground-Fault Circuit Interrupters Required.

All electrical equipment, including power-supply cords, used with storable pools shall be protected by ground-fault circuit interrupters.

FPN: For flexible cord usage, see Section 400.4.

680.33 Lighting Fixtures.

An underwater lighting fixture, if installed, shall be installed in or on the wall of the storable pool. It shall comply with one of the following two provisions:

(A) 15 Volts or Less. A lighting fixture shall be part of a cord- and plug-connected lighting assembly. This assembly shall be listed as an assembly for the purpose and have the following construction features:

(1) No exposed metal parts

(2) A fixture lamp that operates at 15 volts or less

(3) An impact-resistant polymeric lens, fixture body, and transformer enclosure

(4) A transformer meeting the requirements of 680.23(A)(2) with a primary rating not over 150 volts

(B) Over 15 Volts But Not Over 150 Volts. A lighting assembly without a transformer and with the fixture lamp(s) operating at not over 150 volts shall be permitted to be cord- and plug-connected where the assembly is listed as an assembly for the purpose. The installation shall comply with 680.23(A)(5) and the assembly shall have the following construction features:

(1) No exposed metal parts.

(2) An impact-resistant polymeric lens and fixture body.

(3) A ground-fault circuit interrupter with open neutral protection ~~is provided~~ as an integral part of the assembly.

(4) The fixture lamp is permanently connected to the ground-fault circuit interrupter with open-neutral protection.

(5) Compliance with the requirements of 680.23(A).

IV Spas and Hot Tubs

680.40 General. Electrical installations at spas and hot tubs shall comply with the provisions of Part I and Part IV.

680.41 Emergency Switch for Spas and Hot Tubs.

A clearly labeled emergency shutoff or control switch for the purpose of stopping the motor(s) that provide power to the recirculation system and jet system shall be installed at a point readily accessible to the users and not less than 1.5 m (5 ft) away, adjacent to, and within sight of the spa or hot tub. This requirement shall not apply to single-family dwellings.

680.42 Outdoor Installations.

A spa or hot tub installed outdoors shall comply with the provisions of Parts I and II of this article, except as permitted in (A) and (B), that would otherwise apply to pools installed outdoors.

(A) Flexible Connections. Listed packaged spa or hot tub equipment assemblies or self-contained spas or hot tubs utilizing a factory-installed or assembled control panel or panelboard shall be permitted to use flexible connections as covered in (1) and (2):

(1) Flexible Conduit. Liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted in lengths of not more than 1.8 m (6 ft).

(2) Cord- and Plug-Connections. Cord and plug connections with a cord not longer than 4.6 m (15 ft) shall be permitted where protected by a ground-fault circuit interrupter.

(B) Bonding. Bonding by metal-to-metal mounting on a common frame or base shall be permitted. The metal bands or hoops used to secure wooden staves shall not be required to be bonded as required in 680.26.

(C) Interior Wiring to Outdoor Installations. In the interior of a one-family dwelling or in the interior of another building or structure associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code that contain a copper equipment grounding conductor that is insulated or enclosed within the outer sheath of the wiring method and not smaller than No. 12 shall be permitted to be used for the connection to a self-contained spa or hot tub, or a packaged spa or hot tub equipment assembly.

680.43 Indoor Installations

A spa or hot tub installed indoors shall comply with the provisions of Parts I and II except as modified by this section, and shall be connected by the wiring methods of Chapter 3.

Exception: Listed spa and hot tub packaged units rated 20 amperes or less shall be permitted to be cord and plug connected to facilitate the removal or disconnection of the unit for maintenance and repair.

(A) Receptacles. At least one 125-volt, 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located not less than of 1.5 m (5 ft) from and not exceeding 3.0 m (10 ft) from the inside wall of the spa or hot tub.

(1) Location. Receptacles shall be located at least 1.5 m (5 ft) measured horizontally from the inside walls of the spa or hot tub.

(2) Protection, General. Receptacles rated 125 volts and 30 amperes or less located within 3.0 m (10 ft) of the inside walls of a spa or hot tub shall be protected by a ground-fault circuit interrupter.

(3) Protection, Spa or Hot Tub Supply Receptacle. Receptacles that provide power for a spa or hot tub shall be ground-fault circuit-interrupter protected.

(4) Measurements. In determining the dimensions in this section addressing receptacle spacings, the distance to be measured shall be the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier.

(B) Installation of Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans.

(1) Elevation. Lighting fixtures except as covered in Section 680.43(B)(2), lighting outlets, and ceiling-suspended (paddle) fans

located over the spa or hot tub or within 1.5 m (5 ft) from the inside walls of the spa or hot tub shall comply with the following clearances above the maximum water level.

(a) Without GFCI. Where no GFCI protection is provided, the mounting height shall be not less than 3.7 m (12 ft).

(b) With GFCI. Where GFCI protection is provided, the mounting height shall be permitted to be not less than 2.3 m (7 ft 6 in.)

(c) Below 2.3 m (7 ft 6 in.). Lighting fixtures meeting the requirements of (1) or (2) and protected by a ground-fault circuit interrupter shall be permitted to be installed less than 2.3 m (7 ft 6 in.) over a spa or hot tub.

(1) Recessed fixtures with a glass or plastic lens, nonmetallic or electrically isolated metal trim, and suitable for use in damp locations.

(2) Surface-mounted fixtures with a glass or plastic globe a nonmetallic body or a metallic body isolated from contact, and suitable for use in damp locations.

(2) Underwater Applications. Underwater lighting fixtures shall comply with the provisions of Section 680.23 or Section 680.33.

(C) Wall Switches. Switches shall be located at least 1.5 m (5 ft), measured horizontally, from the inside walls of the spa or hot tub.

(D) Bonding. The following parts shall be bonded together.

(1) All metal fittings within or attached to the spa or hot tub structure

(2) Metal parts of electrical equipment associated with the spa or hot tub water circulating system, including pump motors

(3) Metal conduit and metal piping that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub by a permanent barrier

(4) All metal surfaces that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub area by a permanent barrier.

Exception: Small conductive surfaces not likely to become energized, such as air and water jets and drain fittings, where not connected to metallic piping, towel bars, mirror frames, and similar nonelectrical equipment, shall not be required to be bonded.

(5) Electrical devices and controls that are not associated with the spas or hot tubs and that are located not less than 1.5 m (5 ft) from such units; otherwise they shall be bonded to the spa or hot tub system.

(E) Methods of Bonding. All metal parts associated with the spa or hot tub shall be bonded by any of the following methods:

(1) The interconnection of threaded metal piping and fittings

(2) Metal-to-metal mounting on a common frame or base

(3) The provisions ~~.~~ of a copper bonding jumper, insulated, covered, or bare, not smaller than No. 8 solid

(F) Grounding. The following equipment shall be grounded:

(1) All electric equipment located within 1.5 m (5 ft) of the inside wall of the spa or hot tub

(2) All electric equipment associated with the circulating system of the spa or hot tub

(G) Underwater Audio Equipment. Underwater audio equipment shall comply with the provisions of Part II of this article.

680.44 Protection.

Except as otherwise provided in this section, the outlet(s) that supplies a self-contained spa or hot tub, a packaged spa or hot tub equipment assembly, or a field-assembled spa or hot tub protected by a ground-fault circuit interrupter.

(A) Listed Units. If so marked, a listed self-contained unit or listed packaged equipment assembly that includes integral ground-fault circuit-interrupter protection for all electrical parts within the unit or assembly (pumps, air blowers, heaters, lights, controls, sanitizer generators, wiring, etc.) shall be permitted without additional GFCI protection.

(B) Subdivided Loads. If the load has been subdivided to comply with 680.9 or for other reasons, and if the unit is not rated 3 phase or over 250 volts, GFCI protection shall be provided for each subdivided portion of the load.

(C) Other Units. A field assembled spa or hot tub rated 3 phase or rated over 250 volts shall not require the supply to be protected by a ground-fault circuit interrupter.

(D) Combination Pool and Spa or Hot Tub. A combination pool/hot tub or spa assembly commonly bonded need not be protected by a ground-fault circuit interrupter.

FPN: See 680.2 for definitions of self-contained spa or hot tub and for packaged spa or hot equipment assembly.

V Fountains

680.50 General.

The provisions of Part I and Part V shall apply to all permanently installed fountains as defined in 680.2. Fountains that have water common to a pool shall additionally comply with the requirements in Part II of this article. Part V does not cover self-contained, portable fountains not larger than 1.5 m (5 ft) in any dimension. Portable fountains shall comply with Parts II and III of Article 422.

680.51 Lighting Fixtures, Submersible Pumps, and Other Submersible Equipment.

(A) Ground-Fault Circuit Interrupter. Fountain equipment, unless listed for operation at 15 volts or less and supplied by a transformer that complies with 680.23(A)(2), shall be protected by a ground-fault circuit interrupter.

(B) Operating Voltage. No lighting fixtures shall be installed for operation on supply circuits over 150 volts between conductors. Submersible pumps and other submersible equipment shall operate at 300 volts or less between conductors.

(C) Lighting Fixture Lenses. Lighting fixtures shall be installed with the top of the fixture lens below the normal water level of the fountain unless listed for above-water locations. A lighting fixture facing upward shall have the lens adequately guarded to prevent contact by any person.

(D) Overheating Protection. Electrical equipment that depends on submersion for safe operation shall be protected against overheating by a low-water cutoff or other approved means when not submerged.

(E) Wiring. Equipment shall be equipped with provisions for threaded conduit entries or be provided with a suitable flexible cord. The maximum length of exposed cord in the fountain shall be limited to 3.0 m (10 ft). Cords extending beyond the fountain perimeter shall be enclosed in approved wiring enclosures. Metal parts of equipment in contact with water shall be of brass or other approved corrosion-resistant metal.

(F) Servicing. All equipment shall be removable from the water for relamping or normal maintenance. Fixtures shall not be permanently imbedded into the fountain structure ~~so~~ such that the water level must be reduced or the fountain drained for relamping, maintenance, or inspection.

(G) Stability. Equipment shall be inherently stable or be securely fastened in place.

680.52 Junction Boxes and Other Enclosures.

(A) General. Junction boxes and other enclosures used for other than underwater installation shall comply with 680.24.

(B) Underwater Junction Boxes and Other Underwater Enclosures. Junction boxes and other underwater enclosures shall meet the requirements of (1) and (2):

(1) Construction.

(a) Underwater enclosures shall be equipped with provisions for threaded conduit entries or compression glands or seals for cord entry.

(b) Underwater enclosures shall be submersible, and made of copper, brass, or other approved corrosion-resistant material.

(2) Installation. Underwater enclosure installations shall comply with (a) and (b).

(a) Underwater enclosures shall be filled with an approved potting compound to prevent the entry of moisture.

(b) Underwater enclosures shall be firmly attached to the supports or directly to the fountain surface and bonded as required. Where the junction box is supported only by the conduit, the conduit shall be of copper, brass, or other approved corrosion-resistant metal. Where the box is fed by nonmetallic conduit, it shall have additional supports and fasteners of copper, brass, or other approved corrosion-resistant material.

FPN: See 370.23 for support of enclosures.

680.53 Bonding.

All metal piping systems associated with the fountain shall be bonded to the equipment grounding conductor of the branch circuit supplying the fountain.

FPN: See 250.122 for sizing of these conductors.

680.54 Grounding.

The following equipment shall be grounded:

(1) All electrical equipment located within the fountain or within 1.5 m (5 ft) of the inside wall of the fountain

(2) All electrical equipment associated with the recirculating system of the fountain

(3) Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the fountain

680.55 Methods of Grounding.

(A) Applied Provisions. The provisions of 680.21(A), 680.23(B)(3), 680.23(F)(1-2), 680.24(F), and 680.25 shall apply.

(B) Supplied by a Flexible Cord. Electrical equipment that is supplied by a flexible cord shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of this cord. The grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure.

680.56 Cord- and Plug-Connected Equipment.

(A) Ground-Fault Circuit Interrupter. All electrical equipment, including power-supply cords, shall be protected by ground-fault circuit interrupters.

(B) Cord Type. Flexible cord immersed in or exposed to water shall be of a type for "extra hard usage" as designated in Table 400.4 and shall be listed and marked for the purpose.

(C) Sealing. The end of the flexible cord jacket and the flexible cord conductor termination within equipment shall be covered with, or encapsulated in, a suitable potting compound to prevent the entry of water into the equipment through the cord or its conductors. In addition, the ground connection within equipment shall be similarly treated to protect such connections from the deteriorating effect of water that may enter into the equipment.

(D) Terminations. Connections with flexible cord shall be permanent, except that grounding-type attachment plugs and receptacles shall be permitted to facilitate removal or disconnection for maintenance, repair, or storage of fixed or stationary equipment not located in any water-containing part of a fountain.

680.57 Signs.

(A) General. This section covers electric signs installed within or adjacent to fountains.

(B) Ground-Fault Circuit-Interrupter Protection for Personnel. All circuits supplying the sign shall have ground-fault circuit-interrupter protection for personnel.

(C) Location.

(1) Fixed or Stationary. A fixed or stationary electric sign installed within a fountain shall be not less than 1.5 m (5 ft) inside the fountain measured from the outside edges of the fountain.

(2) Portable. A portable electric sign shall not be placed within a pool or fountain, or within 1.5 m (5 ft) measured horizontally from the inside walls of the fountain.

(D) Disconnect. A sign shall have a local disconnecting means in accordance with Section 600.6 and Section 680.12.

(E) Bonding and Grounding. A sign shall be grounded and bonded in accordance with Section 600.7.

VI. Pools and Tubs for Therapeutic Use

680.60 General.

The provisions of Part I and Part VI shall apply to pools and tubs for therapeutic use in health care facilities, gymnasiums, athletic training rooms, and similar areas. Portable therapeutic appliances shall comply with Parts II and III of Article 422.

FPN: See 517.2 for definition of health care facilities.

680.61 Permanently Installed Therapeutic Pools.

Therapeutic pools that are constructed in the ground, on the ground, or in a building in such a manner that the pool cannot be readily disassembled shall comply with Parts I and II of this article.

Exception: The limitations of 680.22(A)(1) and (2) shall not apply where all lighting fixtures are of the totally enclosed type.

680.62 Therapeutic Tubs (Hydrotherapeutic Tanks)

Therapeutic tubs, used for the submersion and treatment of patients, that are not easily moved from one place to another in normal use or that are fastened or otherwise secured at a specific location, including associated piping systems, shall conform to this part.

(A) Protection. Except as otherwise provided in this section, the outlet(s) that supplies a self-contained therapeutic tub or hydrotherapeutic tank, a packaged therapeutic tub or hydrotherapeutic tank, or a field-assembled therapeutic tub or hydrotherapeutic tank shall be protected by a ground-fault circuit interrupter.

(1) Listed Units. If so marked, a listed self-contained unit or listed packaged equipment assembly that includes integral ground-fault circuit-interrupter protection for all electrical parts within the unit or assembly (pumps, air blowers, heaters, lights, controls, sanitizer generators, wiring, etc.) shall be permitted without additional GFCI protection.

(2) Subdivided Loads. If the load has been subdivided to comply with 680.9 or for other reasons, and where the unit is not rated 3 phase or over 250 volts, GFCI protection shall be provided for each subdivided portion of the load.

(3) Other Units. A therapeutic tub or hydrotherapeutic tank rated 3 phase or rated over 250 volts shall not require the supply to be protected by a ground-fault circuit interrupter.

(B) Bonding. The following parts shall be bonded together.

(1) All metal fittings within or attached to the tub structure

(2) Metal parts of electrical equipment associated with the tub water circulating system, including pump motors

(3) Metal-sheathed cables and raceways and metal piping that are within 1.5 m (5 ft) of the inside walls of the tub and not separated from the tub by a permanent barrier

(4) All metal surfaces that are within 1.5 m (5 ft) of the inside walls of the tub and not separated from the tub area by a permanent barrier

(5) Electrical devices and controls that are not associated with the therapeutic tubs and that are located a minimum of 1.5 m (5 ft) from such units; otherwise they shall be bonded to the therapeutic tub system.

(C) Methods of Bonding. All metal parts associated with the tub required to be bonded by this section shall be bonded by any of the following methods:

(1) The interconnection of threaded metal piping and fittings

(2) Metal-to-metal mounting on a common frame or base

(3) Connections by suitable metal clamps

(4) By the provisions of a solid copper bonding jumper, insulated, covered, or bare, not smaller than No. 8

(D) Grounding.

(1) Fixed or Stationary Equipment. The following equipment shall be grounded:

(a) Location. All electrical equipment located within 1.5 m (5 ft) of the inside wall of the tub shall be grounded.

(b) Circulation System. All electrical equipment associated with the circulating system of the tub shall be grounded.

(2) Portable Equipment. Portable therapeutic appliances shall meet the grounding requirements in 250.114.

(E) Receptacles. All receptacles within 1.5 m (5 ft) of a therapeutic tub shall be protected by a ground-fault circuit interrupter.

(F) Lighting Fixtures. All lighting fixtures used in therapeutic tub areas shall be of the totally enclosed type.

VII Hydromassage Bathtubs

680.70 General. Hydromassage bathtubs as defined in 680.2 shall comply with Part VII. They shall not be required to comply with other parts of this article.

680.71 Protection.

Hydromassage bathtubs and their associated electrical components shall be protected by a ground-fault circuit interrupter. All 125-volt, single-phase receptacles not exceeding 30 amperes and located within 1.5 m (5 ft) measured horizontally of the inside walls of a hydromassage tub shall be protected by a ground-fault circuit interrupter(s).

680.72 Other Electrical Equipment.

Lighting fixtures, switches, receptacles, and other electrical equipment located in the same room, and not directly associated with a hydromassage bathtub, shall be installed in accordance with the requirements of Chapters 1 through 4 in this Code covering the installation of that equipment in bathrooms.

680.73 Accessibility.

Hydromassage bathtub electrical equipment shall be accessible without damaging the building structure or building finish.

680.74 Bonding.

All metal piping systems, metal parts of electrical equipment, and pump motors associated with the hydromassage tub shall be bonded together using a copper bonding jumper, insulated, covered, or bare, not smaller than No. 8 solid. Metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded.

Tabular cross reference for ROP users showing revised section locations from the 1999 NEC

NEW (AFTER PANEL ACTION)—680-	OLD (1999 NEC)—680-
1	1
2	4
3	3
4	2
5	5(b)
6	24
7(A and B)	7
7(C)	25(e)
8	8
9	9
10	10
11	11
12	12
20 (new)	
21(A)	25(c)
21(B)	28
22(A) ¶(4) new; (5) also has remnants of ¶6(d)	6(a)
22(B)	6(b)
22(C)	6(c)
23	20
23(A)(1)	20(a)(1) 1st ¶
23(A)(2)	5(a)
23(A)(3)	20(a)(1) 2nd ¶
23(A)(4)	20(a)(2)
23(A)(5)	20(a)(3)
23(A)(6)	20(a)(4)
23(A)(7)	20(a)(5)
23(A)(8)	20(a)(1) 3rd ¶
23(B)(1)	20(b)(1) 1st ¶; 20(b)(1) 4th ¶, 1st, 3rd sentences
23(B)(2)	20(b)(1) 2nd ¶
23(B)(2)(a)	20(b)(1) 3rd ¶
23(B)(2)(b)	20(b)(1) 4th ¶, 1st, 2nd sentences
23(B)(3)	25(b)(5)
23(B)(4)	20(b)(2)
23(B)(5)	20(b)(3)
23(C)(1)	20(c) 1st ¶
23(C)(2)	20(c) 2nd ¶, 4th sentence
23(D)	20(d)
23(E) (new)	
23(F)(1)	25(b)(2-3); 20(c) 2nd ¶, 1st, 2nd, 3rd sentences
23(F)(2)	25(b)(1); 25(b)(4), 3rd sentence
23(F)(2) Ex.	25(b)(3) Ex.
23(F)(2)(a)	25(b)(4)(a)
23(F)(2)(b)	25(b)(4)(b)
23(F)(3)	5(c)
24(A-E)	21
24(F)	25(b)(4), 1st, 2nd sentences
25	25(d)
26	22
27(A)	23
27(B)	26
27(C)	27
30 (new)	
31	30
32	31
33	32
40 (new)	
41	38
42	40
43	41
44	42
50	50
51	51
52	52
53	53
54	54
55	55
56	56
57	57
60	60
61	61
62	62
70 (new)	
71	70
72	71
73	72
74	73

SUBSTANTIATION: This editorial rewrite of Article 680 is to comply with the new style and format of the Code. It also meets the intent of Proposal 20-31.

A summary of the changes are shown on the following pages:

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 1

NOT RETURNED: 1 Ryan

EXPLANATION OF NEGATIVE:

TALKA: There is no argument over the long overdue rewrite of Article 680, however the rewrite as presented and accepted by the panel allows significant changes to be made to Article 680 without sufficient technical substantiation. For example:

Section 680-2 Definitions - The definition of fixed, portable and stationary equipment has been added. The definitions are vague and subject to wide interpretation. The definitions also conflict with other definitions on other ANSI standards. Finally, an essentially identical Proposal 20-5, was rejected by the Panel during this cycle. For consistency alone the Panel should also reject these definitions.

Section 680-7 has been revised to eliminate the 20 amperes limitation on cord and plug connected equipment. Besides the fact that it now allows motors and other equipment rated greater than 240 volts, 20 amperes to be connected via cord and plug, it also has an impact on present Section 680-(6)(a)(1). No technical substantiation was provided to justify this loosening of requirements. This is a major change in philosophy that would be substantiated.

Section 680-26(b)(2) has been revised to require the metallic forming shell of a low voltage no niche fixture to be bonded. This is in contradiction with the present requirement of 680-22(a)(2). This requirement presently reads: "All forming shells and mounting brackets of a no-niche fixture unless a listed low-voltage lighting system is used, not requiring bonding." The qualifying factor is the use of a low voltage fixture. The proposal as written increases the qualifying factor to low voltage and nonmetallic. No substantiation was provided to warrant the tightening of the requirement.

Section 680-44 - The first sentence is missing the words "shall be" between the words tub and protected. It should read "Except as otherwise provided in this section, the outlet(s) that supplies a self-contained spa or hot tub, a packaged spa or hot tub equipment or assembly, or a field assembled spa or hot tub shall be protected by a ground-fault circuit interrupter.

COMMENT ON AFFIRMATIVE:

LABRAKE: The Electric Light and Power Group affirms the panel's action on the Article 680 rewrite with the following comments:

Section 680-8(a) proposed in 20-30a would be acceptable according to the panel's action taken on NFPA 70 A98 ROP Proposal 20-103 if the words were changed throughout 680-8 as follows: delete "supply or" and after "service drop", add "feeder or branch circuit or supply lines associated with separately derived systems." The panel should refer to CMP 4's actions taken to distinguish between utility services and customer-installed outside feeders and branch circuits.

Also, the first column of the 0 to 750V-Ground cables' clearances needs to be harmonized with the 1997 NESC values of 6.9 m (22.5 ft) for "A" and 4.4 m (14.5 ft) for "B" in Table 680-8. The description of cables in the first column of Table 680-8 correspond to Rule 230C2 of the 1997 NESC.

Submitter's Proposed Section	1999 NEC Section	Action	Statement
1	1	N/A	Note: Hard metric conversions applied throughout, incorporating Proposal 20-29 objectives.
2	4	AIP	Incorporate Style Manual revisions to "Fountain; change "may" to "can" three places in other definitions.
Equip.-Fixed		Accept	
Equip.-Port.		Accept	
Equip.-Sta.		Accept	
Maximum Water Level	N/A	AIP	Inserts new definition accepted by the action on Proposal 20-3.
Through-Wall Light. Assembly	N/A	AIP	Inserts new definition accepted by the action on Proposal 20-35.
Pool		Accept	
3	3	AIP	Insert other articles table per Style Manual provisions.
4	2		
5	5(b)	AIP	Pluralize the description, per Style Manual.
6	24	AIP	Specify Article 250 locations, per Style Manual
6(1)		AIP	Incorporate through-wall lighting assemblies as covered in the action on Proposal 20-91.
6(2)		AIP	Change to: "pool or fountain" from "contained body of water" to avoid implication that a pond is covered within Article 680. See panel statement on Proposal 20-32.
6(3)		AIP	Change to: "pool or fountain". See §680.6(2)
6(7)		AIP	Change to: "pool or fountain". See §680.6(2)
7		Accept	
7(A and B)	7	Accept	
7(C)	25(e)	Accept	
8(A)	8	AIP	(A) Power. With respect to service drop conductors and open overhead wiring, swimming pool and similar installations shall comply with the minimum clearances given in Table 680.8. This avoids the contained body of water problem; see §680.6(2). It also deletes proposed coverage of a roofed structure because as proposed it could allow drop conductors to pass over the pool , even if below the roof. The table and figure has an expanded title per current Style Manual preferences, and the text of the rule now refers to the figure for the same reason. The table has its internal references corrected, and the words "over" and "through" are used because the current format can be interpreted as meaning greater than the entire 15kV to 50kV range.
8(B)	8	AP	Accept only "(B) Communications Systems." See Panel action and statement on Proposal 20-53 for wording and reasoning. Retain, however the word "covered" instead of "complying with" for the reasons given in the substantiation hereto in Proposal 20-31.
8(C)(new)		Accept	Add: "(C) Network-Powered Broadband Communications Systems. The minimum clearances for overhead network-powered broadband communications systems conductors from pools or fountains shall comply with the provisions in Table 680.8 for conductors operating at 0 to 750 volts to ground." This correlates with a proposal to change §830.10(e), which if approved by CMP 16 will defer to Art. 680.
Table 680.8	Table 680.8	AIP	Insert metric columns per Proposal 20-56; revise wording in Row B per Proposal 20-57.
9	9	AIP/AP	Leave the word "pool" in this section. Change last part to: "…the total nameplate rated load." Change "more than" to "over". The first change avoids the contained body of water problem; see §680-6(2). The second and third changes are editorial.
10	10	AIP	Metrication integrated per Proposal 20-58. Title added to table, with text reference, per Style Manual
11	11	N/A	Editorial change to drainage description.
12	12	AIP	Wording revised to incorporate the action on Proposal 20-62.
20 (new)		Accept	
21(A)	25(c)	Accept	
(1)	25(c)	Accept	
(2)	25(c)	Accept	
(3)	25(c)	Accept	
(4)	25(c)	Accept	

Submitter's Proposed Section	1999 NEC Section	Action	Statement
(5)	25(c)	AIP	Change to: "(5) Cord- and Plug-Connections. Pool-associated motors shall be permitted to employ cord- and plug-connections in accordance with Section 680.7." The other part of the submitter's text needlessly recapitulated §680.7.
21(B)	6(d)	Reject	The panel decided to retain GFCI protection, but only on receptacle outlets. This material is covered in Section 680.22(A)(5).
21(C)	28	Accept	This becomes 21(B).
22(A)(1)	6(a)(1)	Accept	
22(A)(2)	6(a)(1)	AIP	"Not less than" per Style Manual
22(A)(3)	6(a)(2)	AIP	Edits per Style Manual
22(A)(4) (new)		Accept	Add new: "(4) Restricted Space. Where a pool is within 3 m (10 ft) of a dwelling and the dimensions of the lot preclude meeting the required clearances, not more than one receptacle outlet shall be permitted if at least 1.5 m (5 ft) measured horizontally from the inside wall of the pool." Responds to Proposal 20-39. Renumber following sections (4) & (5) to (5) & (6).
22(A)(5)	6(a)(3)	AIP	Remove "…or fountain…" This part of the article doesn't cover fountains.
22(A)(5)	6(d)	AIP	Added sentence from originally proposed §680.21(B), reworded to only apply to receptacle outlets. The panel reconsidered the concept of providing GFCI protection for all small motors and decided that there was insufficient substantiation to keep the rule for hard wired motors. The voltage range reflects Section 220-2 circuit (as opposed to device) voltages, and the panel action on Proposal 20-49.
22(A)(6)	6(a)FPN	AIP	Keep "doorway with hinged or sliding door". The panel believes that potentially requiring GFCI on inside receptacles near a sliding door is excessive. Change "is" to "shall be" because this is now a requirement.
22(B)	6(b)		N/C
(1)	6(b)(1)	AIP	Editorially delete "For new installations" and change heading to "(1) New Outdoor Installation Clearances."
(2)	6(b)(2)	AIP	Change (2) to (3). Existing installations follows requirements for indoor clearances.
(3)	6(b)(3)	AIP	Change (3) to (2). Change "at least" to "not less than" per Style Manual
(4)	6(b)(4)	AIP	Change in heading "Contiguous" to "Adjacent".
(5)	6(b)(5)	AIP	Change 680-20 to 680-7. The change in title and the beginning of the text (adding "and plug-") incorporates the panel action on Proposal 20-43.
22(C)	6(c)	AIP	See Panel action on 20-44, incorporated herein.
23	20	Accept	
23(A)(1)	20(a)(1) 1st ¶	Accept	
23(A)(2)	5(a)	AIP	Add ungrounded secondary per Proposal 20-36.
23(A)(3)	20(a)(1) 2nd ¶	Accept	
23(A)(4)	20(a)(2)	Accept	
23(A)(5)	20(a)(3)	AIP	Change "at least" to "not less than" per Style Manual
23(A)(6)	20(a)(4)	Accept	
23(A)(7)	20(a)(5)	Accept	
23(A)(8)	20(a)(1) 3rd ¶	Accept	
23(B)(1)	20(b)(1) 1st ¶; 20(b)(1) 4th ¶, 1st, 3rd sentences	Accept	
23(B)(2)	20(b)(1) 2nd ¶	Accept	
(a)		Accept	
(b)		AIP	Add "solid or stranded" to incorporate the panel action on Proposal 20-77. Add "equipment grounding" after "insulated copper" in the first sentence, add "equipment" ahead of "grounding conductor" in the second sentence, and add "equipment grounding" after "No. 8" in the third sentence. This uses terms consistently and incorporates the recommendation of Proposal 20-75. The panel notes that on the submitter's relocation chart, Sections 680.23(b)(3)(a-b) should be 680.23(b)(2)(a-b).
23(B)(3)	25(b)(5)	Accept	
23(B)(4)	20(b)(2)	Accept	
23(B)(5)	20(b)(3)	Accept	
23(C)(1)	20(c) 1st ¶	Accept	
23(C)(2)	20(c) 2nd ¶, 4th sentence	Accept	
23(D)	20(d)	AIP	Delete "be" after "A no-niche fixture shall".

Submitter's Proposed Section	1999 NEC Section	Action	Statement
23(E)	N/A	N/A	Results from action on Proposal 20-115, editorially corrected to correlate with related material. Based on the limited information provided, the panel assumes this product is comparable to a wet-niche fixture while operating. The submitter is invited to provide additional information during the comment period.
23(E)(1)	25(b)(2-3); 20(c) 2nd ¶, 1st, 2nd, 3rd sentences	AIP	Renumber as -23(F)(1) per action on 20-115
23(E)(1) Exception	25(b)(3) Exception	AIP	Renumber as -23(F)(1) Exception per action on 20-115
23(E)(2)	25(b)(1); 25(b)(4), 3rd sentence	AIP	Renumber as -23(F)(2) per action on 20-115. Incorporate through-wall lighting assemblies as covered in the panel action on Proposal 20-93.
23(E)(2) Ex.	25(b)(3) Ex.	AIP	Renumber as -23(F)(2) Exception per action on 20-115
23(E)(2)(a)	25(b)(4)(a)	AIP	Renumber as -23(F)(2)(a) per action on 20-115
23(E)(2)(b)	25(b)(4)(b)	AIP	Renumber as -23(F)(2)(b) per action on 20-115
23(E)(3)	5(c)	AIP	Renumber as -23(F)(3) per action on 20-115
24(A-E)	21	AIP	Minor edits for Style Manual
24(F)	25(b)(4), 1st, 2nd sentences	Accept	
25	25(d)	Accept	
25(A)		Accept	
25(A) Exception		Accept	
25(B)		Accept	
(1)		Accept	
(2)		Accept	
26	22		
26(A)		Accept	
26(B)		AIP	Deletion of "listed" in Section 680.22(B)(1) reflects action on Proposal 20-82. In Section 680.22(B)(4), add the second paragraph as accepted in the action on Proposal 20-84. Change (B)(5)(b) strikethrough to underline for "(b) Vertical. Within", corrects a typo in the submittal.
26(C)		Accept	Note that "(C) Common Bonding Grid. …" is a level one subsection to 680.26.
26(D)		Accept	
26(E)	22(c)	Accept	
27(A)	23	AIP	Insert "solid or stranded" to correlate with the panel action on Proposal 20-77 in a directly comparable application. Revise Section 680-27(A)(2) to include LFNC and change "suitable" to "listed" as covered in the action on Proposal 20-89. Add "equipment grounding" after "insulated copper"; add "equipment" prior to "grounding conductor"; add "equipment grounding after "of the No. 8, in 680.27(A)(2). This is for consistent use of terminology. See Panel action on Proposal 20-75.
27(B)	26	Accept	
27(C)	27	Accept	
30 (new)		AIP	Add the heading "General." Sections require titles.
31	30	Accept	
32	31	AIP	Reword the FPN per current style.
33	32	AIP	The Panel notes the last sentence of 680.33(A) to be newly relocated material from 680.32(a)(5). Remove the dash between "shall" and "be". Item (4) shall end with "…150 volts." Delete the comma and the word "and" at the end of item (4). In (B)(4), delete "is", and in (B)(5) change "It complies" to "Compliance" for style considerations on list items.
40 (new)		AIP	Add the heading "General." Sections require titles.
41	38	AIP	Use the phrase "not less than" per current style.
42	40	AIP	(The rewrite proposal already covered the panel action on the first half of Proposal 20-118 and on Proposal 20-119.) The proposed language is further changed by adding Section 680.42(C) as covered in the second half of Proposal 20-118, slightly modified with regard to the equipment grounding conductor to directly correlate with the language in 680.21(A)(4) of the rewrite. The title is more fully descriptive for clarity.
43	41	Accept	The word "Exception:" is new material.
43(A)	41(a)	AIP	Use "not less than", "not exceeding" per current style.

Submitter's Proposed Section	1999 NEC Section	Action	Statement
43(A)(4)	41(a)(2)FPN	AIP	Add after "ceiling,": "doorway with hinged or sliding door, window opening,". This is consistent with Panel action on 680.22(A)(5), which will be 680.22(A)(6). Change "is" to "shall be" for style.
43(B)(1)(a)	41(b)	AIP	Change "where" to "If" because it describes a condition of existence not location.
43(B)(2)	41(b)(2)	AIP	Change format of 680.43(B)(1)(1) and (2) to 680.43(B)(1)(a) and (b). Add titles "Without GFCI" to the first, and "With GFCI" to the second. Make the rules complete sentences: "Where no GFCI protection is provided, the mounting height shall be not less than 3.7 m (12 ft)." and, for the second item "Where GFCI protection is provided, the mounting height shall be permitted to be not less than 2.3 m (7 ft 6 in.)." Change 680.43(B)(2) in the proposal to 680.43(B)(1)(c) and rewrite as follows: "(c) Below 2.3 m (7 ft 6 in.). Lighting fixtures meeting the requirements of (1) or (2) and protected by a GFCI shall be permitted to be installed less than 2.3 m (7 ft 6 in.) over a spa or hot tub. (1) Recessed fixtures with a glass or plastic lens and nonmetallic or electrically isolated metal trim, and suitable for use in damp locations. (2) Surface-mounted fixtures with a glass or plastic globe, a nonmetallic body or a metallic body isolated from contact, and suitable for use in damp locations."
43(B)(3)		Accept	Item (3) in the proposal, covering "Underwater Applications, will now be 680.43(B)(2). This change and the one preceding it are editorial, addressing Style Manual rules about third level entries and list entries.
43(C)	41(c)	AIP	Use "not less than" per current Style Manual
43(D)	41(d)	AIP	Use "that are" consistently to maintain parallel construction on the list; reword (5) for style and proper grammar in a list
Between 43(F) and (G)	41(g) & (h)	Accept	Removed parts (g) and (h) from old 680-41(g) and (h).
43(G)	41(i)	Accept	
44	42	AIP	Change "where" to "if" in (A) and (B) (three places) because it is a condition of existence and not place.
44(A)	42 Exception	Accept	
44(B)		Accept	
44(C)	42	Accept	
44(D)	42	Accept	
44 FPN	42 FPN	AIP	Change reference to Section 680.2.
50	50	AIP	Specify applicable parts of Art. 422 per Style Manual
51	51	AIP	Section 680.51(A) reworded as covered in the panel action on Proposal 20-125. Section 680.51(C) changed from "approved" to "listed" as covered in the action on Proposal 20-126.
52(B)	52	AIP	At end of last sentence, delete the word "following", and remove colon and add "of (1) and (2) at the end." In (1) and (2), leave only the title, and restate the numbered paragraphs as rules instead of a list format, at the suggestion of the staff editor. This structure better complies with the Style Manual.
55(A)	55	AIP	Change to: "(A) Applied Provisions. The provisions of ~~680-25~~ 680-21(A), 680-23(B)(3), 680-23(E)(1-2), 680-24(F), and 680-25 shall apply." Editorial change to reduce the verbage.
56(B)	56(b)	AIP	Reworded to incorporate the panel action on the Panel proposal associated with Proposal 20-129.
57	57	AIP	Reworded to incorporate the concept of the panel action on Proposal 20-130. This wording supersedes the action on that proposal.
60	60	AIP	Reference to Article 517 changed from 3 to 2 to reflect likely reorganization of that article relative to mandatory Style Manual rule about definition locations. Statement made a fine print note because it is merely explanatory in nature. Applicable parts of Art. 422 specified per Style Manual requirements.
62(A)	62	Accept	
62(A)(1)		Accept	
62(A)(2)		Accept	
62(A)(3)		Accept	
62(B)(5)	62(c)(5)	AIP	Revised to better accommodate the status as a list item.
62(C) – (F)		AIP	Change items (d) to (C), (e) to (D), (g) to (E), and (h) to (F). Corrects numbering error in the submittal.
62(C)	62(d)	AIP	Reworded to incorporate the panel action on Proposal 20-132
70 (new)		Accept	
71	70	Accept	
72	71	Accept	
	72 (deleted)	Reject	Make as Section 680.73. The panel is concerned as to how accessible and well understood the rules are in Section 110-26 regarding access.
73	73	AIP	Change to Section 680.74.

(Log #4256)

20- 31 - (680): Accept in Principle in Part

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise Article 680 as follows:

ARTICLE 680—Swimming Pools, Fountains, and Similar Installations

I. General

680-1. Scope. The provisions of this article apply to the construction and installation of electrical wiring for and equipment in or adjacent to all swimming, wading, therapeutic, and decorative pools, fountains, hot tubs, spas, and hydromassage bathtubs, whether permanently installed or storable, and to metallic auxiliary equipment, such as pumps, filters, and similar equipment.

680-2. Definitions

Cord- and Plug-Connected Lighting Assembly. A lighting assembly consisting of a lighting fixture intended for installation in the wall of a spa, hot tub, or storable pool, and a cord- and plug-connected transformer.

Dry-Niche Lighting Fixture. A lighting fixture intended for installation in the wall of a pool or fountain in a niche that is sealed against the entry of pool water.

Equipment—Fixed. Equipment that is fastened or otherwise secured at a specific location.

Equipment—Portable. Equipment that is actually moved or can easily be moved from one place to another in normal use.

Equipment—Stationary. Equipment that is not easily moved from one place to another in normal use.

Forming Shell. A structure designed to support a wet-niche lighting fixture assembly and intended for mounting in a pool or fountain structure.

Fountain. As used in this article, the term includes fountains, ornamental pools, display pools, and reflection pools. It does not include drinking fountains.

Hydromassage Bathtub. A permanently installed bathtub equipped with a recirculating piping system, pump, and associated equipment. It is designed so it can accept, circulate, and discharge water upon each use.

No-Niche Lighting Fixture. A lighting fixture intended for installation above or below the water without a niche.

Packaged Spa or Hot Tub Equipment Assembly. A factory-fabricated unit consisting of water-circulating, heating, and control equipment mounted on a common base, intended to operate a spa or hot tub. Equipment may include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Packaged Therapeutic Tub or Hydrotherapeutic Tank Equipment Assembly. A factory-fabricated unit consisting of water-circulating, heating, and control equipment mounted on a common base, intended to operate a therapeutic tub or hydrotherapeutic tank. Equipment may include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Permanently Installed Decorative Fountains and Reflection Pools. Those that are constructed in the ground, on the ground, or in a building in such a manner that the fountain cannot be readily disassembled for storage, whether or not served by electrical circuits of any nature. These units are primarily constructed for their aesthetic value and are not intended for swimming or wading.

Permanently Installed Swimming, Wading, and Therapeutic Pools. Those that are constructed in the ground or partially in the ground, and all others capable of holding water in a depth greater than 42 in. (1.07 m), and all pools installed inside of a building, regardless of water depth, whether or not served by electrical circuits of any nature.

Pool. ~~As used in this article, the term includes~~ manufactured or field-constructed equipment designed to contain water on a permanent or semi-permanent basis and used for swimming, wading, ~~and~~ or ~~permanently installed~~ therapeutic ~~pools~~ purposes.

Pool Cover, Electrically Operated. Motor-driven equipment designed to cover and uncover the water surface of a pool by means of a flexible sheet or rigid frame.

Self-Contained Spa or Hot Tub. Factory-fabricated unit consisting of a spa or hot tub vessel with all water-circulating, heating, and control equipment integral to the unit. Equipment may include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Self-Contained Therapeutic Tubs or Hydrotherapeutic Tanks. A factory-fabricated unit consisting of a therapeutic tub or hydrotherapeutic tank with all water-circulating, heating, and control equipment integral to the unit. Equipment may include pumps, air blowers, heaters, light controls, sanitizer generators, etc.

Spa or Hot Tub. A hydromassage pool, or tub for recreational or therapeutic use, not located in health care facilities, designed for immersion of users, and usually having a filter, heater, and motor-driven blower. It may be installed indoors or outdoors, on the ground or supporting structure, or in the ground or supporting structure. Generally, a spa or hot tub is not designed or intended to have its contents drained or discharged after each use.

Storable Swimming or Wading Pool. Those that are constructed on or above the ground and are capable of holding water to a maximum depth of 42 in. (1.07 m), or a pool with nonmetallic, molded polymeric walls or inflatable fabric walls regardless of dimension.

Wet-Niche Lighting Fixture. A lighting fixture intended for installation in a forming shell mounted in a pool or fountain structure where the fixture will be completely surrounded by water.

680-3. Other Articles

(a) Except as modified by this ~~section~~ article, wiring and equipment in or adjacent to pools and fountains shall comply with the applicable requirements of Chapters 1 through 4.

FPN: See Section 370-23 for junction boxes and Section 347-3 for rigid nonmetallic conduit.

(b) The installation and wiring of audio equipment adjacent to pools and fountains shall comply with the applicable requirements of Article 640. Underwater loudspeakers shall be installed in accordance with Section 680-23.

680-4. Approval of Equipment. All electrical equipment installed in the water, walls, or decks of pools, fountains, and similar installations shall comply with the provisions of this article.

680-5. Ground-Fault Circuit Interrupters. A ground-fault circuit interrupter (GFCI) shall be a self-contained unit, or a circuit-breaker or receptacle type, or other ~~approved~~ listed type.

680-6. Grounding. Electrical equipment shall be grounded in accordance with Article 250 and connected by wiring methods of Chapter 3, except as modified by this article. The following equipment shall be grounded:

(1) ~~Wet-niche and no-niche~~ Underwater lighting fixtures, other than those low-voltage systems listed for the application without a grounding conductor

~~2. Dry-niche underwater lighting fixtures~~

(2) All electrical equipment located within 5 ft (1.52 m) of the inside wall of the ~~pool~~ contained body of water.

(3) All electrical equipment associated with the recirculating system of the ~~pool~~ contained body of water.

(4) Junction boxes

(5) Transformer enclosures

(6) Ground-fault circuit interrupters

(7) Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the ~~pool~~ contained body of water

680-7. Cord- and Plug-Connected Equipment. Fixed or stationary equipment ~~rated 20 amperes or less~~, other than an underwater lighting fixture for a permanently installed pool, shall be permitted to be connected with a flexible cord to facilitate the removal or disconnection for maintenance or repair.

(a) Length. For other than storable pools, the flexible cord shall not exceed 3 ft (914 mm) in length.

(b) Equipment Grounding. The flexible cord ~~and~~ shall have a copper equipment grounding conductor sized in accordance with Section 250-122 but not smaller than No. 12. The cord shall terminate in ~~with~~ a grounding-type attachment plug.

(c) Construction. The equipment grounding conductors shall be connected to a fixed metal part of the assembly. The removable part shall be mounted on or bonded to the fixed metal part.

~~FPN: See Section 680-25(c) for connection with flexible cords.~~

~~(f) Other Equipment. Other electrical equipment shall be grounded in accordance with Article 250 and connected by wiring methods of Chapter 3.~~

680-8. Overhead Conductor Clearances.

(a) Power. With respect to service drop conductors and open overhead wiring, including messenger supported wiring and festoon lighting, swimming pool and similar installations shall comply with the minimum clearances given in Table 680-8 unless the contained body of water is fully enclosed by a solid or screened permanent structure.

~~The following parts of pools shall not be placed under existing service-drop conductors or any other open overhead wiring; nor shall such wiring be installed above the following:~~

~~1. Pools and the area extending 10 ft (3.05 m) horizontally from the inside of the walls of the pool,~~
~~2. Diving structure, or~~
~~3. Observation stands, towers, or platforms unless the installations provide the clearances in Table 680-8.~~

Table 680.8. Clearances

	Insulated Supply or Service Drop Cables, 0–750 Volts to Ground, Supported on and Cabled Together with an Effectively Grounded Bare Messenger or Effectively Grounded Neutral Conductor	All Other Supply or Service-Drop Conductors Voltage to Ground	
		0–15 kV	Greater than 15–50 kV
A Clearance in any direction to the water level, edge of water surface, base of diving platform, or permanently anchored raft	22 ft (6.7 m)	25 ft (7.62 m)	27 ft (8.23 m)
B Clearance in any direction to the diving platform or tower	14 ft (4.27 m)	17 ft (5.2 m)	18 ft (5.49 m)
C Horizontal limit of clearance measured from inside wall of the pool	This limit shall extend to the outer edge of the structures listed in (1) and (2) but not less than 10 ft (3.05 m).		

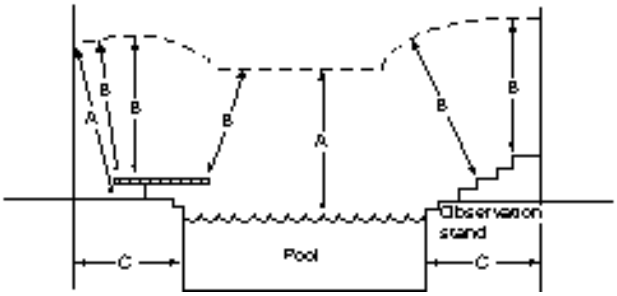


Figure 680-8

(b) Communications Systems. ~~Community antenna system coaxial cables complying with Article 820~~ The following communications systems conductors and ~~the~~ their supporting messengers shall ~~be permitted at a height~~ have a minimum clearance of not less than 10 ft (3.05 m) above swimming and wading pools, diving structures, and observation stands, towers, or platforms:

(1) Communications circuit conductors covered in Article 800.

(2) Community antenna system coaxial cables ~~complying with~~ covered in Article 820.

FPN: See Sections 225-18 and 225-19 for clearances for conductors not covered by this section.

680-9. Electric ~~Pool~~ Water Heaters. All electric ~~pool~~ water heaters shall have the heating elements subdivided into loads not exceeding 48 amperes and protected at not more than 60 amperes. The ampacity of the branch-circuit conductors and the rating or setting of overcurrent protective devices shall not be less than 125 percent of the total rated load ~~of~~ as given on the nameplate ~~rating~~.

680-10. Underground Wiring Location. Underground wiring shall not be permitted under the pool or within the area extending 5 ft (1.52 m) horizontally from the inside wall of the pool unless this wiring is necessary to supply pool equipment permitted by this article. Where space limitations prevent wiring from being routed 5 ft (1.52 m) or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be as follows.

Wiring Method	Minimum Burial (in.)
Rigid metal conduit	6
Intermediate metal conduit	6
Nonmetallic raceways listed for direct burial without concrete encasement	18
Other approved raceways*	18

Note: For SI units, 1 in. = 25.4 mm.
* Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 2 in. (50.8 mm) thick.

680-11. Equipment Rooms and Pits. Electric equipment shall not be installed in rooms or pits that do not have adequate drainage to prevent water accumulation during normal operation or filter maintenance.

680-12. Disconnecting Means. One or more ~~a~~ disconnecting means shall be ~~provided and be accessible, located within sight from all pools, spas, and~~ installed for motor-operated pool, spa, or hot tub equipment, and for pool, spa, or hot tub heating equipment. The disconnecting means shall be accessible and located within sight of the equipment supplied, at a point at least 5 feet (1.52 m) horizontally from the inside walls of the pool, spa, or hot tub.

II. Permanently Installed Pools

680-20. General. Electrical installations at permanently installed pools shall comply with the provisions of Part I and this part.

680-21. Motors.

(a) Wiring Methods.

(1) General. The branch circuits for pool-associated motors shall be installed in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or Type MC cable listed for the location ~~application~~. Other wiring methods and materials shall be permitted in specific locations or applications as covered in this section. Any wiring method employed shall contain a copper equipment grounding conductor sized in accordance with ~~Table~~ Section 250-122 but not smaller than No. 12.

(2) On or Within Buildings. Where installed on or within buildings, electrical metallic tubing shall be permitted ~~to be used to protect the conductors~~.

(3) Flexible Connections. Where necessary to employ flexible connections at or adjacent to the motor, liquidtight flexible metal or nonmetallic conduit with approved fittings shall be permitted.

(4) One-Family Dwellings. In the interior of ~~a~~ one-family dwellings, or in the interior of ~~another~~ accessory buildings ~~or structure~~ associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code shall be permitted that comply with the provisions of this paragraph.. ~~that contain a copper equipment grounding conductor that is insulated or covered by the outer sheath of the wiring method and is not smaller than No. 12 shall be permitted to be used for the connection of pool-associated motors.~~ Where run in a raceway the equipment grounding conductor shall be insulated. Where run in a cable assembly, the equipment grounding conductor shall be permitted to be uninsulated, but it shall be enclosed within the outer sheath of the cable assembly.

(5) Cord- and Plug-Connections. Pool-associated motors shall be permitted to employ cord- and plug-connections. The flexible cord shall not exceed 3 ft (914 mm) in length. The flexible cord shall include an equipment grounding conductor sized in accordance with Section 250-122 and shall terminate in a grounding-type attachment plug.

(b) GFCI Protection. ~~Motors in Other than Dwelling Units. Wiring~~ Outlets supplying pool pump motors from branch circuits with short-circuit and ground-fault protection rated 15 ~~and~~ or 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.

(c) Double Insulated Pool Pumps. A ~~permanently installed pool shall be permitted to be provided with~~ listed cord- and plug-connected pool ~~pumps~~ pump incorporating an approved system of double insulation that provides a means for grounding only the internal and nonaccessible, noncurrent-carrying metal parts of the pump shall be connected to any wiring method recognized in Chapter 3 that is suitable for the location.

680-22. Area Lighting, Receptacles, and Equipment.

(a) Receptacles.

(1) Circulation and Sanitation System, Location. Receptacles that provide power for water-pump motors or for other loads directly related to the circulation and sanitation system shall be located at least 10 ft (3.05 m) from the inside walls of the pool, or not less than 5 ft (1.52 m) from the inside walls of the pool if they meet all of the following conditions:

(1) Single receptacle.

(2) Locking configuration.

(3) Grounding type.

(4) GFCI protected.

~~a permanently installed pool or fountain, as permitted in Section 680-7, shall be permitted between 5 ft and 10 ft (1.52 m and 3.05 m) from the inside walls of the pool or fountain, and, where so located, shall be single-and of the locking-and-grounding types and shall be protected by a ground-fault circuit interrupter(s).~~

(2) Other Receptacles, Location. Other receptacles ~~on the property~~ shall be located at least 10 ft (3.05 m) from the inside walls of a pool ~~or fountain~~.

(3) Dwelling Unit(s). Where a permanently installed pool is installed at a dwelling unit(s), at least one 125-volt 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located a minimum of 10 ft (3.05 m) from and not more than 20 ft (6.08 m) from the inside wall of the pool. This receptacle shall be located not more than 6 ft 6 in. (1.98 m) above the floor, platform, or grade level serving the pool.

(4) GFCI Protection. All 125-volt receptacles located within 20 ft (6.08 m) of the inside walls of a pool or fountain shall be protected by a ground-fault circuit interrupter.

(5) Measurements. ~~FPN:~~ In determining the ~~above~~ dimensions in this section addressing receptacle spacings, the distance to be measured is the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, ~~doorway with hinged or sliding door,~~ window opening, or other effective permanent barrier.

(b) Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans.

(1) Outdoor Clearances. For new installations in outdoor pool areas, lighting fixtures, lighting outlets, and ceiling-suspended (paddle) fans installed above the pool or the area extending 5 ft (1.52 m) horizontally from the inside walls of the pool shall ~~not~~ be installed at least 12 ft (3.66 m) above the maximum water level ~~over~~ of the pool. ~~or over the area extending 5 ft (1.52 m) horizontally from the inside walls of a pool unless no part of the lighting fixture or ceiling suspended (paddle) fan is less than 12 ft (3.66 m) above the maximum water level.~~

(2) Existing Installations. Existing lighting fixtures and lighting outlets located less than 5 ft (1.52 m) measured horizontally from the inside walls of a pool shall be at least 5 ft (1.52 m) above the surface of the maximum water level, shall be rigidly attached to the existing structure, and shall be protected by a ground-fault circuit interrupter.

(3) Indoor Clearances. For installations in indoor pool areas, the clearances shall be the same as for outdoor areas unless modified as provided in this paragraph. Where the branch circuit supplying the equipment is protected by a ground-fault circuit-interrupter, the following equipment shall be permitted at a height not less than 7 ft 6 in. (2.29 m) above the maximum pool water level: ~~the limitations of Section 680-6(b)(1) shall not apply if all of the following conditions are complied with~~

(1) Totally enclosed fixtures.

(2) Ceiling-suspended (paddle) fans identified for use beneath ceiling structures such as provided on porches or patios.

~~A ground-fault circuit interrupter is installed in the branch circuit supplying the fixture(s) or ceiling-suspended (paddle) fans, and~~

~~c. The distance from the bottom of the fixture or ceiling-suspended (paddle) fan to the maximum water level is not less than 7 ft 6 in. (2.29 m).~~

(4) GFCI Protection in Contiguous Areas. Lighting fixtures, ~~and~~ lighting outlets, and ceiling-suspended (paddle) fans installed in the area extending between 5 ft (1.52 m) and 10 ft (3.05 m) horizontally from the inside walls of a pool shall be protected by a ground-fault circuit interrupter unless installed not less than 5 ft (1.52 m) above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool.

(5) Cord-Connected Lighting Fixtures. Cord-connected lighting fixtures shall comply with the requirements of Section 680-20 ~~meet the same specifications as other cord- and plug-connected equipment as set forth in Section 680-7~~ where installed within 16 ft (4.88 m) of any point on the water surface, measured radially.

(c) Switching Devices. Switching devices ~~on the property~~ shall be located at least 5 ft (1.52 m) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall, or other permanent barrier.

680-23. Underwater Lighting Fixtures.

~~Paragraphs (a) through (d) apply to~~ This section covers all lighting fixtures installed below the normal water level of the pool.

(a) General.

(1) Fixture Design, Normal Operation. The design of an underwater lighting fixture supplied from a branch circuit either directly or by way of a transformer meeting the requirements of ~~Section 680-5(a)~~ this section shall be such that, where the fixture is properly installed without a ground-fault circuit interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping).

(2) Transformers. Transformers used for the supply of underwater fixtures, together with the transformer enclosure, shall be ~~identified~~ listed for the purpose. The transformer shall be an isolated winding type that has a grounded metal barrier between the primary and secondary windings.

(3) GFCI Protection, Relamping. ~~In addition,~~ A ground-fault circuit interrupter shall be installed in the branch circuit supplying fixtures operating at more than 15 volts, so that there is no shock hazard during relamping. The installation of the ground-fault circuit interrupter shall be such that there is no shock hazard with any likely fault-condition combination that involves a person in a conductive path from any ungrounded part of the branch circuit or the fixture to ground.

(4) Voltage Limitation. No lighting fixtures shall be installed for operation on supply circuits over 150 volts between conductors.

(5) Location, Wall Mounted Fixtures. Lighting fixtures mounted in walls shall be installed with the top of the fixture lens at least 18 in. (457 mm) below the normal water level of the pool, unless the lighting fixture is listed and identified for use at lesser depths. No fixture shall be installed ~~a depth of not~~ less than 4 in. (102 mm) below the normal water level of the pool.

(6) Bottom-Mounted Fixtures. A lighting fixture facing upward shall have the lens adequately guarded to prevent contact by any person.

(7) Dependence on Submersion. Fixtures that depend on submersion for safe operation shall be inherently protected against the hazards of overheating when not submerged.

(8) Compliance. Compliance with ~~this~~ these requirements shall be obtained by the use of a listed underwater lighting fixture, and by installation of a listed ground-fault circuit interrupter in the branch circuit or a listed transformer for fixtures operating at not more than 15 volts.

(b) Wet-Niche Fixtures.

(1) Forming Shells. Forming shells shall be installed for the mounting of all wet-niche underwater fixtures and shall be equipped with provisions for conduit entries. Metal parts of the fixture and forming shell in contact with the pool water shall be of brass or other approved corrosion-resistant metal. All forming shells used with nonmetallic conduit systems, other than those that are part of a listed low-voltage lighting system not requiring grounding, shall include provisions for terminating a No. 8 copper conductor.

(2) Wiring Extending Directly to the Forming Shell. Conduit shall ~~extend~~ be installed from the forming shell to a suitable junction box or other enclosure located as provided in Section 680-24. Conduit shall be rigid metal, intermediate metal, liquidtight flexible nonmetallic, or rigid nonmetallic.

(a) Metal Conduit. Metal conduit shall be approved, and shall be of brass or other approved corrosion-resistant metal.

(b) Nonmetallic Conduit. Where a nonmetallic conduit is used, a No. 8 insulated copper conductor shall be installed in this conduit unless a listed low-voltage lighting system is used, not requiring grounding. ~~with provisions for terminating in~~ The grounding conductor shall be terminated in the forming shell, junction box or transformer enclosure, or ground-fault circuit-interrupter enclosure The termination of the No. 8 conductor in the forming shell shall be covered with, or encapsulated in, a listed potting compound to protect ~~such~~ the connection from the possible deteriorating effect of pool water. ~~Metal parts of the fixture and forming shell in contact with the pool water shall be of brass or other approved corrosion-resistant metal.~~

(3) Equipment Grounding Provisions for Cords. Wet-niche ~~or no-niche~~ lighting fixtures that are supplied by a flexible cord or cable shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of the cord or cable. This grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure. The grounding conductor shall not be smaller than the supply conductors and not smaller than No. 16.

(4) Fixture Grounding Terminations. The end of the flexible-cord jacket and the flexible-cord conductor terminations within a fixture shall be covered with, or encapsulated in, a suitable potting compound to prevent the entry of water into the fixture through the cord or its conductors. In addition, the grounding connection within a fixture shall be similarly treated to protect such connection from the deteriorating effect of pool water in the event of water entry into the fixture.

(5) Fixture Bonding. The fixture shall be bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to remove the fixture from the forming shell. Bonding ~~is~~ shall not be required for fixtures listed for the application, having no noncurrent-carrying metal parts.

(c) Dry-Niche Fixtures.

(1) Construction. A dry-niche lighting fixture shall be provided with a provision for drainage of water and a means for accommodating one equipment grounding conductor for each conduit entry.

(2) Junction Box. A junction box shall not be required but, if used, shall not be required to be elevated or located as specified in Section 680-21(a)(4), if the fixture is specifically identified for the purpose. ~~Approved rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit shall be installed from the fixture to the service equipment or panelboard. Where installed on buildings, electrical metallic tubing shall be permitted to be used to protect conductors. Where installed within buildings, electrical nonmetallic tubing or electrical metallic tubing shall be permitted to be used to protect conductors.~~

(d) No-Niche Fixtures. A no-niche fixture shall be meet the construction requirements of Section 680-23(B)(3) and be installed in accordance with the requirements of Section 680-23(B). Where connection to a forming shell is specified, the connection shall be to the mounting bracket.

~~1. Listed for the purpose~~

~~2. Installed in accordance with the requirements of Section 680-20(b)~~

~~Where connection to a forming shell is specified, the connection shall be to the mounting bracket.~~

(e) Branch-Circuit Wiring.

(1) Wiring Methods. Branch circuit wiring on the supply side of enclosures and junction boxes connected to conduits run to wet-niche and no-niche fixtures, and the field wiring compartments of dry-niche fixtures, shall be installed using rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Where installed on buildings, electrical metallic tubing shall be permitted, and where installed within buildings, electrical nonmetallic tubing or electrical metallic tubing shall be permitted.

FPN: For requirements of electrical nonmetallic tubing, see Article 331.

Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted to be used when installed in accordance with Article 351. The length shall ~~and does~~ not exceed 6 ft (1.83 m) for any one length, nor ~~or~~ more than 10 ft (3.05 m) ~~of~~ in total length used.

(2) Equipment Grounding. Wet-niche, dry-niche, or no-niche lighting fixtures shall be connected to an insulated copper equipment grounding conductor installed with the circuit conductors. The equipment grounding conductor shall be installed without joint or splice except as permitted in (a) and (b). The equipment grounding conductor shall be sized in accordance with Table 250-122 but not smaller than No. 12.

Exception: An equipment grounding conductor between the wiring chamber of the secondary winding of a transformer and a junction box shall be sized in accordance with the overcurrent device in this circuit.

(a) Where more than one underwater lighting fixture is supplied by the same branch circuit, the equipment grounding conductor, installed between the junction boxes, transformer enclosures, or other enclosures in the supply circuit to wet-niche fixtures, or between the field-wiring compartments of dry-niche fixtures, shall be permitted to be terminated on grounding terminals.

(b) Where the underwater lighting fixture is supplied from a transformer, ground-fault circuit interrupter, clock-operated switch, or a manual snap switch that is located between the panelboard and a junction box connected to the conduit that extends directly to the underwater lighting fixture, the equipment grounding conductor shall be permitted to terminate on grounding terminals on the transformer, ground-fault circuit interrupter, clock-operated switch enclosure, or an outlet box used to enclose a snap switch.

(3) Conductors. Conductors on the load side of a ground-fault circuit interrupter or of a transformer, used to comply with the provisions of Section 680-23(a)(8), shall not occupy raceways, boxes, or enclosures containing other conductors unless one of the following conditions applies:

(a) GFCI Protection. The other conductors are protected by ground-fault circuit interrupters.

(b) Grounding Conductors. The other conductors ~~or~~ are grounding conductors.

(c) With Supply Conductors. The other conductors are supply conductors to a feed-through type ground-fault circuit interrupter ~~shall be permitted in the same enclosure~~.

(d) In a Common Panelboard. Ground-fault circuit interrupters shall be permitted in a panelboard that contains circuits protected by other than ground-fault circuit interrupters.

680-24. Junction Boxes and Enclosures for Transformers or Ground-Fault Circuit Interrupters

(a) Junction Boxes. A junction box connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche fixture shall ~~be as follows~~ meet the requirements of this section.

(1) Construction. The junction box shall be listed and labeled for the purpose and:

(1) Equipped with threaded entries or hubs or a nonmetallic hub listed for the purpose.

(2) Of copper, brass, suitable plastic, or other approved corrosion-resistant material.

(3) Provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper,

brass, or other approved corrosion-resistant metal that is integral with the box.

(2) Installation. Where the fixture operates over 15 volts, the junction box location shall comply with (a) and (b). Where the fixture operates at 15 volts or less, the junction box location shall be permitted to comply with (c).

(a) Vertical Spacing. The junction box shall be located not less than 4 in. (102 mm), measured from the inside of the bottom of the box, above the ground level, or pool deck, or not less than 8 in. (203 mm) above the maximum pool water level, whichever provides the greater elevation.

(b) Horizontal Spacing. The junction box shall be located not less than 4 ft (1.22 m) from the inside wall of the pool, unless separated from the pool by a solid fence, wall, or other permanent barrier.

(c) Flush Deck Box. If used on a lighting system operating at 15 volts or less, a flush deck box shall be permitted provided

(1) An approved potting compound is used to fill the box to prevent the entrance of moisture, and

(2) The flush deck box is located not less than 4 ft (1.22 m) from the inside wall of the pool.

(b) Other Enclosures. An enclosure for a transformer, ground-fault circuit interrupter, or a similar device connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche fixture shall ~~be as follows~~ meet the requirements of this section.

(1) Construction. The enclosure shall be listed and labeled for the purpose and:

(a) Equipped with threaded entries or hubs or a nonmetallic hub listed for the purpose.

(b) Of copper, brass, suitable plastic, or other approved corrosion-resistant material.

(c) Provided with an approved seal, such as duct seal at the conduit connection, that prevents circulation of air between the conduit and the enclosures

(d) Provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper, brass, or other approved corrosion-resistant metal that is integral with the box.

(2) Installation.

(a) Vertical Spacing. The enclosure shall be located not less than 4 in. (102 mm), measured from the inside of the bottom of the box, above the ground level, or pool deck, or not less than 8 in. (203 mm) above the maximum pool water level, whichever provides the greater elevation.

(b) Horizontal Spacing. The enclosure shall be located not less than 4 ft (1.22 m) from the inside wall of the pool, unless separated from the pool by a solid fence, wall, or other permanent barrier.

(c) Protection. Junction boxes and enclosures mounted above the grade of the finished walkway around the pool shall not be located in the walkway unless afforded additional protection, such as by location under diving boards, adjacent to fixed structures, and the like.

(d) Grounding Terminals. Junction boxes, transformer enclosures, and ground-fault circuit-interrupter enclosures connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche fixture shall be provided with a number of grounding terminals that shall be at least one more than the number of conduit entries.

(e) Strain Relief. The termination of a flexible cord of an underwater lighting fixture within a junction box, transformer enclosure, ground-fault circuit interrupter, or other enclosure shall be provided with a strain relief.

(f) Grounding. The junction box, transformer enclosure, or other enclosure in the supply circuit to a wet-niche or no-niche lighting fixture and the field-wiring chamber of a dry-niche lighting fixture shall be grounded to the equipment grounding terminal of the panelboard. This terminal shall be directly connected to the panelboard enclosure.

680-25. Feeders.

These provisions shall apply to any feeder on the supply side of panelboards supplying branch circuits for pool equipment covered in Part II of this Article and on the load side of the service equipment or the source of a separately derived system.

(a) Wiring Methods. Feeders shall be installed in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Electrical metallic tubing shall be permitted ~~to be used to protect conductors~~ where installed on or within a ~~the~~ building, and ~~in accordance with Article 348~~. electrical nonmetallic tubing shall be permitted ~~to be used to enclose the conductors~~ where installed within ~~the~~ a building ~~in accordance with Article 331~~.

Exception: An existing feeder between an existing remote panelboard and ~~the~~ service equipment ~~is~~ shall be permitted to run in ~~connected by means of a~~ flexible metal conduit or an approved cable assembly with an insulated or covered equipment grounding conductor~~, the conduits listed above shall not be required~~.

(b) Grounding. ~~A panelboard and, where installed, a disconnecting means, that are not part of the service equipment or source of a separately derived system, shall have~~ An insulated equipment grounding conductor shall be installed with the feeder conductors between ~~it's~~ the grounding terminal of the pool equipment panelboard and the grounding terminal of the applicable service equipment or source of a separately derived system.

(1) Size. This conductor shall be sized in accordance with ~~Table~~ Section 250-122 but not smaller than No. 12. On separately derived systems, this conductor shall be sized in accordance with Table 250-66 but not smaller than No. 8.

(2) Separate Buildings. A panelboard at a separate building shall be permitted to supply swimming pool equipment if the feeder meets the requirements for grounding in Section 250-32. Where installed, a separate equipment grounding conductor shall be an insulated conductor.

680-26. Bonding.

(a) Performance. The bonding required by this section shall be installed ~~employed~~ to eliminate voltage gradients in the pool area as prescribed. ~~It shall not be the intent of~~

FPN: This section ~~to~~ does not require that the No. 8 or larger solid copper bonding conductor be extended or attached to any remote panelboard, service equipment, or any electrode~~, but only that it~~.

(b) Bonded Parts. The following parts shall be bonded together.

(1) Metallic Structural Components. All metallic parts of the pool structure, including the reinforcing metal of the pool shell, coping stones, and deck, shall be bonded. The usual steel tie wires shall be considered suitable for bonding the reinforcing steel together, and welding or special clamping shall not be required. These tie wires shall be made tight. Where reinforcing steel is effectively insulated by a listed encapsulating nonconductive compound, at the time of manufacture and installation, it shall not be required to be bonded.

(2) Underwater Lighting. All forming shells, and mounting brackets of ~~a~~ no-niche fixtures, shall be bonded unless a listed low-voltage lighting system with nonmetallic forming shells is used, not requiring bonding.

(3) Metal Fittings. All metal fittings within or attached to the pool structure shall be bonded. Isolated parts that are not over 4 in. (102 mm) in any dimension and do not penetrate into the pool structure more than 1 in. (25.4 mm) shall not require bonding.

(4) Electrical Equipment. Metal parts of electrical equipment associated with the pool water circulating system, including pump motors and metal parts of equipment associated with pool covers, including electric motors shall be bonded. Metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded.

(5) Metal Wiring Methods and Equipment. Metal-sheathed cables and raceways, metal piping, and all fixed metal parts shall be bonded that are within the following distances of the pool:

(a) Horizontal. Within 5 ft (1.52 m) horizontally of the inside walls of the pool~~, unless separated from the pool by a permanent barrier~~. ~~and~~

~~(b) Vertical. Within~~ 12 ft (3.66 m) above the maximum water level of the pool, or any observation stands, towers, or platforms, or ~~from~~ any diving structures.

(c) Permanent Barrier. The bonding requirement shall not apply to metal parts that are ~~not~~ separated from the pool by a permanent barrier.

(c) Common Bonding Grid. The parts specified in (A) shall be connected to a common bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than No. 8. Connection shall be made by exothermic welding or by pressure connectors or clamps that are labeled as being suitable for the purpose and are of the following material: stainless steel, brass, copper, or copper alloy. The common bonding grid shall be permitted to be any of the following:

(1) Reinforcing Steel. The structural reinforcing steel of a concrete pool where the reinforcing rods are bonded together by the usual steel tie wires or the equivalent.
(2) Metal Pool Structure. The wall of a bolted or welded metal pool.
(3) Solid Copper Conductor. A solid copper conductor, insulated, covered, or bare, not smaller than No. 8.
(4) Metal Conduit. Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal conduit.
(d) Connections. Where structural reinforcing steel or the walls of bolted or welded metal pool structures ~~shall be permitted~~ are used as a common bonding grid for nonelectrical parts, ~~where~~ the connections shall ~~can~~ be made in accordance with Section 250-8.
(e) Pool Water Heaters. For pool water heaters rated at more than 50 amperes that have specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded, and only those parts designated to be grounded shall be grounded.
680-27. Specialized Pool Equipment
(a) Underwater Audio Equipment. All underwater audio equipment shall be identified for the purpose.
(1) Speakers. Each speaker shall be mounted in an approved metal forming shell, the front of which is enclosed by a captive metal screen, or equivalent, that is bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to open for installation or servicing of the speaker. The forming shell shall be installed in a recess in the wall or floor of the pool.
(2) Wiring Methods. Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal or rigid nonmetallic conduit shall extend from the forming shell to a suitable junction box or other enclosure as provided in Section 680-24. Where rigid nonmetallic conduit is used, a No. 8 insulated copper conductor shall be installed in this conduit. ~~with provisions for terminating~~ The grounding conductor shall be terminated in the forming shell and the junction box. The termination of the No. 8 conductor in the forming shell shall be covered with, or encapsulated in, a suitable potting compound to protect such connection from the possible deteriorating effect of pool water.
(3) Forming Shell and Metal Screen. The forming shell and metal screen shall be of brass or other approved corrosion-resistant metal. All forming shells shall include provisions for terminating a No. 8 copper conductor.
(b) Electrically Operated Pool Covers
(1) Motors and Controllers. The electric motors, controllers, and wiring shall be located at least 5 ft (1.52 m) from the inside wall of the pool unless separated from the pool by a wall, cover, or other permanent barrier. Electric motors installed below grade level shall be of the totally enclosed type.
FPN No. 1: For cabinets installed in damp and wet locations, see Section 373-2(a).
FPN No. 2: For switches or circuit breakers installed in wet locations, see Section 380-4.
FPN No. 3: For protection against liquids, see Section 430-11.
(2) ~~Wiring Methods~~ Protection. The electric motor and controller shall be connected to a circuit protected by a ground-fault circuit interrupter.
(c) Deck Area Heating. These provisions ~~of this section~~ shall apply to all pool deck areas, including a covered pool, where electrically operated comfort heating units are installed within 20 ft (6.1 m) of the inside wall of the pool.
(1) Unit Heaters. Unit heaters shall be rigidly mounted to the structure and shall be of the totally enclosed or guarded types. Unit heaters shall not be mounted over the pool or within the area extending 5 ft (1.52 m) horizontally from the inside walls of a pool.
(2) Permanently Wired Radiant Heaters. Radiant electric heaters shall be suitably guarded and securely fastened to their mounting device(s). Heaters shall not be installed over a pool or within the area extending 5 ft (1.52 m) horizontally from the inside walls of the pool and shall be mounted at least 12 ft (3.66 m) vertically above the pool deck unless otherwise approved.
(3) Radiant Heating Cables Not Permitted. Radiant heating cables embedded in or below the deck shall not be permitted.
III. Storable Pools
680-30. Electrical installations at storable pools shall comply with the provisions of Part I and this part.
680-31. Pumps. A cord-connected pool filter pump shall incorporate an approved system of double insulation or its equivalent and shall be provided with means for grounding only the internal and nonaccessible noncurrent-carrying metal parts of the appliance. The means for grounding shall be an equipment grounding conductor run with the power-supply conductors in the flexible cord that is properly terminated in a grounding-type attachment plug having a fixed grounding contact member.
680-32. Ground-Fault Circuit Interrupters Required
All electrical equipment, including power-supply cords, used with storable pools shall be protected by ground-fault circuit interrupters.
FPN: Where flexible cords are used, see Section 400-4.
680-33. Lighting Fixtures. An underwater lighting fixture, if installed, shall be installed in or on the wall of the storable pool. It shall comply with one of the following two provisions:
(a) 15 Volts or Less. A lighting fixture ~~installed in or on the wall of a storable pool~~ shall be part of a cord- and plug-connected lighting assembly. This assembly shall ~~l~~be listed as an assembly for the purpose and ~~as follows~~ have the following construction features:
(1) ~~Have~~ No exposed metal parts
(2) ~~Have~~ A fixture lamp that operates at 15 volts or less
(3) ~~Have~~ An impact-resistant polymeric lens, fixture body, and transformer enclosure
(4) ~~Have~~ A transformer meeting the requirements of Section 680-23(A)(2) with a primary rating not over 150 volts, and
~~5. Be listed as an assembly for the purpose~~
(b) Over 15 Volts But Not Over 150 Volts. A lighting assembly without a transformer, and with the fixture lamp(s) operating at not over 150 volts, shall be permitted to be cord- and plug-connected where the assembly is listed as an assembly for the purpose. The installation shall comply with Section 680-23(A)(5) and the assembly shall have ~~complies with all of the following.~~ the following construction features:
(1) No exposed metal parts.
(2) An impact-resistant polymeric lens and fixture body.
(3) A ground-fault circuit interrupter with open neutral protection ~~is provided~~ as an integral part of the assembly.
(4) The fixture lamp is permanently connected to the ground-fault circuit interrupter with open-neutral protection.
(5) It complies with the requirements of Section 680-23(A).
~~6. It is listed as an assembly for the purpose.~~
IV. Spas and Hot Tubs
680-40. Electrical installations at spas and hot tubs shall comply with the provisions of Part I and this part.
680-41. Emergency Switch for Spas and Hot Tubs. A clearly labeled emergency shutoff or control switch for the purpose of stopping the motor(s) that provide power to the recirculation system and jet system shall be installed at a point readily accessible to the users and at least 5 ft (1.52 m) away, adjacent to, and within sight of the spa or hot tub. This requirement shall not apply to single-family dwellings.
680-42. Outdoor Installations. A spa or hot tub installed outdoors shall comply with the provisions of Parts I and II of this article except as permitted in (A) and (B) that would otherwise apply to pools installed outdoors.
(a) Flexible Connections. Listed packaged spa or hot tub equipment assemblies or self-contained spas or hot tubs ~~units~~ utilizing a factory-installed or assembled control panel or ~~remote~~ panelboard shall be permitted to use flexible connections as covered in (1) and (2):
(1) Flexible Conduit. Liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted in lengths of ~~be connected with~~ not more than 6 ft (1.828 m).
(2) Cord- and Plug-Connections. Cord and plug connections with a cord not longer than 15 ft (4.57 m) shall be permitted where ~~if~~ protected by a ground-fault circuit interrupter.
(b) Bonding. Bonding by metal-to-metal mounting on a common frame or base shall be permitted. The metal bands or hoops used to secure wooden staves shall not be required to be bonded as required in Section 680-26.
680-43. Indoor Installations. A spa or hot tub installed indoors shall comply with the provisions of Parts I and II except as modified by this section, and shall be connected by the wiring methods of Chapter 3.
Exception: Listed spa and hot tub packaged units rated 20 amperes or less shall be permitted to be cord and plug connected to facilitate the removal or disconnection of the unit for maintenance and repair.
(a) Receptacles. At least one 125-volt, 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located a minimum of 5 ft (1.52 m) from and not more than 10 ft (3.05 m) from the inside wall of the spa or hot tub.

(1) Location. Receptacles ~~on the property~~ shall be located at least 5 ft (1.52 m) measured horizontally from the inside walls of the spa or hot tub.

(2) Protection, General. Receptacles ~~of~~ rated 125 volts and 30 amperes or less located within 10 ft (3.05 m) of the inside walls of a spa or hot tub shall be protected by a ground-fault circuit interrupter.

(3) Protection, Spa or Hot Tub Supply Receptacle. Receptacles that provide power for a spa or hot tub shall be ground-fault circuit-interrupter protected.

(4) Measurements. ~~FPN:~~ In determining the ~~above~~ dimensions in this section addressing receptacle spacings, the distance to be measured is the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or other effective permanent barrier.

(b) Installation ~~Mounting Height~~ of Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans.

(1) Elevation. Lighting fixtures except as covered in Section 680-43(B)(2), lighting outlets, and ceiling-suspended (paddle) fans located over the spa or hot tub or within 5 ft (1.52 m) from the inside walls of the spa or hot tub shall comply with the following clearances ~~be a minimum of 7 ft 6 in. (2.29 m)~~ above the maximum water level ~~and shall be protected by a ground-fault circuit interrupter~~.

(1) Where no GFCI protection is provided, 12 feet (3.66 m).

(2) Where GFCI protection is provided, 7 ft 6 in. (2.29 m).

~~Lighting fixtures, lighting outlets, and ceiling-suspended (paddle) fans that are located 12 ft (3.66 m) or more above the maximum water level shall not require a ground-fault circuit interrupter for protection.~~

(2) Low-Level Fixtures. Lighting fixtures meeting the requirements of (a) or (b) and protected by a ground-fault circuit interrupter shall be permitted to be installed less than 7 ft 6 in. (2.29 m) over a spa or hot tub.

(a) Recessed fixtures with a glass or plastic lens and nonmetallic or electrically isolated metal trim, suitable for use in damp locations shall be permitted.

(b) Surface-mounted fixtures with a glass or plastic globe and a nonmetallic body or a metallic body isolated from contact shall be permitted. Such fixtures shall be suitable for use in damp locations.

(3) Underwater Applications. Underwater lighting fixtures shall comply with the provisions of Section 680-23 or Section 680-33 of this article.

(c) Wall Switches. Switches shall be located at least 5 ft (1.52 m), measured horizontally, from the inside walls of the spa or hot tub.

(d) Bonding. The following parts shall be bonded together.

(1) All metal fittings within or attached to the spa or hot tub structure.

(2) Metal parts of electrical equipment associated with the spa or hot tub water circulating system, including pump motors.

(3) Metal conduit and metal piping within 5 ft (1.52 m) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub by a permanent barrier.

(4) All metal surfaces that are within 5 ft (1.52 m) of the inside walls of the spa or hot tub and not separated from the spa or hot tub area by a permanent barrier.

Exception: Small conductive surfaces not likely to become energized, such as air and water jets and drain fittings, where not connected to metallic piping, towel bars, mirror frames, and similar nonelectrical equipment, shall not be required to be bonded.

(5) Electrical devices and controls not associated with the spas or hot tubs shall be located a minimum of 5 ft (1.52 m) away from such units or they shall be bonded to the spa or hot tub system.

(e) Methods of Bonding. All metal parts associated with the spa or hot tub shall be bonded by any of the following methods:

(1) The interconnection of threaded metal piping and fittings.

(2) Metal-to-metal mounting on a common frame or base.

(3) The provision~~s~~ of a copper bonding jumper, insulated, covered, or bare, not smaller than No. 8 solid.

(f) Grounding. The following equipment shall be grounded:

(1) All electric equipment located within 5 ft (1.52 m) of the inside wall of the spa or hot tub

(2) All electric equipment associated with the circulating system of the spa or hot tub

~~(g) Methods of Grounding.~~

~~1. All electrical equipment shall be grounded in accordance with Article 250 and be connected by the wiring methods of Chapter 3.~~

~~2. Where equipment is connected with a flexible cord, the equipment grounding conductor shall be connected to a fixed metal part of the assembly.~~

~~(h) Electric Water Heaters. All electric spa or hot tub water heaters shall be listed and shall have the heating elements subdivided into loads not exceeding 48 amperes and protected at not more than 60 amperes.~~

~~The ampacity of the branch-circuit conductors, and the rating or setting of overcurrent protective devices, shall not be less than 125 percent of the total load of the nameplate rating.~~

(g) Underwater Audio Equipment. Underwater audio equipment shall comply with the provisions of Part II ~~or C~~ of this article.

680-44. Protection. Except as otherwise provided in this section, the outlet(s) that supplies a self-contained spa or hot tub, or a packaged spa or hot tub equipment assembly, or a field-assembled spa or hot tub ~~with a heater load of 50 amperes or less~~ shall be protected by a ground-fault circuit interrupter.

(a) Listed Units. Where so marked, a listed self-contained unit or listed packaged equipment assembly ~~marked to indicate~~ that includes integral ground-fault circuit-interrupter protection ~~is provided~~ for all electrical parts within the unit or assembly (pumps, air blowers, heaters, lights, controls, sanitizer generators, wiring, etc.) shall be permitted without additional GFCI protection.

~~not require that the outlet supply be protected by a ground-fault circuit interrupter.~~

(b) Subdivided Loads. Where the load has been subdivided to comply with Section 680-9 or for other reasons, and where the unit is not rated 3 phase or over 250 volts, GFCI protection shall be provided for each subdivided portion of the load.

(c) Other Units. A ~~field-assembled~~ spa or hot tub rated 3 phase or rated ~~greater than~~ over 250 volts shall not require the supply to be protected by a ground-fault circuit interrupter.

(d) Combination Pool and Spa or Hot Tub. A combination pool/hot tub or spa assembly commonly bonded need not be protected by a ground-fault circuit interrupter.

FPN: See Section 680-4 for definitions of self-contained spa or hot tub and for packaged spa or hot equipment assembly.

V. Fountains

680-50. General. The provisions of Part V shall apply to all permanently installed fountains as defined in Section 680-2. Fountains that have water common to a pool shall additionally comply with the ~~pool~~ requirements in Part II of this article. Part V does not cover self-contained, portable fountains not larger than 5 ft (1.52 m) in any dimension ~~are not covered by Part E.~~ Portable fountains shall comply with Article 422.

680-51. Lighting Fixtures, Submersible Pumps, and Other Submersible Equipment

(a) Ground-Fault Circuit Interrupter. A ground-fault circuit interrupter shall be installed in the branch circuit supplying fountain equipment unless the equipment is listed for operation at 15 volts or less and is supplied by a transformer that complies with Section 680-23(A)(2).

(b) Operating Voltage. No lighting fixtures shall be installed for operation on supply circuits over 150 volts between conductors. Submersible pumps and other submersible equipment shall operate at 300 volts or less between conductors.

(c) Lighting Fixture Lenses. Lighting fixtures shall be installed with the top of the fixture lens below the normal water level of the fountain unless approved for above-water locations. A lighting fixture facing upward shall have the lens adequately guarded to prevent contact by any person.

(d) Overheating Protection. Electrical equipment that depends on submersion for safe operation shall be protected against overheating by a low-water cutoff or other approved means when not submerged.

(e) Wiring. Equipment shall be equipped with provisions for threaded conduit entries or be provided with a suitable flexible cord. The maximum length of exposed cord in the fountain shall be limited to 10 ft (3.05 m). Cords extending beyond the fountain perimeter shall be enclosed in approved wiring enclosures. Metal parts of equipment in contact with water shall be of brass or other approved corrosion-resistant metal.

(f) Servicing. All equipment shall be removable from the water for relamping or normal maintenance. Fixtures shall not be permanently imbedded into the fountain structure so that the water level must be reduced or the fountain drained for relamping, maintenance, or inspection.

(g) Stability. Equipment shall be inherently stable or be securely fastened in place.

680-52. Junction Boxes and Other Enclosures

(a) General. Junction boxes and other enclosures used for other than underwater installation shall comply with Section 680-24.

(b) Underwater Junction Boxes and Other Underwater Enclosures. Junction boxes and other underwater enclosures shall ~~be submersible and~~ meet the following requirements:

(1) Construction. Underwater enclosures shall comply with the following:

(a) They shall be equipped with provisions for threaded conduit entries or compression glands or seals for cord entry.

(b) They shall be submersible, and made of copper, brass, or other approved corrosion-resistant material.

(2) Installation. Underwater enclosure installations shall comply with the following:

(a) They shall be filled with an approved potting compound to prevent the entry of moisture.

(b) They shall be firmly attached to the supports or directly to the fountain surface and bonded as required. Where the junction box is supported only by the conduit, the conduit shall be of copper, brass, or other approved corrosion-resistant metal. Where the box is fed by nonmetallic conduit, it shall have additional supports and fasteners of copper, brass, or other approved corrosion-resistant material.

FPN: See Section 370-23 for support of enclosures.

680-53. Bonding. All metal piping systems associated with the fountain shall be bonded to the equipment grounding conductor of the branch circuit supplying the fountain.

FPN: See Section 250-122 for sizing of these conductors.

680-54. Grounding. The following equipment shall be grounded:

(1) All electrical equipment located within the fountain or within 5 ft (1.52 m) of the inside wall of the fountain

(2) All electrical equipment associated with the recirculating system of the fountain

(3) Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the fountain

680-55. Methods of Grounding.

(a) Applied Provisions. The provisions of Section ~~680-25~~ 680-21(A), Section 680-23(B)(3), Section 680-23(E)(1-2), Section 680-24(F), and Section 680-25 shall apply.

(b) Supplied by a Flexible Cord. Electrical equipment that is supplied by a flexible cord shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of this cord. This grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure.

680-56. Cord- and Plug-Connected Equipment.

(a) Ground-Fault Circuit Interrupter. All electrical equipment, including power-supply cords, shall be protected by ground-fault circuit interrupters.

(b) Cord Type. Flexible cord immersed in or exposed to water shall be of the hard-service type as designated in Table 400-4 and shall be marked water resistant.

(c) Sealing. The end of the flexible cord jacket and the flexible cord conductor termination within equipment shall be covered with, or encapsulated in, a suitable potting compound to prevent the entry of water into the equipment through the cord or its conductors. In addition, the ground connection within equipment shall be similarly treated to protect such connections from the deteriorating effect of water that may enter into the equipment.

(d) Terminations. Connections with flexible cord shall be permanent, except that grounding-type attachment plugs and receptacles shall be permitted to facilitate removal or disconnection for maintenance, repair, or storage of fixed or stationary equipment not located in any water-containing part of a fountain.

680-57. Signs.

(a) General. This section includes only fixed, stationary electrically illuminated utilization equipment installed within fountains that uses ~~with~~ words or symbols designed to convey information or attract attention.

(b) Ground-Fault Circuit-Interrupter Protection for Personnel. All circuits supplying the sign shall have ground-fault circuit-interrupter protection for personnel.

(c) Location. Any sign ~~installed inside a fountain~~ shall be at least 5 ft (1.52 m) inside the fountain measured from the outside edges of the fountain.

(d) Disconnect. A sign shall have a local disconnecting means in accordance ~~comply~~ with Section 600-6 and Section 680-12.

(e) Bonding and Grounding. A sign shall be grounded and bonded in accordance ~~Shall comply~~ with Section 600-7.

~~(f) Grounding. Any equipment associated with the sign shall be grounded as per Article 250.~~

VI. Pools and Tubs for Therapeutic Use

680-60. General. The provisions of Part I and Part VI shall apply to pools and tubs for therapeutic use in health care facilities, gymnasiums, athletic training rooms, and similar areas. See Section 517-3 for definition of health care facilities. Portable therapeutic appliances shall comply with Article 422.

680-61. Permanently Installed Therapeutic Pools. Therapeutic pools that are constructed in the ground, on the ground, or in a building in such a manner that the pool cannot be readily disassembled shall comply with Parts I and II of this article.

Exception: The limitations of Sections 680-22(A)(1) and (2) shall not apply where all lighting fixtures are of the totally enclosed type.

680-62. Therapeutic Tubs (Hydrotherapeutic Tanks). Therapeutic tubs, used for the submersion and treatment of patients, that are not easily moved from one place to another in normal use or that are fastened or otherwise secured at a specific location, including associated piping systems, shall conform to this part.

(a) Protection. Except as otherwise provided in this section, the outlet(s) that supplies a self-contained therapeutic tub or hydrotherapeutic tank, or a packaged therapeutic tub or hydrotherapeutic tank, or a field-assembled therapeutic tub or hydrotherapeutic tank ~~with a heater load of 50 amperes or less~~ shall be protected by a ground-fault circuit interrupter.

(1) Listed Units. Where so marked, a listed self-contained unit or listed packaged equipment assembly ~~marked to indicate~~ that includes integral ground-fault circuit-interrupter protection ~~is provided~~ for all electrical parts within the unit or assembly (pumps, air blowers, heaters, lights, controls, sanitizer generators, wiring, etc.) shall be permitted without additional GFCI protection.

~~not require that the outlet supply be protected by a ground fault circuit interrupter.~~

(2) Subdivided Loads. Where the load has been subdivided to comply with Section 680-9 or for other reasons, and where the unit is not rated 3 phase or over 250 volts, GFCI protection shall be provided for each subdivided portion of the load.

(3) Other Units. A ~~field assembled~~ therapeutic tub or hydrotherapeutic tank rated 3 phase or rated ~~greater than~~ over 250 volts shall not require the supply to be protected by a ground-fault circuit interrupter.

~~(b) Ground Fault Circuit Interrupter. A ground-fault circuit interrupter shall protect all therapeutic equipment.~~

~~Exception: Portable therapeutic appliances shall comply with Section 250-114.~~

(b) Bonding. The following parts shall be bonded together.

(1) All metal fittings within or attached to the tub structure.

(2) Metal parts of electrical equipment associated with the tub water circulating system, including pump motors.

(3) Metal-sheathed cables and raceways and metal piping that are within 5 ft (1.52 m) of the inside walls of the tub and not separated from the tub by a permanent barrier.

(4) All metal surfaces that are within 5 ft (1.52 m) of the inside walls of the tub and not separated from the tub area by a permanent barrier.

(5) Electrical devices and controls not associated with the therapeutic tubs shall be located a minimum of 5 ft (1.52 m) away from such units or they shall be bonded to the therapeutic tub system.

(d) Methods of Bonding. All metal parts associated with the tub shall be bonded by any of the following methods:

(1) The interconnection of threaded metal piping and fittings,

(2) Metal-to-metal mounting on a common frame or base,

(3) Connections by suitable metal clamps, or

(4) By the provision~~s~~ of a solid copper bonding jumper, insulated, covered, or bare, not smaller than No. 8

(e) Grounding.

(1) Fixed or Stationary Equipment. The following equipment shall be grounded:

(a) Location. All electrical equipment located within 5 ft (1.52 m) of the inside wall of the tub shall be grounded.

(b) Circulation System. All electrical equipment associated with the circulating system of the tub shall be grounded.

(2) Portable Equipment. Portable therapeutic appliances shall meet the grounding requirements in Section 250-114.

~~(f) Methods of Grounding.~~

~~1. All electrical equipment shall be grounded in accordance with Article 250 and connected by wiring methods of Chapter 3.~~

~~2. Where equipment is connected with a flexible cord, the equipment grounding conductor shall be connected to a fixed metal part of the assembly.~~

(g) Receptacles. All receptacles within 5 ft (1.52 m) of a therapeutic tub shall be protected by a ground-fault circuit interrupter.

(h) Lighting Fixtures. All lighting fixtures used in therapeutic tub areas shall be of the totally enclosed type.

VII. Hydromassage Bathtubs

680-70. General. Hydromassage bathtubs as defined in Section 680-2 shall comply with the provisions of this part. They shall not be required to comply with other parts of this article.

680-71. Protection. Hydromassage bathtubs and their associated electrical components shall be protected by a ground-fault circuit interrupter. All 125-volt, single-phase receptacles not exceeding 30 amperes and located within 5 ft (1.52 m) measured horizontally of the inside walls of a hydromassage tub shall be protected by a ground-fault circuit interrupter(s).

680-72. Other Electrical Equipment. Lighting fixtures, switches, receptacles, and other electrical equipment located in the same room, and not directly associated with a hydromassage bathtub, shall be installed in accordance with the requirements of Chapters 1 through 4 in this Code covering the installation of that equipment in bathrooms.

~~680-73. Accessibility. Hydromassage bathtub electrical equipment shall be accessible without damaging the building structure or building finish.~~

680-73. Bonding. All metal piping systems, metal parts of electrical equipment, and pump motors associated with the hydromassage tub shall be bonded together using a copper bonding jumper, insulated, covered, or bare, not smaller than No. 8 solid. Metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded.

SUBSTANTIATION: This rewrite has several overall objectives. First, it sets out straightforward requirements that electricians actually look for. For example, when you want to wire something, you need to know what wiring methods are appropriate. At key points, through the use of "wiring methods" headings, the rewrite does exactly that. The current NEC has the tail wagging the dog, as it only describes the wiring methods in the context of what could be used to enclose a grounding conductor. This not only unnecessarily confuses the article, it leads to overlapping and duplicative requirements, as frequently occurs between Section 680-20 and Section 680-25. The rewrite eliminates these difficulties.

This rewrite also addresses major editorial problems introduced in the prior NEC, where exceptions were converted to normal text without restructuring the main rule, and resulting in conflicting, orphaned, uncitable rules. In most cases the rewrite restructures the parent rule so as to correctly preserve the change to no exceptions, although the exception from was revived in a few instances.

Finally the rewrite addresses the demands of the new style manual, which will only permit topic subdivisions three layers deep. The new style manual also requires renumbering of the definitions section, elimination of Section 90-3 redundancies, changes the nomenclature on article parts, and other changes. These are covered in the specific substantiation that follows:

Section 680-2. This is the mandated section number for definitions. There is one technical change, the inclusion of definitions for fixed, stationary, and portable equipment. These terms are used all over Article 680, and should be defined here since CMP 1 has steadily refused to define them in Article 100.

Section 680-4. The new location of former Section 680-3.

Section 680-5. Former subsection (a) has been relocated into Part II of the article since it is a product requirement more closely related to other product requirements in the former Section 680-20. Although these transformers are used in other parts of the article, in every instance they're referred to as a specific cross reference [complying with Section 680-5(a)], and therefore, by simply modifying the cross reference in those few locations, the same effect results. Former Section 680-5(c) is a wiring requirement for wet-niche (and no-niche) fixture wiring only by virtue of the cross reference to Section 680-20(a)(1). This has been relocated into the branch-circuit wiring rules for these fixtures where it belongs, in Part II.

Section 680-6. Former Section 680-6 covered requirements that only applied to permanently installed pool installations, and this rewrite moves into Part II. On the other hand, former Section 680-24 includes grounding rules that apply throughout the article. In an effort to reduce the loading of Part II, this seemed a logical place to relocate this material, which otherwise needs to be repeated and repeated in each part of the article. Several grounding rules in other parts, which repeated this information, have been deleted accordingly. All that was necessary was converting "pool" to "contained body of water". In addition, since the rewritten Part II has unified grounding rules for all species of underwater fixtures, it simplified the section to use this terminology. The final change was to adapt and incorporate the generic grounding language of Section 680-25(e) into this

Section 680-7. This provision has been broadened beyond the former 20A limitation, since some applications now exceed that limit. In addition, since other article parts reference former Section 680-25(e), which is actually a generic requirement, it has been combined with this section, and deleted from Part II.

Section 680-8. This section has been restructured using much simple, positive language which has been broadened to include similar premises applications such as festoon lighting and messenger-supported open conductors. The errors in the last cycle of (1) making the table only applicable to observation stands, etc., and not to applications over the pool itself, and (2) the deletion of communications conductors, have been fixed. The prior inadvertent inclusion of indoor pools, which has been addressed in the NESC and also in the new Section 830-10(e) Exception No. 1, has been avoided. Finally, the term "complying with" has been changed to "covered in" in order to avoid a gap in code coverage when applications don't literally comply with all the requirements.

Section 680-9. Editorial revision because a load isn't "of" an equipment nameplate.

Section 680-12. Editorial revisions included in a separate proposal from the Massachusetts Electrical Code Advisory Committee. Please refer to that proposal for more detailed substantiation.

Section 680-20. A new section, made parallel throughout the remaining parts of the article, explaining what the part covers and what other parts of the article need to be applied simultaneously.

Section 680-21. Comprehensive rules on wiring motors in the permanently installed pool environment.

The first subsection (a) gives straightforward rules on wiring methods, and is essentially Section 680-25(c) relocated. Editorial changes include numbered and titled paragraphs for ease of citation, and proper setup language in the first paragraph to introduce the concept of modifications to the general rule in what follows without using exceptions. Flexible cord gets its own paragraph (a printing error in the 1999 NEC) so it won't be confused as only applying at dwellings. The dwelling rule has been technically corrected, since a bare equipment grounding conductor under the sheath of Type NM cable isn't actually covered within the definition in Article 100. In addition, the blanket Chapter 3 allowance has been slightly modified to remove Chapter 3 methods that don't include grounding or wiring assemblies, such as knob-and-tube.

The second subsection (b) is former Section 680-6(d) properly worded to cover "outlets" instead of "wiring" and all occupancies instead of only nonresidential applications. There wasn't any substantiation that supported a nonresidential restriction when the proposal was acted on, and it seems apparent that the original submitter was under the misapprehension that all residential applications already had a GFCI requirement. That, of course, isn't true. It also solves the problem of exactly what parameters are being measured in the ampere specification.

The third subsection (c) is the former Section 680-28 relocated with editorial changes to fit the new location.

Section 680-22. This is the new location of the former Section 680-6 with only editorial changes and titles to properly implement the elimination of exceptions in the prior cycle. The proximity rule for receptacles has been split apart so it is no longer a misworded, excessively long sentence. The expression "on the property" has been deleted throughout because it adds nothing to the requirement, and could be problematic under some condo-minimum forms of ownership. The fine print note on distance measurements appears to be a rule and this proposal makes it such. The proposal does suggest a technical change at this point, namely the deletion of the allowance to

count a doorway as an impenetrable barrier. This allowance does not exist in the comparable rule for spas and hot tubs. Very commonly people will evade the GFCI rule by leaving a door open and running a cord out to the pool area. If the pool is close to the house, this is a real problem.

The changes on area lighting are purely editorial as well, with one exception. In the 1996 NEC, Section 680-6(b)(1) Exception No. 2 implied that a paddle fan had to be totally enclosed, an obvious impossibility. However, it pro-vided the inspector with some leverage to ask that the installer follow a logical provision in the UL Orange Book, Guide Card GPRT. This mentions a type of paddle fan that has survived a water spray test, which seems appropriate for a fan hanging only 7.5 ft over a pool. The language in item (2) of Section 680-22(b)(3) directly quotes the Orange Book reference to that end. The reference in (5) to Section 680-7 on cord connections has been eliminated because Section 680-20 makes Part I rules mandatory for these applications.

Section 680-23. This is the new home of Section 680-20, with Section 680-25(b) rules included. All the formerly unnumbered paragraphs now have titles and independent numbering for ease in citation. Now a code user only needs to go to one section, titled "Underwater Lighting Fixtures" to get all the rules on wiring these fixtures and their circuits, with the exception of junction boxes and enclosures, and these still show up in the very next section. Section 680-23(a)(2) is the relocation of former §680-5(a). The previous allowance for an "identified" transformer has been changed here to "listed" to reflect current practice. Authorities having jurisdiction aren't making evaluations of this equipment and listed transformers are readily available.

Subsection (b) covers wet-niche fixtures with independently titled and citable paragraphs. Paragraph (1) includes language clarifying the implication in the 4th paragraph of 1999 Section 680-20(b)(1) ("with provisions for terminating in the forming shell") that forming shells used with nonmetallic conduit must include terminals for the No. 8 grounding conductor. The editorial sequence then runs from the forming shell out of the pool and back towards the home run, thereby leading the reader logically to the next section on enclosures. Paragraph (2)(a) includes an express allowance for the brass conduit to be approved instead of listed, thereby modifying Section 346-1. CMP 8 has been doctrinaire in its refusal to lift the listing requirement under any circumstances, and there isn't any listed brass conduit now in production. Heavy wall brass conduit, in every way suitable except for the listing, is available, and this wording allows the authority having jurisdiction to take this into account. Otherwise the elaborate requirements of this article that assume the practical possibility of brass conduits, such as the new bonding grid allowance, are all for nothing. Paragraph (5) is the relocation of former Section 680-25(b)(5).

Subsection (c) covers dry-niche fixtures. Since the wiring methods for underwater fixtures has converged over the years, the specific wiring rules have been relocated to a unified subsection on wiring methods in (e).

Subsection (d) has no substantive changes. The listing requirement has been dropped because it duplicates the requirement in Section 680-23(a)(8). The additional construction reference reflects the fact that Section 680-23(b)(3) contains a product requirement which formerly appeared in §680-25(b)(5), and which would otherwise be lost from the Code.

Subsection (e) continues the process of working from the pool out by incorporating the requirements for branch-circuit wiring on the supply side of dry-niche fixtures, and the supply side of pool junction boxes and enclosures for wet- or no-niche fixtures. All of these fixtures now have identical wiring method rules, and former Section 680-25(b)(2-3) now appear in (1). The exception for flexible connections has been relocated to this point, correcting an error in the 1999 NEC. The specialized equipment grounding conductor rules (no joint or splice, etc.) in former Section 680-25(b)(1, first half of 4) move here. Finally, former Section 680-5(c) arrives to cover separation rules between these conductors and other conductors in panels and in common raceways.

Section 680-24. This is the current Section 680-21 with only editorial changes for increased clarity and to meet the new style manual requirements on list items, and to provided titles as required. New subsection (f) incorporates what used to be the last half of former Section 680-25(b)(4) as a stand-alone set of grounding requirements which primarily apply to the overall subject of this section.

Section 680-25. This is the material formerly located in Section 680-25(d) It opens with clarifying language as to what feeders actually get covered. Since the principal impact of these rules, again, is on wiring method selection and wiring procedures in conjunction with installing the feeders, that seemed a better title for the section. The baggage about "used to protect the conductors" that was left over from the grounding location has been eliminated as unnecessary, along with the article references. The new style manual cautions against reiterating material implicit in Section 90-3, along with encouraging brevity, and this rewrite addresses both objectives. The language covering an existing feeder has been restored to an exception format since it otherwise directly conflicts with the main rule, and there isn't any other neat editorial fix for this.

Subsection (b) covers the special grounding rules. Since the section now directly addresses feeders instead of devices, and since a feeder will exist at any point between the source and the branch-circuit panelboard, the 1999 change that included disconnects is no longer necessary. The reference to 250-122 addresses the section and not the table because actually you only get to the table by way of the section. In addition, these applications frequently involve motor circuits which may make use of some of the specific provisions of Section 250-122 as well as its table. 680-21(a)(1) has the same change for the same reason.

Section 680-26. This is the former Section 680-22 with no substantive changes. The opening language properly restores the former FPN as truly advisory language by splitting out only the performance language, which is a rule, and leaving that in the mandatory section. There are editorial changes designed to improve readability and citability on the part of inspectors. The principal statements in (b) have been made complete sentences in order to transform a list into a sequence of requirements. This is more appropriate given the complex nature of many of the items. Section 680-26(b)(2) includes a minor technical change in that the low-voltage exclusion would only apply to nonmetallic forming shells. This seems to agree with the originating substantiation, and it removes the possibility that a substantial body of metal enclosing a fixture and in contact with pool water might be omitted from the bonding grid.

Section 680-27. This becomes a catch point for the former independent sections on underwater audio, pool covers, and deck area heating. There aren't any substantive changes, only minor editorial one chiefly reflected in the demoted status of the material. The reason for the demotion is to preserve some section numbers for the future, now that the new style manual requires parts to begin with even decade numberings. The alternative would be to preserve the section status for these items (which would become sections 27, 28, and 29) and then bump all the numbers in Parts III, IV, V, VI, and VII upwards by 10.

Section 680-30. This is the statement of applicability, paralleling other parts.

Section 680-33. These changes are primarily editorial aimed at making the lists in each subsection cover a coherent subject and moving the rules into the parent text. There is a minor technical change addressing low-voltage lighting assemblies, for which common sense and apparent intent indicate should only go in the walls of these pools, and not the bottoms. The literal text of the prior code, however, only addressed wall mounted fixtures, leaving a gap in the rules should someone attempt a floor installation. This proposal addresses this point on both the low-voltage and the line-voltage fixtures. As I recall, guide card restrictions also preclude floor installations, but the code should include the proper language.

Section 680-40. The parallel statement of applicable requirements for this part. The section number begins on the decade, in accordance with revised style manual requirements.

Section 680-41. The former Section 680-38 relocated and with a minor change to assist readability. The phrase "at a point" provides a verbal "hinge" so the reader transitions from what has to be installed into exactly where the installation takes place.

Section 680-42. This is the old Section 680-40, but rewritten to incorporate CMP 20 actions on Proposals 20-170, 171, and 172 in the last cycle. There are three substantive changes, all accepted and then inadvertently discarded as the panel did unrelated editorial work during the comment period. Specifically the rewrite includes the provision for the reference to Part II to apply to requirements that would otherwise apply to an outdoor pool; it addresses the newly defined equipment assemblies and self-contained units; and it added control panels to the list of possible applications.

Section 680-43 The second paragraph of the opening subsection has been returned to an exception format because there isn't any simpler way to cleanly state the allowance, an allowance that directly conflicts with the principal rule. As in other locations, the phrase "on the property" has been removed, and for the same reasons. The former FPN on measurements has been converted to a rule, which, after all, is what it actually is. The subsection on fixture and paddle fan mounting incorporates a Massachusetts Electrical Code Advisory Committee proposal restoring the coverage of underwater lighting fixtures that was dropped inadvertently and in violation of TCC express instructions in the previous cycle. The cross references, however, have been made explicit in view of current style manual preference. In addition, there is some editorial reformatting to recast the requirements as positive text and read more easily. The provisions of the text allowing for fixtures to be mounted at lower heights have been made into complete sentences so they will format as rules and not a list.

Former subsections (g) and (h) have been dropped since they exactly duplicate material now in Part I. The rules on grounding methods now appear in Section 680-6 and Section 680-7. And the water heater load subdivision rule appears in Section 680-9. The underwater audio rule deletes the reference to storable pools because they don't cover underwater audio. This reference entered the Code in 1987, apparently in error. The panel was adding storable pool references to Section 680-41(b) (the same ones that inadvertently fell out in the 1999 cycle) (see A86TCR 20-89 and 20-90), and also, simultaneously, adding underwater audio to spas and hot tubs. By the action on A86TCD 20-25, the panel created this subsection. The panel statement stated that "the change in-corporated by Proposal 20-90 remains." Although 20-90 only addressed adding storable pools to 680-41(b), the panel statement seems to have been misinterpreted by staff to mean that storable pools had to go into both locations. Given present (and former) provisions in Part C, this just isn't tenable.

Section 680-44. This contains a technical change, in that it fully addresses the concerns expressed at the 1998 Annual Meeting. No one, by virtue of field installation, should be able to build to a lesser standard of performance than a manufacturer subject to the listing process. Nevertheless, if I field construct and install a unit with, for example two 40A heater loads, total heater load of 80A, no GFCI requirement applies. Granted, 100A GFCI devices aren't available, but 50A devices are available, as are 60A devices. A 60A device will accommodate the largest heater load permitted without subdivision, namely, 48A. Therefore, any spa or hot tub, of whatever total heater loading, is within the range of commercially available GFCI protective devices unless the voltage exceeds 250 or the heaters are three-phase. The listed variety has comprehensive GFCI protection, and the field constructed units need not supply this protection unless their load falls to 50A or less. This in spite of the fact that the larger units present a somewhat greater shock exposure than smaller units. The present language stands these principles on their head and should be corrected.

The other changes are purely editorial, designed to eliminate a list comprised of such simple terms that a simple sentence flows better, and to create independently numbered and easily citable paragraphs.

Section 680-50. Minor editorial changes, and, to clarify the status of the portable fountain, language was added corresponding to the last sentence of §680-60, which addresses a comparable problem.

Section 680-52. This has editorial changes only, which make the former hanging second paragraph independently citable by including it in the numbered rules. In addition, the list items have been reformatted using complete sentences to make them rules. Although some of the items could be on a list, some of them state complex requirements, and the proposed language creates editorial consistency.

Section 680-53. This is unchanged. Note that the FPN (unchanged in this proposal) uses the correct reference to "Section" (not "Table") 250-122 in instances where motor circuits or other special rules may apply.

Section 680-55. The former reference, to Section 680-25 excluding -25(e), needs correlation with changes in Part II, herein supplied.

Section 680-57. The sign rules have been reformatted using titles and complete sentences as required for this level of detail by the new style manual. Since the relevant bonding and grounding rules for signs both occur in the same section, those topics have been combined in this proposal.

Section 680-60. The usual statement as to applicability of parts. For clarity, an express reference to Part I has been included.

Section 680-62. This is a substantive change, and the language and substantiation exactly parallel that covered in the proposed Section 680-44 revisions. The substantive only change between them is the common bonding allowance which applies to spas and hot tubs doesn't apply here, and has been omitted for that reason. Note that former Section 680-62(b), retained in the 1999 NEC due to a panel error, actually required GFCI for all of these units, and therefore directly conflicted with the new 1999 provisions. This proposal removes that obsolete provision. The portable equipment rule covered in the exception would otherwise be lost, and has been re-worded as positive text and relocated to Section 680-62(e)(2). The grounding rules at this point are stated as complete sentences so they will get letter designations as rules. The "methods of grounding" subsection has been deleted because it completely duplicates provisions in Section 680-6 and 680-7.

Section 680-70. The statement of applicability of provisions in the article. This one is important, because major controversies have erupted over applicability of Part I rules to this equipment, which was never intended. Some authorities having jurisdiction, for example, are insisting that cord-connected hydromassage tubs use No. 12 cord not over 3 ft long, as covered in Section 680-7. On the literal text of the Code, it would be hard to argue to the contrary.

Section 680-71. The only change here is an upper limit on the ampere rating of the receptacle to which the GFCI rule applies. Without this the rule could be abused. As covered in the 1999 changes in Section 305-6(a), 30A 125V GFCI circuit protective devices are readily available.

Section 680-73. This section adds nothing to the Code not already addressed in Section 110-26 and 110-26(c). The new style manual cautions against reiterating requirements for which Section 90-3 provides the remedy. In this case, the provisions in the Chapter 1 Article 110 apply because nothing in the Chapter 6 Article 680 modifies them. The section can be deleted without changing any requirements. I have used Section 110-26 for years to get access doors provided for this equipment.

The following tabular reference tracks the relationship between the 1999 NEC and this proposal.

Tabular cross reference for comparison between proposed and the 1999 version of Article 680

NEW (PROPOSED)—680-	OLD (1999 NEC)—680-
1	1
2	4
3	3
4	2
5	5(b)
6	24
7(a and b)	7
7(c)	25(e)
8	8
9	9
10	10
11	11
12	12
20 (new)	
21(a)	25(c)
21(b)	6(d)
21(c)	28
22(a)	6(a)
22(b)	6(b)
22(c)	6(c)
23	20
23(a)(1)	20(a)(1) 1st ¶
23(a)(2)	5(a)
23(a)(3)	20(a)(1) 2nd ¶
23(a)(4)	20(a)(2)
23(a)(5)	20(a)(3)
23(a)(6)	20(a)(4)
23(a)(7)	20(a)(5)
23(a)(8)	20(a)(1) 3rd ¶

NEW (PROPOSED)—680-	OLD (1999 NEC)—680-
23(b)(1)	20(b)(1) 1st ¶; 20(b)(1) 4th ¶, 1st, 3rd sentences
23(b)(2)	20(b)(1) 2nd ¶
23(b)(3)(a)	20(b)(1) 3rd ¶
23(b)(3)(b)	20(b)(1) 4th ¶, 1st, 2nd sentences
23(b)(3)	25(b)(5)
23(b)(4)	20(b)(2)
23(b)(5)	20(b)(3)
23(c)(1)	20(c) 1st ¶
23(c)(2)	20(c) 2nd ¶, 4th sentence
23(d)	20(d)
23(e)(1)	25(b)(2-3); 20(c) 2nd ¶, 1st, 2nd, 3rd sentences
23(e)(2)	25(b)(1); 25(b)(4), 3rd sentence
23(e)(2) Ex.	25(b)(3) Ex.
23(e)(2)(a)	25(b)(4)(a)
23(e)(2)(b)	25(b)(4)(b)
23(e)(3)	5(c)
24(A-E)	21
24(f)	25(b)(4), 1st, 2nd sentences
25	25(d)
26	22
27(a)	23
27(b)	26
27(c)	27
30 (new)	
31	30
32	31
33	32
40 (new)	
41	38
42	40
43	41
44	42
50	50
51	51
52	52
53	53
54	54
55	55
56	56
57	57
60	60
61	61
62	62
70 (new)	
71	70
72	71
	72 (deleted)
73	73

PANEL ACTION: Accept in Principle in Part.

Revise the submitter's proposed text as follows:

Also see Proposal 20-30a.

Accept Proposal 20-31 in Principle; Revise Article 680 as follows:

ARTICLE 680—Swimming Pools, Fountains, and Similar Installations

I General

680.1 Scope

The provisions of this article apply to the construction and installation of electrical wiring for and equipment in or adjacent to all swimming, wading, therapeutic, and decorative pools, fountains, hot tubs, spas, and hydromassage bathtubs, whether permanently installed or storable, and to metallic auxiliary equipment, such as pumps, filters, and similar equipment.

680.2 Definitions.

Cord- and Plug-Connected Lighting Assembly. A lighting assembly consisting of a lighting fixture intended for installation in the wall of a spa, hot tub, or storable pool, and a cord- and plug-connected transformer.

Dry-Niche Lighting Fixture. A lighting fixture intended for installation in the wall of a pool or fountain in a niche that is sealed against the entry of pool water.

Equipment—Fixed. Equipment that is fastened or otherwise secured at a specific location.

Equipment—Portable. Equipment that is actually moved or can easily be moved from one place to another in normal use.

Equipment—Stationary. Equipment that is not easily moved from one place to another in normal use.

Forming Shell. A structure designed to support a wet-niche lighting fixture assembly and intended for mounting in a pool or fountain structure.

Fountain. ~~As used in this article, the term includes~~ Fountains, ornamental pools, display pools, and reflection pools. ~~It~~ The definition does not include drinking fountains.

Hydromassage Bathtub. A permanently installed bathtub equipped with a recirculating piping system, pump, and associated equipment. It is designed so it can accept, circulate, and discharge water upon each use.

Maximum Water Level. The highest level that water can reach before it spills out.

No-Niche Lighting Fixture. A lighting fixture intended for installation above or below the water without a niche.

Packaged Spa or Hot Tub Equipment Assembly. A factory-fabricated unit consisting of water-circulating, heating, and control equipment mounted on a common base, intended to operate a spa or hot tub. Equipment ~~may~~ can include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Packaged Therapeutic Tub or Hydrotherapeutic Tank Equipment Assembly. A factory-fabricated unit consisting of water-circulating, heating, and control equipment mounted on a common base, intended to operate a therapeutic tub or hydrotherapeutic tank. Equipment ~~may~~ can include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Permanently Installed Decorative Fountains and Reflection Pools. Those that are constructed in the ground, on the ground, or in a building in such a manner that the fountain cannot be readily disassembled for storage, whether or not served by electrical circuits of any nature. These units are primarily constructed for their aesthetic value and are not intended for swimming or wading.

Permanently Installed Swimming, Wading, and Therapeutic Pools. Those that are constructed in the ground or partially in the ground, and all others capable of holding water in a depth greater than 1.1 m (42 in.), and all pools installed inside of a building, regardless of water depth, whether or not served by electrical circuits of any nature.

Pool. ~~As used in this article, the term includes~~ Manufactured or field-constructed equipment designed to contain water on a permanent or semi-permanent basis and used for swimming, wading, ~~and~~ or ~~permanently installed~~ therapeutic ~~pools~~ purposes.

Pool Cover, Electrically Operated. Motor-driven equipment designed to cover and uncover the water surface of a pool by means of a flexible sheet or rigid frame.

Self-Contained Spa or Hot Tub. Factory-fabricated unit consisting of a spa or hot tub vessel with all water-circulating, heating, and control equipment integral to the unit. Equipment ~~may~~ can include pumps, air blowers, heaters, lights, controls, sanitizer generators, etc.

Self-Contained Therapeutic Tubs or Hydrotherapeutic Tanks. A factory-fabricated unit consisting of a therapeutic tub or hydrotherapeutic tank with all water-circulating, heating, and control equipment integral to the unit. Equipment may include pumps, air blowers, heaters, light controls, sanitizer generators, etc.

Spa or Hot Tub. A hydromassage pool, or tub for recreational or therapeutic use, not located in health care facilities, designed for immersion of users, and usually having a filter, heater, and motor-driven blower. It may be installed indoors or outdoors, on the ground or supporting structure, or in the ground or supporting structure. Generally, a spa or hot tub is not designed or intended to have its contents drained or discharged after each use.

Storable Swimming or Wading Pool. Those that are constructed on or above the ground and are capable of holding water to a maximum depth of 1.0 m (42 in.), or a pool with nonmetallic, molded polymeric walls or inflatable fabric walls regardless of dimension.

Through-Wall Lighting Assembly. A lighting assembly intended for installation above grade, on or through the wall of a pool, consisting of two interconnected groups of components separated by the pool wall.

Wet-Niche Lighting Fixture. A lighting fixture intended for installation in a forming shell mounted in a pool or fountain structure where the fixture will be completely surrounded by water.

680.3 Other Articles

Except as modified by this article, wiring and equipment in or adjacent to pools and fountains shall comply with other applicable provisions of this Code, including those provisions identified in Table 680.3.

Table 680.3 Other Articles

Topic	Section or Article
Wiring	Chapters 1 - 4
Junction box support	370.23
Rigid nonmetallic conduit	347.3
Audio Equipment	Article 640, Parts I and II
Adjacent to pools and fountains	640.10
Underwater speakers*	

*Note: Underwater loudspeakers shall be installed in accordance with 680.27(A).

~~**(A) Wiring.** Except as modified by this section article, wiring and equipment in or adjacent to pools and fountains shall comply with the applicable requirements of Chapters 1 through 4.~~

~~FPN: See Section 370.23 for junction boxes and Section 347.3 for rigid nonmetallic conduit.~~

~~**(B) Audio Equipment.** The installation and wiring of audio equipment adjacent to pools and fountains shall comply with the applicable requirements of Article 640. Underwater loudspeakers shall be installed in accordance with Section 680.23.~~

680.4 Approval of Equipment

All electrical equipment installed in the water, walls, or decks of pools, fountains, and similar installations shall comply with the provisions of this article.

680.5 Ground-Fault Circuit Interrupters.

~~A~~ Ground-fault circuit interrupters (GFCI) shall be ~~a~~ self-contained units, ~~or a~~ circuit-breaker or receptacle types, or other ~~approved~~ listed types.

680.6 Grounding.

Electrical equipment shall be grounded in accordance with Parts V, VI, and VII of Article 250 and connected by wiring methods of Chapter 3, except as modified by this article. The following equipment shall be grounded:

(1) ~~Wet niche and no niche~~ Through-wall lighting assemblies and underwater lighting fixtures, other than those low-voltage systems listed for the application without a grounding conductor

~~2. Dry niche underwater lighting fixtures~~

(2) All electrical equipment located within 1.5 m (5 ft) of the inside wall of the pool or fountain

(3) All electrical equipment associated with the recirculating system of the pool or fountain

(4) Junction boxes

(5) Transformer enclosures

(6) Ground-fault circuit interrupters

(7) Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the pool or fountain

680.7 Cord- and Plug-Connected Equipment.

Fixed or stationary equipment ~~rated 20 amperes or less~~, other than an underwater lighting fixture for a permanently installed pool, shall be permitted to be connected with a flexible cord to facilitate the removal or disconnection for maintenance or repair.

(A) Length. For other than storable pools, the flexible cord shall not exceed 900 mm (3 ft) in length.

(B) Equipment Grounding. The flexible cord ~~and~~ shall have a copper equipment grounding conductor sized in accordance with 250.122 but not smaller than No. 12. The cord shall terminate in ~~with~~ a grounding-type attachment plug.

(C) Construction. The equipment grounding conductors shall be connected to a fixed metal part of the assembly. The removable part shall be mounted on or bonded to the fixed metal part.

~~FPN: See Section 680.25(c) for connection with flexible cords.~~

~~(f) Other Equipment. Other electrical equipment shall be grounded in accordance with Article 250 and connected by wiring methods of Chapter 3.~~

680.8 Overhead Conductor Clearances.

(A) Power. With respect to service drop conductors and open overhead wiring, swimming pool and similar installations shall comply with the minimum clearances given in Table 680.8 and illustrated in Figure 680.8.

~~The following parts of pools shall not be placed under existing service-drop conductors or any other open overhead wiring; nor shall such wiring be installed above the following:~~

~~1. Pools and the area extending 10 ft (3.05 m) horizontally from the inside of the walls of the pool,~~

~~2. Diving structure, or~~

~~3. Observation stands, towers, or platforms unless the installations provide the clearances in Table 680.8.~~

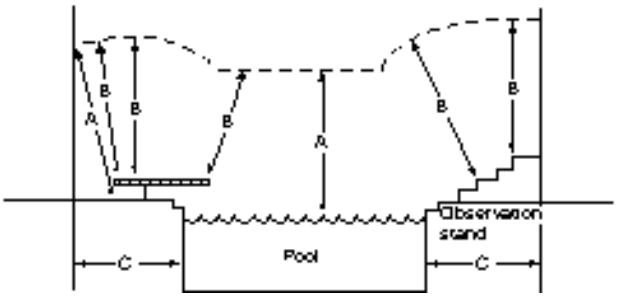


Figure 680.8 Clearances from Pool Structures

Table 680.8 Overhead Conductor Clearances

	Insulated Supply or Service Drop Cables, 0–750 Volts to Ground, Supported on and Cabled Together with an Effectively Grounded Bare Messenger or Effectively Grounded Neutral Conductor		All Other Supply or Service-Drop Conductors Voltage to Ground			
			0 through 15 kV		Over 15 through 50 kV	
	m	ft	m	ft	m	ft
A Clearance in any direction to the water level, edge of water surface, base of diving platform, or permanently anchored raft	6.7	22	7.5	25	8.0	27
B Clearance in any direction to the observation stand, tower, or diving platform ~~or tower~~.	4.3	14	5.2	17	5.5	18
C Horizontal limit of clearance measured from inside wall of the pool	This limit shall extend to the outer edge of the structures listed in ~~1~~A and ~~2~~B of this Table, but not less than 3 m (10 ft).					

(B) Communications Systems. Communication, radio, and television ~~Community antenna system~~ coaxial cables ~~complying~~ covered by Articles 800 through ~~with Article~~ 820 shall be permitted at a height of not less than 3.0 m (10 ft) above swimming and wading pools, diving structures, and observation stands, towers, or platforms.

(C) Network-Powered Broadband Communications Systems. The minimum clearances for overhead network-powered broadband communications systems conductors from pools or fountains shall comply with the provisions in Table 680.8 for conductors operating at 0 to 750 volts to ground.

~~FPN: See Sections 225-18 and 225-19 for clearances for conductors not covered by this section.~~

680.9 Electric Pool Water Heaters.

All electric pool water heaters shall have the heating elements subdivided into loads not exceeding 48 amperes and protected at not ~~more than~~ over 60 amperes. The ampacity of the branch-circuit conductors and the rating or setting of overcurrent protective devices shall not be less than 125 percent of the total nameplate-rated load ~~of the nameplate rating~~.

680.10 Underground Wiring Location.

Underground wiring shall not be permitted under the pool or within the area extending 1.5 m (5 ft) horizontally from the inside wall of the pool unless this wiring is necessary to supply pool equipment permitted by this article. Where space limitations prevent wiring from being routed 1.5 m (5 ft) or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be as ~~follows.~~ given in Table 680.10.

Table 680.10 Minimum Burial Depths

Wiring Method	Minimum Burial	
	mm	in.
Rigid metal conduit	150	6
Intermediate metal conduit	150	6
Nonmetallic raceways listed for direct burial without concrete encasement	450	18
Other approved raceways*	450	18

~~Note: For SI units, 1 in. = 25.4 mm.~~

* Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 50 mm (2 in.) thick.

680.11 Equipment Rooms and Pits.

Electric equipment shall not be installed in rooms or pits that do not have ~~adequate drainage to prevent~~ drainage that adequately prevents water accumulation during normal operation or filter maintenance.

680.12 Maintenance Disconnecting Means.

~~One or more a disconnecting means shall be provided and be accessible, located within sight from all pools, spas, and installed for motor-operated pool, spa, or hot tub equipment, and for pool, spa, or hot tub heating equipment. The disconnecting means shall be accessible and located within sight of the equipment supplied, at a point at least 1.5 m (5 ft.) horizontally from the inside walls of the pool, spa, or hot tub.~~

One or more disconnecting means from all ungrounded conductors shall be provided for all utilization equipment other than lighting. Each means shall be accessible and within sight from its equipment.

II Permanently Installed Pools

680.20 General.

Electrical installations at permanently installed pools shall comply with the provisions of Part I and Part II.

680.21 Motors.

(A) Wiring Methods.

(1) General. The branch circuits for pool-associated motors shall be installed in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or Type MC cable listed for the location ~~application~~. Other wiring methods and materials shall be permitted in specific locations or applications as covered in this section. Any wiring method employed shall contain a copper equipment grounding conductor sized in accordance with ~~Table~~ 250.122 but not smaller than No. 12.

(2) On or Within Buildings. Where installed on or within buildings, electrical metallic tubing shall be permitted ~~to be used to protect the conductors~~.

(3) Flexible Connections. Where necessary to employ flexible connections at or adjacent to the motor, liquidtight flexible metal or nonmetallic conduit with approved fittings shall be permitted.

(4) One-Family Dwellings. In the interior of ~~a~~ one-family dwellings, or in the interior of ~~another~~ accessory buildings ~~or structure~~ associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code shall be permitted that comply with the provisions of this paragraph.. ~~that contain a copper equipment grounding conductor that is insulated or covered by the outer sheath of the wiring method and is not smaller than No. 12 shall be permitted to be used for the connection of pool-associated motors.~~ Where run in a raceway the equipment grounding conductor shall be insulated. Where run in a cable assembly, the equipment grounding conductor shall be permitted to be uninsulated, but it shall be enclosed within the outer sheath of the cable assembly.

(5) Cord- and Plug-Connections. Pool-associated motors shall be permitted to employ cord- and plug-connections. The flexible cord shall not exceed 900 mm (3 ft) in length. The flexible cord shall include an equipment grounding conductor sized in accordance with Section 250.122 and shall terminate in a grounding-type attachment plug.

(B) Double Insulated Pool Pumps. A ~~permanently installed pool shall be permitted to be provided with~~ listed cord- and plug-connected pool ~~pumps~~ pump incorporating an approved system of double insulation that provides a means for grounding only the internal and nonaccessible, noncurrent-carrying metal parts of the pump shall be connected to any wiring method recognized in Chapter 3 that is suitable for the location.

680.22 Area Lighting, Receptacles, and Equipment.

(A) Receptacles.

(1) Circulation and Sanitation System, Location. Receptacles that provide power for water-pump motors or for other loads directly related to the circulation and sanitation system shall be located at least 3.0 m (10 ft) from the inside walls of the pool, or not less than 1.5 m (5 ft) from the inside walls of the pool if they meet all of the following conditions:

(1) Consist of single receptacles
(2) Employ a locking configuration
(3) Are of the grounding type
(4) Have GFCI protection

~~a permanently installed pool or fountain, as permitted in Section 680-7, shall be permitted between 5 ft and 10 ft (1.52 m and 3.05 m) from the inside walls of the pool or fountain, and, where so located, shall be single and of the locking and grounding types and shall be protected by a ground-fault circuit interrupter(s).~~

(2) Other Receptacles, Location. Other receptacles ~~on the property~~ shall be ~~located at least~~ not less than 3.0 m (10 ft) from the inside walls of a pool ~~or fountain~~.

(3) Dwelling Unit(s). ~~Where~~ If a permanently installed pool is installed at a dwelling unit(s), ~~at least~~ no fewer than one 125-volt 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located ~~a minimum of~~ not less than 1.5 m (5 ft) from and not more than 6.0 m (20 ft) from the inside wall of the pool. This receptacle shall be located not more than 2.0 m (6 ft 6 in.) above the floor, platform, or grade level serving the pool.

(4) Restricted Space. Where a pool is within 3.0 m (10 ft) of a dwelling and the dimensions of the lot preclude meeting the required clearances, not more than one receptacle outlet shall be permitted if not less than 1.5 m (5 ft) measured horizontally from the inside wall of the pool.

(5) GFCI Protection. All 125-volt receptacles located within 6.0 m (20 ft) of the inside walls of a pool or fountain shall be protected by a ground-fault circuit interrupter. ~~Wiring~~ Receptacles supplying pool pump motors from branch circuits with short-circuit and ground-fault protection rated 15 ~~and~~ or 20 amperes, ~~125 volt or~~ 120 volt through 240 volt, single phase, shall be provided with GFCI protection.

(6) Measurements. ~~FPN:~~ In determining the ~~above~~ dimensions in this section addressing receptacle spacings, the distance to be measured ~~is~~ shall be the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier.

(B) Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans.

(1) New Outdoor Installation Clearances. In outdoor pool areas, lighting fixtures, lighting outlets, and ceiling-suspended

(paddle) fans installed above the pool or the area extending 1.5 m (5 ft) horizontally from the inside walls of the pool shall ~~not~~ be installed at a height not less than 3.7 m (12 ft) above the maximum water level ~~over~~ of the pool. ~~or over the area extending 5 ft (1.52 m) horizontally from the inside walls of a pool unless no part of the lighting fixture or ceiling suspended (paddle) fan is less than 12 ft (3.66 m) above the maximum water level.~~

(2) Indoor Clearances. For installations in indoor pool areas, the clearances shall be the same as for outdoor areas unless modified as provided in this paragraph. If the branch circuit supplying the equipment is protected by a ground-fault circuit-interrupter, the following equipment shall be permitted at a height not less than 2.3 m (7 ft 6 in). above the maximum pool water level: ~~the limitations of Section 680.6(b)(1) shall not apply if all of the following conditions are complied with~~

(1) Totally enclosed fixtures.

(2) Ceiling-suspended (paddle) fans identified for use beneath ceiling structures such as provided on porches or patios. ~~A ground-fault circuit interrupter is installed in the branch circuit supplying the fixture(s) or ceiling suspended (paddle) fans, and c. The distance from the bottom of the fixture or ceiling suspended (paddle) fan to the maximum water level is not less than 7 ft 6 in. (2.29 m).~~

(3) Existing Installations. Existing lighting fixtures and lighting outlets located less than 1.5 m (5 ft) measured horizontally from the inside walls of a pool shall be ~~at least~~ not less than 1.5 m (5 ft) above the surface of the maximum water level, shall be rigidly attached to the existing structure, and shall be protected by a ground-fault circuit interrupter.

(4) GFCI Protection in Adjacent Areas. Lighting fixtures, ~~and~~ lighting outlets, and ceiling-suspended (paddle) fans installed in the area extending between 1.5 m (5 ft) and 3.0 m (10 ft) horizontally from the inside walls of a pool shall be protected by a ground-fault circuit interrupter unless installed not less than 1.5 m (5 ft) above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool.

(5) Cord- and Plug-Connected Lighting Fixtures. Cord- and plug-connected lighting fixtures shall comply with the requirements of Section 680.7 ~~meet the same specifications as other cord- and plug-connected equipment as set forth in Section 680.7~~ where installed within 4.9 m (16 ft) of any point on the water surface, measured radially.

(C) Switching Devices. Switching devices ~~on the property~~ shall be located at least 1.5 m (5 ft) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall, or other permanent barrier. Alternatively, a switch that is listed as being acceptable for use within 1.5 m (5 ft) shall be permitted.

680.23 Underwater Lighting Fixtures.

~~Paragraphs (a) through (d) apply to~~ This section covers all lighting fixtures installed below the normal water level of the pool.

(A) General.

(1) Fixture Design, Normal Operation. The design of an underwater lighting fixture supplied from a branch circuit either directly or by way of a transformer meeting the requirements of ~~Section 680.5(a)~~ this section shall be such that, where the fixture is properly installed without a ground-fault circuit interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping).

(2) Transformers. Transformers used for the supply of underwater fixtures, together with the transformer enclosure, shall be ~~identified~~ listed for the purpose. The transformer shall be an isolated winding type with an ungrounded seconary that has a grounded metal barrier between the primary and secondary windings.

(3) GFCI Protection, Relamping. ~~In addition,~~ A ground-fault circuit interrupter shall be installed in the branch circuit supplying fixtures operating at more than 15 volts, so that there is no shock hazard during relamping. The installation of the ground-fault circuit interrupter shall be such that there is no shock hazard with any likely fault-condition combination that involves a person in a conductive path from any ungrounded part of the branch circuit or the fixture to ground.

(4) Voltage Limitation. No lighting fixtures shall be installed for operation on supply circuits over 150 volts between conductors.

(5) Location, Wall Mounted Fixtures. Lighting fixtures mounted in walls shall be installed with the top of the fixture lens ~~at least~~ not less than 450 mm (18 in.) below the normal water level of the pool, unless the lighting fixture is listed and identified for use at lesser depths. No fixture shall be installed ~~a depth of not~~ less than 100 mm (4 in.) below the normal water level of the pool.

(6) Bottom-Mounted Fixtures. A lighting fixture facing upward shall have the lens adequately guarded to prevent contact by any person.

(7) Dependence on Submersion. Fixtures that depend on submersion for safe operation shall be inherently protected against the hazards of overheating when not submerged.

(8) Compliance. Compliance with ~~this~~ these requirements shall be obtained by the use of a listed underwater lighting fixture, and by installation of a listed ground-fault circuit interrupter in the branch circuit or a listed transformer for fixtures operating at not more than 15 volts.

(B) Wet-Niche Fixtures.

(1) Forming Shells. Forming shells shall be installed for the mounting of all wet-niche underwater fixtures and shall be equipped with provisions for conduit entries. Metal parts of the fixture and forming shell in contact with the pool water shall be of brass or other approved corrosion-resistant metal. All forming shells used with nonmetallic conduit systems, other than those that are part of a listed low-voltage lighting system not requiring grounding, shall include provisions for terminating a No. 8 copper conductor.

(2) Wiring Extending Directly to the Forming Shell. Conduit shall ~~extend~~ be installed from the forming shell to a suitable junction box or other enclosure located as provided in 680.24. Conduit shall be rigid metal, intermediate metal, liquidtight flexible nonmetallic, or rigid nonmetallic.

(a) Metal Conduit. Metal conduit shall be approved, and shall be of brass or other approved corrosion-resistant metal.

(b) Nonmetallic Conduit. Where a nonmetallic conduit is used, a No. 8 insulated solid or stranded copper equipment grounding conductor shall be installed in this conduit unless a listed low-voltage lighting system not requiring grounding is used. ~~with provisions for terminating in~~ The equipment grounding conductor shall be terminated in the forming shell, junction box or transformer enclosure, or ground-fault circuit-interrupter enclosure The termination of the No. 8 equipment grounding conductor in the forming shell shall be covered with, or encapsulated in, a listed potting compound to protect ~~such~~ the connection from the possible deteriorating effect of pool water. ~~Metal parts of the fixture and forming shell in contact with the pool water shall be of brass or other approved corrosion-resistant metal.~~

(3) Equipment Grounding Provisions for Cords. Wet-niche ~~or no-niche~~ lighting fixtures that are supplied by a flexible cord or cable shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of the cord or cable. This grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure. The grounding conductor shall not be smaller than the supply conductors and not smaller than No. 16.

(4) Fixture Grounding Terminations. The end of the flexible-cord jacket and the flexible-cord conductor terminations within a fixture shall be covered with, or encapsulated in, a suitable potting compound to prevent the entry of water into the fixture through the cord or its conductors. In addition, the grounding connection within a fixture shall be similarly treated to protect such connection from the deteriorating effect of pool water in the event of water entry into the fixture.

(5) Fixture Bonding. The fixture shall be bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to remove the fixture from the forming shell. Bonding ~~is~~ shall not be required for fixtures that are listed for the application ~~having~~ and have no noncurrent-carrying metal parts.

(C) Dry-Niche Fixtures.

(1) Construction. A dry-niche lighting fixture shall be provided with a provision for drainage of water and a means for accommodating one equipment grounding conductor for each conduit entry.

(2) Junction Box. A junction box shall not be required but, if used, shall not be required to be elevated or located as specified in 680.24(A)(2), if the fixture is specifically identified for the purpose. ~~Approved rigid metal conduit, intermediate metal conduit, liquidtight~~

~~flexible nonmetallic conduit, or rigid nonmetallic conduit shall be installed from the fixture to the service equipment or panelboard. Where installed on buildings, electrical metallic tubing shall be permitted to be used to protect conductors. Where installed within buildings, electrical nonmetallic tubing or electrical metallic tubing shall be permitted to be used to protect conductors.~~

(D) No-Niche Fixtures. A no-niche fixture shall meet the construction requirements of 680.23(B)(3) and be installed in accordance with the requirements of 680.23(B). Where connection to a forming shell is specified, the connection shall be to the mounting bracket.

~~1. Listed for the purpose~~

~~2. Installed in accordance with the requirements of Section 680-20(b) Where connection to a forming shell is specified, the connection shall be to the mounting bracket.~~

(E) Through-Wall Lighting Assembly. A through-wall lighting assembly shall be equipped with a threaded entry or hub, or a nonmetallic hub listed for the purpose, for the purpose of accommodating the termination of the supply conduit. A through-wall lighting assembly shall meet the construction requirements of 680.23(B)(3) and be installed in accordance with the requirements of 680.23. Where connection to a forming shell is specified, the connection shall be to the conduit termination point.

(F) Branch-Circuit Wiring.

(1) Wiring Methods. Branch circuit wiring on the supply side of enclosures and junction boxes connected to conduits run to wet-niche and no-niche fixtures, and the field wiring compartments of dry-niche fixtures, shall be installed using rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Where installed on buildings, electrical metallic tubing shall be permitted, and where installed within buildings, electrical nonmetallic tubing or electrical metallic tubing shall be permitted.

FPN: For requirements of electrical nonmetallic tubing, see Article 331.

Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted to be used when installed in accordance with Article 351. The length shall ~~and does~~ not exceed 6 ft (1.83 m) for any one length ~~or~~, nor exceed 10 ft (3.05 m) ~~of~~ in total length used.

(2) Equipment Grounding. Through-wall lighting assemblies, wet-niche, dry-niche, or no-niche lighting fixtures shall be connected to an insulated copper equipment grounding conductor installed with the circuit conductors. The equipment grounding conductor shall be installed without joint or splice except as permitted in (a) and (b). The equipment grounding conducor shall be sized in accordance with Table 250.122 but shall not be smaller than No. 12.

Exception: An equipment grounding conductor between the wiring chamber of the secondary winding of a transformer and a junction box shall be sized in accordance with the overcurrent device in this circuit.

(a) ~~Where~~ If more than one underwater lighting fixture is supplied by the same branch circuit, the equipment grounding conductor, installed between the junction boxes, transformer enclosures, or other enclosures in the supply circuit to wet-niche fixtures, or between the field-wiring compartments of dry-niche fixtures, shall be permitted to be terminated on grounding terminals.

(b) ~~Where~~ If the underwater lighting fixture is supplied from a transformer, ground-fault circuit interrupter, clock-operated switch, or a manual snap switch that is located between the panelboard and a junction box connected to the conduit that extends directly to the underwater lighting fixture, the equipment grounding conductor shall be permitted to terminate on grounding terminals on the transformer, ground-fault circuit interrupter, clock-operated switch enclosure, or an outlet box used to enclose a snap switch.

(3) Conductors. Conductors on the load side of a ground-fault circuit interrupter or of a transformer, used to comply with the provisions of 680.23(A)(8), shall not occupy raceways, boxes, or enclosures containing other conductors unless one of the following conditions applies:

(1) The other conductors are protected by ground-fault circuit interrupters.

(2) The other conductors ~~or~~ are grounding conductors.

(3) The other conductors are supply conductors to a feed-through type ground-fault circuit interrupter ~~shall be permitted in the same enclosure~~.

(4) Ground-fault circuit interrupters shall be permitted in a panelboard that contains circuits protected by other than ground-fault circuit interrupters.

680.24 Junction Boxes and Enclosures for Transformers or Ground-Fault Circuit Interrupters.

(A) Junction Boxes. A junction box connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche fixture shall ~~be as follows~~ meet the requirements of this section.

(1) Construction. The junction box shall be listed and labeled for the purpose and:

(1) Equipped with threaded entries or hubs or a nonmetallic hub listed for the purpose.

(2) Comprised of copper, brass, suitable plastic, or other approved corrosion-resistant material.

(3) Provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper, brass, or other approved corrosion-resistant metal that is integral with the box.

(2) Installation. Where the fixture operates over 15 volts, the junction box location shall comply with (a) and (b). Where the fixture operates at less than 15 volts, the junction box location shall be permitted to comply with (c).

(a) Vertical Spacing. The junction box shall be located not less than 100 mm (4 in.), measured from the inside of the bottom of the box, above the ground level, or pool deck, or not less than 200 mm (8 in.) above the maximum pool water level, whichever provides the greater elevation.

(b) Horizontal Spacing. The junction box shall be located not less than 1.2 m (4 ft) from the inside wall of the pool, unless separated from the pool by a solid fence, wall, or other permanent barrier.

(c) Flush Deck Box. If used on a lighting system operating at 15 volts or less, a flush deck box shall be permitted ~~provided~~ if both of the following apply:

(1) An approved potting compound is used to fill the box to prevent the entrance of moisture, and

(2) The flush deck box is located not less than 1.2 m (4 ft) from the inside wall of the pool.

(B) Other Enclosures. An enclosure for a transformer, ground-fault circuit interrupter, or a similar device connected to a conduit that extends directly to a forming shell or mounting bracket of a no-niche fixture shall ~~be as follows~~ meet the requirements of this section.

(1) Construction. The enclosure shall be listed and labeled for the purpose and meet the following requirements:

(1) Equipped with threaded entries or hubs or a nonmetallic hub listed for the purpose.

(2) Comprised of copper, brass, suitable plastic, or other approved corrosion-resistant material.

(3) Provided with an approved seal, such as duct seal at the conduit connection, that prevents circulation of air between the conduit and the enclosures

(4) Provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper, brass, or other approved corrosion-resistant metal that is integral with the box.

(2) Installation.

(a) Vertical Spacing. The enclosure shall be located not less than 100 mm (4 in.), measured from the inside of the bottom of the box, above the ground level, or pool deck, or not less than 200 mm (8 in.) above the maximum pool water level, whichever provides the greater elevation.

(b) Horizontal Spacing. The enclosure shall be located not less than 1.2 m (4 ft) from the inside wall of the pool, unless separated from the pool by a solid fence, wall, or other permanent barrier.

(C) Protection. Junction boxes and enclosures mounted above the grade of the finished walkway around the pool shall not be located in the walkway unless afforded additional protection, such as by location under diving boards, adjacent to fixed structures, and the like.

(D) Grounding Terminals. Junction boxes, transformer enclosures, and ground-fault circuit-interrupter enclosures connected to a conduit that extends directly to a forming shell or mounting

bracket of a no-niche fixture shall be provided with a number of grounding terminals that shall be ~~at least~~ no fewer than one more than the number of conduit entries.

(E) Strain Relief. The termination of a flexible cord of an underwater lighting fixture within a junction box, transformer enclosure, ground-fault circuit interrupter, or other enclosure shall be provided with a strain relief.

(F) Grounding. The junction box, transformer enclosure, or other enclosure in the supply circuit to a wet-niche or no-niche lighting fixture and the field-wiring chamber of a dry-niche lighting fixture shall be grounded to the equipment grounding terminal of the panelboard. This terminal shall be directly connected to the panelboard enclosure.

680.25 Feeders.

These provisions shall apply to any feeder on the supply side of panelboards supplying branch circuits for pool equipment covered in Part II and on the load side of the service equipment or the source of a separately derived system.

(A) Wiring Methods. Feeders shall be installed in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit. Electrical metallic tubing shall be permitted ~~to be used to protect conductors~~ where installed on or within a ~~the~~ building, and ~~in accordance with Article 348~~. electrical nonmetallic tubing shall be permitted ~~to be used to enclose the conductors~~ where installed within ~~the~~ a building ~~in accordance with Article 331~~.

Exception: An existing feeder ~~the~~ between an existing remote panelboard and ~~the~~service equipment ~~s~~shall be permitted to run ~~connected by means of~~ a flexible metal conduit or an approved cable assembly with an insulated or covered equipment grounding con~~ductor, the conduits listed above s~~hall not be ~~required~~

(B) Grounding. ~~A panelboard and, where installed, a disconnecting means, that are not part of the service equipment or source of a separately derived system, shall have~~ An insulated equipment grounding conductor shall be installed with the feeder conductors between ~~it's~~ the grounding terminal of the pool equipment panelboard and the grounding terminal of the applicable service equipment or source of a separately derived system.

(1) Size. This conductor shall be sized in accordance with 250.122 but not smaller than No. 12. On separately derived systems, this conductor shall be sized in accordance with Table 250.66 but not smaller than No. 8.

(2) Separate Buildings. A panelboard at a separate building shall be permitted to supply swimming pool equipment if the feeder meets the requirements for grounding in 250.32. Where installed, a separate equipment grounding conductor shall be an insulated conductor.

680.26 Bonding.

(A) Performance. The bonding required by this section shall be installed ~~employed~~ to eliminate voltage gradients in the pool area as prescribed. ~~It shall not be the intent of~~

FPN: This section ~~to~~ does not require that the No. 8 or larger solid copper bonding conductor be extended or attached to any remote panelboard, service equipment, or any electrode. ~~but only that it~~.

(B) Bonded Parts. The following parts shall be bonded together.

(1) Metallic Structural Components. All metallic parts of the pool structure, including the reinforcing metal of the pool shell, coping stones, and deck, shall be bonded. The usual steel tie wires shall be considered suitable for bonding the reinforcing steel together, and welding or special clamping shall not be required. These tie wires shall be made tight. If ~~Where~~ reinforcing steel is effectively insulated by an ~~listed~~ encapsulating nonconductive compound, at the time of manufacture and installation, it shall not be required to be bonded.

(2) Underwater Lighting. All forming shells, and mounting brackets of ~~a~~ no-niche fixtures, shall be bonded unless a listed low-voltage lighting system with nonmetallic forming shells is used, not requiring bonding.

(3) Metal Fittings. All metal fittings within or attached to the pool structure shall be bonded. Isolated parts that are not over 100 mm (4 in.) in any dimension and do not penetrate into the pool structure more than 25 mm (1 in.) shall not require bonding.

(4) Electrical Equipment. Metal parts of electrical equipment associated with the pool water circulating system, including pump motors and metal parts of equipment associated with pool covers, including electric motors, shall be bonded. Metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded.

Where a double-insulated water-pump motor is installed under the provisions of this rule, a solid No. 8 copper conductor that is of sufficient length to make a bonding connection to a replacement motor shall be extended from the bonding grid to an accessible point in the motor vicinity. Where there is no connection between the swimming pool bonding grid and the equipment grounding system for the premises, this bonding conductor shall be connected to the equipment grounding conductor of the motor circuit.

(5) Metal Wiring Methods and Equipment. Metal-sheathed cables and raceways, metal piping, and all fixed metal parts except those separated form the pool by a permanent barrier, shall be bonded that are within the following distances of the pool:

(1) Within 1.5 m (5 ft) horizontally of the inside walls of the pool, ~~unless separated from the pool by a permanent barrier~~. ~~and~~

(2) Within 3.7 m (12 ft) measured vertically above the maximum water level of the pool, or any observation stands, towers, or platforms, or ~~from~~ any diving structures.

(C) Common Bonding Grid. The parts specified in 680.26(B) shall be connected to a common bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than No. 8. Connection shall be made by exothermic welding or by pressure connectors or clamps that are labeled as being suitable for the purpose and are of the following material: stainless steel, brass, copper, or copper alloy. The common bonding grid shall be permitted to be any of the following:

(1) The structural reinforcing steel of a concrete pool where the reinforcing rods are bonded together by the usual steel tie wires or the equivalent.

(2) The wall of a bolted or welded metal pool.

(3) A solid copper conductor, insulated, covered, or bare, not smaller than No. 8.

(4) Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal conduit.

(D) Connections. Where structural reinforcing steel or the walls of bolted or welded metal pool structures ~~shall be permitted~~ are used as a common bonding grid for nonelectrical parts, ~~where~~ the connections shall ~~can~~ be made in accordance with 250.8.

(E) Pool Water Heaters. For pool water heaters rated at more than 50 amperes that have specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded, and only those parts designated to be grounded shall be grounded.

680.27 Specialized Pool Equipment

(A) Underwater Audio Equipment. All underwater audio equipment shall be identified for the purpose.

(1) Speakers. Each speaker shall be mounted in an approved metal forming shell, the front of which is enclosed by a captive metal screen, or equivalent, that is bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to open for installation or servicing of the speaker. The forming shell shall be installed in a recess in the wall or floor of the pool.

(2) Wiring Methods. Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal, liquidtight flexible nonmetallic conduit (LFNC-B) or rigid nonmetallic conduit shall extend from the forming shell to a suitable junction box or other enclosure as provided in 680.24. Where rigid nonmetallic conduit or liquidtight flexible nonmetallic conduit (LFNC-B) is used, a No. 8 insulated solid or stranded copper equipment grounding conductor shall be installed in this conduit. ~~with provisions for terminating~~ The equipment grounding conductor shall be terminated in the forming shell and the junction box. The termination of the No. 8 equipment grounding conductor in the forming shell shall be covered with, or encapsulated in, a ~~suitable~~ listed potting compound to protect such connection from the possible deteriorating effect of pool water.

(3) Forming Shell and Metal Screen. The forming shell and metal screen shall be of brass or other approved corrosion-resistant metal. All forming shells shall include provisions for terminating a No. 8 copper conductor.

(B) Electrically Operated Pool Covers.

(1) Motors and Controllers. The electric motors, controllers, and wiring shall be located ~~at least~~ not less than 1.5 m (5 ft) from the inside wall of the pool unless separated from the pool by a wall, cover, or other permanent barrier. Electric motors installed below grade level shall be of the totally enclosed type.

FPN No. 1: For cabinets installed in damp and wet locations, see 373.2(A).

FPN No. 2: For switches or circuit breakers installed in wet locations, see 380.4

FPN No. 3: For protection against liquids, see 430.11.

(2) ~~Wiring Methods~~Protection. The electric motor and controller shall be connected to a circuit protected by a ground-fault circuit interrupter.

(C) Deck Area Heating. These provisions ~~of this section~~ shall apply to all pool deck areas, including a covered pool, where electrically operated comfort heating units are installed within 6.0 m (20 ft) of the inside wall of the pool.

(1) Unit Heaters. Unit heaters shall be rigidly mounted to the structure and shall be of the totally enclosed or guarded types. Unit heaters shall not be mounted over the pool or within the area extending 1.5 m (5 ft) horizontally from the inside walls of a pool.

(2) Permanently Wired Radiant Heaters. Radiant electric heaters shall be suitably guarded and securely fastened to their mounting device(s). Heaters shall not be installed over a pool or within the area extending 1.5 m (5 ft) horizontally from the inside walls of the pool and shall be mounted at least 3.7 m (12 ft) vertically above the pool deck unless otherwise approved.

(3) Radiant Heating Cables Not Permitted. Radiant heating cables embedded in or below the deck shall not be permitted.

III. Storable Pools

680.30 General. Electrical installations at storable pools shall comply with the provisions of Part I and Part III.

680.31 Pumps.

A cord-connected pool filter pump shall incorporate an approved system of double insulation or its equivalent and shall be provided with means for grounding only the internal and nonaccessible noncurrent-carrying metal parts of the appliance.

The means for grounding shall be an equipment grounding conductor run with the power-supply conductors in the flexible cord that is properly terminated in a grounding-type attachment plug having a fixed grounding contact member.

680.32 Ground-Fault Circuit Interrupters Required.

All electrical equipment, including power-supply cords, used with storable pools shall be protected by ground-fault circuit interrupters.

FPN: ~~Where~~ For flexible cord~~s~~ usage ~~are used~~, see ~~Section~~ 400.4.

680.33 Lighting Fixtures.

An underwater lighting fixture, if installed, shall be installed in or on the wall of the storable pool. It shall comply with one of the following two provisions:

(A) 15 Volts or Less. A lighting fixture ~~installed in or on the wall of a storable pool~~ shall be part of a cord- and plug-connected lighting assembly. This assembly shall be listed as an assembly for the purpose and ~~as follows~~ have the following construction features:

(1) ~~Have~~ No exposed metal parts

(2) ~~Have~~ A fixture lamp that operates at 15 volts or less

(3) ~~Have~~ An impact-resistant polymeric lens, fixture body, and transformer enclosure

(4) ~~Have~~ A transformer meeting the requirements of 680.23(A)(2) with a primary rating not over 150 volts~~, and~~

~~5. Be listed as an assembly for the purpose~~

(B) Over 15 Volts But Not Over 150 Volts. A lighting assembly without a transformer and with the fixture lamp(s) operating at not over 150 volts shall be permitted to be cord- and plug-connected where the assembly is listed as an assembly for the purpose. The installation shall comply with 680.23(A)(5) and the assembly shall have ~~complies with all of the following~~ the following construction features:

(1) No exposed metal parts.

(2) An impact-resistant polymeric lens and fixture body.

(3) A ground-fault circuit interrupter with open neutral protection ~~is provided~~ as an integral part of the assembly.

(4) The fixture lamp is permanently connected to the ground-fault circuit interrupter with open-neutral protection.

(5) ~~It complies~~ Compliance with the requirements of 680.23(A).

~~6. It is listed as an assembly for the purpose.~~

IV. Spas and Hot Tubs

680.40 General. Electrical installations at spas and hot tubs shall comply with the provisions of Part I and Part IV.

680.41 Emergency Switch for Spas and Hot Tubs.

A clearly labeled emergency shutoff or control switch for the purpose of stopping the motor(s) that provide power to the recirculation system and jet system shall be installed at a point readily accessible to the users and ~~at least~~ not less than 1.5 m (5 ft) away, adjacent to, and within sight of the spa or hot tub. This requirement shall not apply to single-family dwellings.

680.42 Outdoor Installations.

A spa or hot tub installed outdoors shall comply with the provisions of Parts I and II of this article, except as permitted in (A) and (B), that would otherwise apply to pools installed outdoors.

(A) Flexible Connections. Listed packaged spa or hot tub equipment assemblies or self-contained spas or hot tubs ~~units~~ utilizing a factory-installed or assembled control panel or ~~remote~~ panelboard shall be permitted to use flexible connections as covered in (1) and (2):

(1) Flexible Conduit. Liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted in lengths of ~~be connected with~~ not more than 1.8 m (6 ft).

(2) Cord- and Plug-Connections. Cord and plug connections with a cord not longer than 4.6 m (15 ft) shall be permitted where ~~if~~ protected by a ground-fault circuit interrupter.

(B) Bonding. Bonding by metal-to-metal mounting on a common frame or base shall be permitted. The metal bands or hoops used to secure wooden staves shall not be required to be bonded as required in 680.26.

(C) Interior Wiring to Outdoor Installations. In the interior of a one-family dwelling or in the interior of another building or structure associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code that contain a copper equipment grounding conductor that is insulated or enclosed within the outer sheath of the wiring method and not smaller than No. 12 shall be permitted to be used for the connection to a self-contained spa or hot tub, or a packaged spa or hot tub equipment assembly.

680.43 Indoor Installations

A spa or hot tub installed indoors shall comply with the provisions of Parts I and II except as modified by this section, and shall be connected by the wiring methods of Chapter 3.

Exception: Listed spa and hot tub packaged units rated 20 amperes or less shall be permitted to be cord and plug connected to facilitate the removal or disconnection of the unit for maintenance and repair.

(A) Receptacles. At least one 125-volt, 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located ~~a minimum~~ not less than of 1.5 m (5 ft) from and not ~~more than~~ exceeding 3.0 m (10 ft) from the inside wall of the spa or hot tub.

(1) Location. Receptacles ~~on the property~~ shall be located at least 1.5 m (5 ft) measured horizontally from the inside walls of the spa or hot tub.

(2) Protection, General. Receptacles ~~of~~ rated 125 volts and 30 amperes or less located within 3.0 m (10 ft) of the inside walls of a spa or hot tub shall be protected by a ground-fault circuit interrupter.

(3) Protection, Spa or Hot Tub Supply Receptacle. Receptacles that provide power for a spa or hot tub shall be ground-fault circuit-interrupter protected.

(4) Measurements. ~~FPN:~~ In determining the ~~above~~ dimensions in this section addressing receptacle spacings, the distance to be measured ~~is~~ shall be the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier.

(B) Installation ~~Mounting Height~~ of Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans.

(1) Elevation. Lighting fixtures except as covered in Section 680.43(B)(2), lighting outlets, and ceiling-suspended (paddle) fans located over the spa or hot tub or within 1.5 m (5 ft) from the inside walls of the spa or hot tub shall comply with the following clearances ~~be a minimum of 7 ft 6 in. (2.29 m)~~ above the maximum water level ~~and shall be protected by a ground fault circuit interrupter~~.

(a) Without GFCI. Where no GFCI protection is provided, the mounting height shall be not less than 3.7 m (12 ft).

(b) With GFCI. Where GFCI protection is provided, the mounting height shall be permitted to be not less than 2.3 m (7 ft 6 in.)

~~Lighting fixtures, lighting outlets, and ceiling suspended (paddle) fans that are located 12 ft (3.66 m) or more above the maximum water level shall not require a ground fault circuit interrupter for protection.~~

(c) Below 2.3 m (7 ft 6 in.). Lighting fixtures meeting the requirements of (1) or (2) and protected by a ground-fault circuit interrupter shall be permitted to be installed less than 2.3 m (7 ft 6 in.) over a spa or hot tub.

(1) Recessed fixtures with a glass or plastic lens, ~~and~~ nonmetallic or electrically isolated metal trim, and suitable for use in damp locations.

(2) Surface-mounted fixtures with a glass or plastic globe ~~and~~ a nonmetallic body or a metallic body isolated from contact, and suitable for use in damp locations.

(2) Underwater Applications. Underwater lighting fixtures shall comply with the provisions of Section 680.23 or Section 680.33.

(C) Wall Switches. Switches shall be located at least 1.5 m (5 ft), measured horizontally, from the inside walls of the spa or hot tub.

(D) Bonding. The following parts shall be bonded together.

(1) All metal fittings within or attached to the spa or hot tub structure

(2) Metal parts of electrical equipment associated with the spa or hot tub water circulating system, including pump motors

(3) Metal conduit and metal piping that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub by a permanent barrier

(4) All metal surfaces that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub area by a permanent barrier.

Exception: Small conductive surfaces not likely to become energized, such as air and water jets and drain fittings, where not connected to metallic piping, towel bars, mirror frames, and similar nonelectrical equipment, shall not be required to be bonded.

(5) Electrical devices and controls that are not associated with the spas or hot tubs and that are ~~shall be~~ located ~~a minimum~~ not less than ~~of~~ 1.5 m (5 ft) ~~away~~ from such units; otherwise ~~or~~ they shall be bonded to the spa or hot tub system.

(E) Methods of Bonding. All metal parts associated with the spa or hot tub shall be bonded by any of the following methods:

(1) The interconnection of threaded metal piping and fittings

(2) Metal-to-metal mounting on a common frame or base

(3) The provision~~s~~ of a copper bonding jumper, insulated, covered, or bare, not smaller than No. 8 solid

(F) Grounding. The following equipment shall be grounded:

(1) All electric equipment located within 1.5 m (5 ft) of the inside wall of the spa or hot tub

(2) All electric equipment associated with the circulating system of the spa or hot tub

~~(g) Methods of Grounding.~~

~~1. All electrical equipment shall be grounded in accordance with Article 250 and be connected by the wiring methods of Chapter 3.~~

~~2. Where equipment is connected with a flexible cord, the equipment grounding conductor shall be connected to a fixed metal part of the assembly.~~

~~(h) Electric Water Heaters. All electric spa or hot tub water heaters shall be listed and shall have the heating elements subdivided into loads not exceeding 48 amperes and protected at not more than 60 amperes.~~

~~The ampacity of the branch-circuit conductors, and the rating or setting of overcurrent protective devices, shall not be less than 125 percent of the total load of the nameplate rating.~~

(G) Underwater Audio Equipment. Underwater audio equipment shall comply with the provisions of Part II ~~or C~~ of this article.

680.44 Protection.

Except as otherwise provided in this section, the outlet(s) that supplies a self-contained spa or hot tub, ~~or~~ a packaged spa or hot tub equipment assembly, or a field-assembled spa or hot tub ~~with a heater load of 50 amperes or less~~ shall be protected by a ground-fault circuit interrupter.

(A) Listed Units. If so marked, a listed self-contained unit or listed packaged equipment assembly ~~marked to indicate~~ that includes integral ground-fault circuit-interrupter protection ~~is provided~~ for all electrical parts within the unit or assembly (pumps, air blowers, heaters, lights, controls, sanitizer generators, wiring, etc.) shall be permitted without additional GFCI protection.

~~not require that the outlet supply be protected by a ground-fault circuit interrupter.~~

(B) Subdivided Loads. If the load has been subdivided to comply with 680.9 or for other reasons, and if the unit is not rated 3 phase or over 250 volts, GFCI protection shall be provided for each subdivided portion of the load.

(C) Other Units. A ~~field-assembled~~ spa or hot tub rated 3 phase or rated ~~greater than~~ over 250 volts shall not require the supply to be protected by a ground-fault circuit interrupter.

(D) Combination Pool and Spa or Hot Tub. A combination pool/hot tub or spa assembly commonly bonded need not be protected by a ground-fault circuit interrupter.

FPN: See 680.2 for definitions of self-contained spa or hot tub and for packaged spa or hot equipment assembly.

V. Fountains

680.50 General.

The provisions of Part I and Part V shall apply to all permanently installed fountains as defined in 680.2. Fountains that have water common to a pool shall additionally comply with the ~~pool~~ requirements in Part II of this article. Part V does not cover self-contained, portable fountains not larger than 1.5 m (5 ft) in any dimension ~~are not covered by Part E.~~ Portable fountains shall comply with Parts II and III of Article 422.

680.51 Lighting Fixtures, Submersible Pumps, and Other Submersible Equipment.

(A) Ground-Fault Circuit Interrupter. ~~A ground-fault circuit interrupter shall be installed in the branch circuit supplying fountain equipment~~ Fountain equipment, unless ~~the equipment is~~ listed for operation at 15 volts or less and ~~is~~ supplied by a transformer that complies with ~~Section 680.5(a)~~ 680.23(A)(2), shall be protected by a ground-fault circuit interrupter.

(B) Operating Voltage. No lighting fixtures shall be installed for operation on supply circuits over 150 volts between conductors. Submersible pumps and other submersible equipment shall operate at 300 volts or less between conductors.

(C) Lighting Fixture Lenses. Lighting fixtures shall be installed with the top of the fixture lens below the normal water level of the fountain unless ~~approved~~ listed for above-water locations. A lighting fixture facing upward shall have the lens adequately guarded to prevent contact by any person.

(D) Overheating Protection. Electrical equipment that depends on submersion for safe operation shall be protected against overheating by a low-water cutoff or other approved means when not submerged.

(E) Wiring. Equipment shall be equipped with provisions for threaded conduit entries or be provided with a suitable flexible cord. The maximum length of exposed cord in the fountain shall be limited to 3.0 m (10 ft). Cords extending beyond the fountain perimeter shall be enclosed in approved wiring enclosures. Metal parts of equipment in contact with water shall be of brass or other approved corrosion-resistant metal.

(F) Servicing. All equipment shall be removable from the water for relamping or normal maintenance. Fixtures shall not be permanently imbedded into the fountain structure ~~so~~ such that the water level must be reduced or the fountain drained for relamping, maintenance, or inspection.

(G) Stability. Equipment shall be inherently stable or be securely fastened in place.

680.52 Junction Boxes and Other Enclosures.

(A) General. Junction boxes and other enclosures used for other than underwater installation shall comply with 680.24.

(B) Underwater Junction Boxes and Other Underwater Enclosures. Junction boxes and other underwater enclosures shall ~~be submersible and~~ meet the requirements of (1) and (2):

(1) Construction.

(a) Underwater enclosures shall be equipped with provisions for threaded conduit entries or compression glands or seals for cord entry.

(b) Underwater enclosures shall be submersible, and made of copper, brass, or other approved corrosion-resistant material.

(2) Installation. Underwater enclosure installations shall comply with (a) and (b).

(a) Underwater enclosures shall be filled with an approved potting compound to prevent the entry of moisture.

(b) Underwater enclosures shall be firmly attached to the supports or directly to the fountain surface and bonded as required. Where the junction box is supported only by the conduit, the conduit shall be of copper, brass, or other approved corrosion-resistant metal. Where the box is fed by nonmetallic conduit, it shall have additional supports and fasteners of copper, brass, or other approved corrosion-resistant material.

FPN: See 370.23 for support of enclosures.

680.53 Bonding.

All metal piping systems associated with the fountain shall be bonded to the equipment grounding conductor of the branch circuit supplying the fountain.

FPN: See 250.122 for sizing of these conductors.

680.54 Grounding.

The following equipment shall be grounded:

(1) All electrical equipment located within the fountain or within 1.5 m (5 ft) of the inside wall of the fountain

(2) All electrical equipment associated with the recirculating system of the fountain

(3) Panelboards that are not part of the service equipment and that supply any electrical equipment associated with the fountain

680.55 Methods of Grounding.

(A) Applied Provisions. The provisions of ~~Sections 680.25~~ 680.21(A), 680.23(B)(3), 680.23(F)(1-2), 680.24(F), and 680.25 shall apply.

(B) Supplied by a Flexible Cord. Electrical equipment that is supplied by a flexible cord shall have all exposed noncurrent-carrying metal parts grounded by an insulated copper equipment grounding conductor that is an integral part of this cord. The grounding conductor shall be connected to a grounding terminal in the supply junction box, transformer enclosure, or other enclosure.

680.56 Cord- and Plug-Connected Equipment.

(A) Ground-Fault Circuit Interrupter. All electrical equipment, including power-supply cords, shall be protected by ground-fault circuit interrupters.

(B) Cord Type. Flexible cord immersed in or exposed to water shall be of ~~the hard-service type~~ a type for "extra hard usage" as designated in Table 400.4 and shall be ~~marked water-resistant.~~ listed and marked for the purpose.

(C) Sealing. The end of the flexible cord jacket and the flexible cord conductor termination within equipment shall be covered with, or encapsulated in, a suitable potting compound to prevent the entry of water into the equipment through the cord or its conductors. In addition, the ground connection within equipment shall be similarly treated to protect such connections from the deteriorating effect of water that may enter into the equipment.

(D) Terminations. Connections with flexible cord shall be permanent, except that grounding-type attachment plugs and receptacles shall be permitted to facilitate removal or disconnection for maintenance, repair, or storage of fixed or stationary equipment not located in any water-containing part of a fountain.

680.57 Signs.

(A) General. This section ~~includes only fixed, stationary electrically illuminated utilization equipment~~ covers electric signs installed within or adjacent to fountains. ~~with words or symbols designed to convey information or attract attention.~~

(B) Ground-Fault Circuit-Interrupter Protection for Personnel. All circuits supplying the sign shall have ground-fault circuit-interrupter protection for personnel.

(C) Location.

(1) Fixed or Stationary. A fixed or stationary electric sign installed within a fountain ~~Any sign installed inside a fountain~~ shall be ~~at least~~ not less than 1.5 m (5 ft) inside the fountain measured from the outside edges of the fountain.

(2) Portable. A portable electric sign shall not be placed within a fountain or within 1.5 m (5 ft) measured horizontally from the inside walls of the fountain.

(D) Disconnect. A sign shall have a local disconnecting means in accordance ~~comply~~ with Section 600.6 and Section 680.12.

(E) Bonding and Grounding. A sign shall be grounded and bonded in accordance ~~Shall comply~~ with Section 600.7.

~~(F) Grounding. Any equipment associated with the sign shall be grounded as per Article 250.~~

VI. Pools and Tubs for Therapeutic Use

680.60 General.

The provisions of Part I and Part VI shall apply to pools and tubs for therapeutic use in health care facilities, gymnasiums, athletic training rooms, and similar areas. ~~See Section 517.2 for definition of health care facilities.~~ Portable therapeutic appliances shall comply with Parts II and III of Article 422.

FPN: See 517.2 for definition of health care facilities.

680.61 Permanently Installed Therapeutic Pools.

Therapeutic pools that are constructed in the ground, on the ground, or in a building in such a manner that the pool cannot be readily disassembled shall comply with Parts I and II of this article.

Exception: The limitations of 680.22(A)(1) and (2) shall not apply where all lighting fixtures are of the totally enclosed type.

680.62 Therapeutic Tubs (Hydrotherapeutic Tanks)

Therapeutic tubs, used for the submersion and treatment of patients, that are not easily moved from one place to another in normal use or that are fastened or otherwise secured at a specific location, including associated piping systems, shall conform to this part.

(A) Protection. Except as otherwise provided in this section, the outlet(s) that supplies a self-contained therapeutic tub or hydrotherapeutic tank, ~~or~~ a packaged therapeutic tub or hydrotherapeutic tank, or a field-assembled therapeutic tub or hydrotherapeutic tank ~~with a heater load of 50 amperes or less~~ shall be protected by a ground-fault circuit interrupter.

(1) Listed Units. If so marked, a listed self-contained unit or listed packaged equipment assembly ~~marked to indicate~~ that includes integral ground-fault circuit-interrupter protection ~~is provided~~ for all electrical parts within the unit or assembly (pumps, air blowers, heaters, lights, controls, sanitizer generators, wiring, etc.) shall be permitted without additional GFCI protection.

~~not require that the outlet supply be protected by a ground-fault circuit interrupter.~~

(2) Subdivided Loads. If the load has been subdivided to comply with 680.9 or for other reasons, and where the unit is not rated 3 phase or over 250 volts, GFCI protection shall be provided for each subdivided portion of the load.

(3) Other Units. A ~~field-assembled~~ therapeutic tub or hydrotherapeutic tank rated 3 phase or rated ~~greater than~~ over 250 volts shall not require the supply to be protected by a ground-fault circuit interrupter.

~~(b) Ground-Fault Circuit Interrupter. A ground-fault circuit interrupter shall protect all therapeutic equipment.~~

~~Exception: Portable therapeutic appliances shall comply with Section 250-114.~~

(B) Bonding. The following parts shall be bonded together.

(1) All metal fittings within or attached to the tub structure

(2) Metal parts of electrical equipment associated with the tub water circulating system, including pump motors

(3) Metal-sheathed cables and raceways and metal piping that are within 1.5 m (5 ft) of the inside walls of the tub and not separated from the tub by a permanent barrier

(4) All metal surfaces that are within 1.5 m (5 ft) of the inside walls of the tub and not separated from the tub area by a permanent barrier

(5) Electrical devices and controls that are not associated with the therapeutic tubs ~~shall be~~ and that are located a minimum of 1.5 m (5 ft) ~~away~~ from such units; otherwise ~~or~~ they shall be bonded to the therapeutic tub system.

(C) Methods of Bonding. All metal parts ~~associated with the tub~~ required to be bonded by this section shall be bonded by any of the following methods:

(1) The interconnection of threaded metal piping and fittings

(2) Metal-to-metal mounting on a common frame or base

(3) Connections by suitable metal clamps

(4) By the provision~~s~~ of a solid copper bonding jumper, insulated, covered, or bare, not smaller than No. 8

(D) Grounding.

(1) Fixed or Stationary Equipment. The following equipment shall be grounded:

(a) Location. All electrical equipment located within 1.5 m (5 ft) of the inside wall of the tub shall be grounded.

(b) Circulation System. All electrical equipment associated with the circulating system of the tub shall be grounded.

(2) Portable Equipment. Portable therapeutic appliances shall meet the grounding requirements in 250.114.

~~(f) Methods of Grounding.~~

~~1. All electrical equipment shall be grounded in accordance with Article 250 and connected by wiring methods of Chapter 3.~~
~~2. Where equipment is connected with a flexible cord, the equipment grounding conductor shall be connected to a fixed metal part of the assembly.~~

(E) Receptacles. All receptacles within 1.5 m (5 ft) of a therapeutic tub shall be protected by a ground-fault circuit interrupter.

(F) Lighting Fixtures. All lighting fixtures used in therapeutic tub areas shall be of the totally enclosed type.

VII. Hydromassage Bathtubs

680.70 General. Hydromassage bathtubs as defined in 680.2 shall comply with Part VII. They shall not be required to comply with other parts of this article.

680.71 Protection.

Hydromassage bathtubs and their associated electrical components shall be protected by a ground-fault circuit interrupter. All 125-volt, single-phase receptacles not exceeding 30 amperes and located within 1.5 m (5 ft) measured horizontally of the inside walls of a hydromassage tub shall be protected by a ground-fault circuit interrupter(s).

680.72 Other Electrical Equipment.

Lighting fixtures, switches, receptacles, and other electrical equipment located in the same room, and not directly associated with a hydromassage bathtub, shall be installed in accordance with the requirements of Chapters 1 through 4 in this Code covering the installation of that equipment in bathrooms.

680.73 Accessibility.

Hydromassage bathtub electrical equipment shall be accessible without damaging the building structure or building finish.

680.74 Bonding.

All metal piping systems, metal parts of electrical equipment, and pump motors associated with the hydromassage tub shall be bonded together using a copper bonding jumper, insulated, covered, or bare, not smaller than No. 8 solid. Metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal nonaccessible, noncurrent-carrying metal parts shall not be bonded.

PANEL STATEMENT: Proposal 20-30a presents a clean editorial rewrite of Article 680 that incorporates the concept recommended by the submitter and other amendments according to style and actions on subsequent proposals. See the following table for a summary of the changes made to the submitter's proposal that appear in Proposal 20-30a. (See table on next page)

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ryan

EXPLANATION OF NEGATIVE:

TALKA: This proposal should be rejected. Plese see Explanation of Negative Vote for Proposal 20-30a (Log #CP2001).

(Log #3124)

20- 32 - (680-3(a)): Reject

Note: The Technical Corrlating Committee agrees that this material is outside of the Scope of Article 680. If special safety needs exist, a separate Article could be proposed through the Code-Making process.

SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.

RECOMMENDATION: Change:

680-3. Other Articles.

(a) Except as modified by this section, wiring and equipment in or adjacent to pools, ~~and~~ fountains, and other bodies of water shall comply with the applicable requirements of Chapters 1 through ~~4~~ 5.

SUBSTANTIATION: This change provides guidance to installers of fountains in natural bodies of water. It also clarifies NEC CMP 20's Panel Statement in their rejection of NFPA 70 A95 ROP Proposal 20-53 for 1993 NEC Section 680-4 to include ponds indicated in part: "Storm retention basins, sewage treatment ponds, and similar bodies of water are not covered under the scope of Article 680. It would be impractical to require these facilities to comply with Part E of Article 680. The term 'pond' is not even referred to in Part E covering fountains."

For example, the installation of an electric pump in a natural body of water could be accomplished in similar fashion as a submersible or jet water pump for a well. Reference to 1999 NEC Section 250-6 must be considered for an installation as described to prevent objectionable current flows. Chapter 2 of the IEEE Green Book (IEEE Standard 142) provides information as a reference on equipment grounding. Also, 1999 NEC Articles 553, "Floating Buildings," and 555, "Marinas and Boatyards," could be considered in determining the wiring method for this application. Whatever the case, complying with grounding and bonding rules, using GFCI protection where applicable, and having an accessible disconnect for electric equipment in natural bodies of water will result in safer conditions for people in the area.

PANEL ACTION: Reject.

PANEL STATEMENT: Inclusion of all bodies of water cannot be accomplished by a simple modification of scope. A detailed analysis and possibly substantial expansion of requirements should be performed to justify such a revision. With further justification, this issue should be addressed in a separate code article or by a different Code Making Panel.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3876)

20- 33 - (680-3(a)): Accept

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-3 of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: J. Philip Simmons, Olympia, WA

RECOMMENDATION: Revise the section as follows:

(a) Except as modified by this section, wiring and equipment in or adjacent to pools and fountains shall comply with the applicable requirements of Chapters 1 through 4.

SUBSTANTIATION: Editorial correction.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2918)

20- 34 - (680-4-Fountain): Reject

Note: The Technical Correlating Committee agrees that this material is outside of the Scope of Article 680. If special safety needs exist, a separate Article could be proposed through the Code-Making process.

SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.

RECOMMENDATION: Revise the definition as follows:

Fountain. As used in this article, the term includes fountains, ornamental pools, display pools, reflection pools, land aeration fountains used in bodies of water natural, or manmade to prevent stagnation. It does not include drinking fountains.

SUBSTANTIATION: While inspecting a job and failing the job due to noncompliance with the NEC, the contractor stated that the NEC article on fountains did not cover aeration devices. Also that due to the fact of the pond being a natural body of water that the aeration device was not covered by the NEC.

PANEL ACTION: Reject.

PANEL STATEMENT: Inclusion of all bodies of water cannot be accomplished by a simple modification of scope. A detailed analysis and possibly substantial expansion of requirements should be performed to justify such a revision. With further justification, this issue should be addressed in a separate code article or by a different code making panel.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

Submitter's Proposed Section	1999 NEC Section	Action	Statement
1	1	N/A	Note: Hard metric conversions applied throughout, incorporating Proposal 20-29 objectives.
2	4	AIP	Incorporate Style Manual revisions to "Fountain; change "may" to "can" three places in other definitions.
Equip.-Fixed		Accept	
Equip.-Port.		Accept	
Equip.-Sta.		Accept	
Maximum Water Level	N/A	AIP	Inserts new definition accepted by the action on Proposal 20-3.
Through-Wall Light. Assembly	N/A	AIP	Inserts new definition accepted by the action on Proposal 20-35.
Pool		Accept	
3	3	AIP	Insert other articles table per Style Manual provisions.
4	2		
5	5(b)	AIP	Pluralize the description, per Style Manual.
6	24	AIP	Specify Article 250 locations, per Style Manual
6(1)		AIP	Incorporate through-wall lighting assemblies as covered in the action on Proposal 20-91.
6(2)		AIP	Change to: "pool or fountain" from "contained body of water" to avoid implication that a pond is covered within Article 680. See panel statement on Proposal 20-32.
6(3)		AIP	Change to: "pool or fountain". See §680.6(2)
6(7)		AIP	Change to: "pool or fountain". See §680.6(2)
7		Accept	
7(A and B)	7	Accept	
7(C)	25(e)	Accept	
8(A)	8	AIP	(A) Power. With respect to service drop conductors and open overhead wiring, swimming pool and similar installations shall comply with the minimum clearances given in Table 680.8. This avoids the contained body of water problem; see §680.6(2). It also deletes proposed coverage of a roofed structure because as proposed it could allow drop conductors to pass over the pool , even if below the roof. The table and figure has an expanded title per current Style Manual preferences, and the text of the rule now refers to the figure for the same reason. The table has its internal references corrected, and the words "over" and "through" are used because the current format can be interpreted as meaning greater than the entire 15kV to 50kV range.
8(B)	8	AP	Accept only "(B) Communications Systems." See Panel action and statement on Proposal 20-53 for wording and reasoning. Retain, however the word "covered" instead of "complying with" for the reasons given in the substantiation hereto in Proposal 20-31.
8(C)(new)		Accept	Add: "(C) Network-Powered Broadband Communications Systems. The minimum clearances for overhead network-powered broadband communications systems conductors from pools or fountains shall comply with the provisions in Table 680.8 for conductors operating at 0 to 750 volts to ground." This correlates with a proposal to change §830.10(e), which if approved by CMP 16 will defer to Art. 680.
Table 680.8	Table 680.8	AIP	Insert metric columns per Proposal 20-56; revise wording in Row B per Proposal 20-57.
9	9	AIP/AP	Leave the word "pool" in this section. Change last part to: "…the total nameplate rated load." Change "more than" to "over". The first change avoids the contained body of water problem; see §680-6(2). The second and third changes are editorial.
10	10	AIP	Metrication integrated per Proposal 20-58. Title added to table, with text reference, per Style Manual

Submitter's Proposed Section	1999 NEC Section	Action	Statement
11	11	N/A	Editorial change to drainage description.
12	12	AIP	Wording revised to incorporate the action on Proposal 20-62.
20 (new)		Accept	
21(A)	25(c)	Accept	
(1)	25(c)	Accept	
(2)	25(c)	Accept	
(3)	25(c)	Accept	
(4)	25(c)	Accept	
(5)	25(c)	AIP	Change to: "(5) Cord- and Plug-Connections. Pool-associated motors shall be permitted to employ cord- and plug-connections in accordance with Section 680.7." The other part of the submitter's text needlessly recapitulated §680.7.
21(B)	6(d)	Reject	The panel decided to retain GFCI protection, but only on receptacle outlets. This material is covered in Section 680.22(A)(5).
21(C)	28	Accept	This becomes 21(B).
22(A)(1)	6(a)(1)	Accept	
22(A)(2)	6(a)(1)	AIP	"Not less than" per Style Manual
22(A)(3)	6(a)(2)	AIP	Edits per Style Manual
22(A)(4) (new)		Accept	Add new: "(4) Restricted Space. Where a pool is within 3 m (10 ft) of a dwelling and the dimensions of the lot preclude meeting the required clearances, not more than one receptacle outlet shall be permitted if at least 1.5 m (5 ft) measured horizontally from the inside wall of the pool." Responds to Proposal 20-39. Renumber following sections (4) & (5) to (5) & (6).
22(A)(5)	6(a)(3)	AIP	Remove "…or fountain…" This part of the article doesn't cover fountains.
22(A)(5)	6(d)	AIP	Added sentence from originally proposed §680.21(B), reworded to only apply to receptacle outlets. The panel reconsidered the concept of providing GFCI protection for all small motors and decided that there was insufficient substantiation to keep the rule for hard wired motors. The voltage range reflects Section 220-2 circuit (as opposed to device) voltages, and the panel action on Proposal 20-49.
22(A)(6)	6(a)FPN	AIP	Keep "doorway with hinged or sliding door". The panel believes that potentially requiring GFCI on inside receptacles near a sliding door is excessive. Change "is" to "shall be" because this is now a requirement.
22(B)	6(b)		N/C
(1)	6(b)(1)	AIP	Editorially delete "For new installations" and change heading to "(1) New Outdoor Installation Clearances."
(2)	6(b)(2)	AIP	Change (2) to (3). Existing installations follows requirements for indoor clearances.
(3)	6(b)(3)	AIP	Change (3) to (2). Change "at least" to "not less than" per Style Manual
(4)	6(b)(4)	AIP	Change in heading "Contiguous" to "Adjacent".
(5)	6(b)(5)	AIP	Change 680-20 to 680-7. The change in title and the beginning of the text (adding "and plug-") incorporates the panel action on Proposal 20-43.
22(C)	6(c)	AIP	See Panel action on 20-44, incorporated herein.
23	20	Accept	
23(A)(1)	20(a)(1) 1st ¶	Accept	
23(A)(2)	5(a)	AIP	Add ungrounded secondary per Proposal 20-36.
23(A)(3)	20(a)(1) 2nd ¶	Accept	
23(A)(4)	20(a)(2)	Accept	
23(A)(5)	20(a)(3)	AIP	Change "at least" to "not less than" per Style Manual
23(A)(6)	20(a)(4)	Accept	
23(A)(7)	20(a)(5)	Accept	
23(A)(8)	20(a)(1) 3rd ¶	Accept	

Submitter's Proposed Section	1999 NEC Section	Action	Statement
23(B)(1)	20(b)(1) 1st ¶; 20(b)(1) 4th ¶, 1st, 3rd sentences	Accept	
23(B)(2)	20(b)(1) 2nd ¶	Accept	
(a)		Accept	
(b)		AIP	Add "solid or stranded" to incorporate the panel action on Proposal 20-77. Add "equipment grounding" after "insulated copper" in the first sentence, add "equipment" ahead of "grounding conductor" in the second sentence, and add "equipment grounding" after "No. 8" in the third sentence. This uses terms consistently and incorporates the recommendation of Proposal 20-75. The panel notes that on the submitter's relocation chart, Sections 680.23(b)(3)(a-b) should be 680.23(b)(2)(a-b).
23(B)(3)	25(b)(5)	Accept	
23(B)(4)	20(b)(2)	Accept	
23(B)(5)	20(b)(3)	Accept	
23(C)(1)	20(c) 1st ¶	Accept	
23(C)(2)	20(c) 2nd ¶, 4th sentence	Accept	
23(D)	20(d)	AIP	Delete "be" after "A no-niche fixture shall".
23(E)	N/A	N/A	Results from action on Proposal 20-115, editorially corrected to correlate with related material. Based on the limited information provided, the panel assumes this product is comparable to a wet-niche fixture while operating. The submitter is invited to provide additional information during the comment period.
23(E)(1)	25(b)(2-3); 20(c) 2nd ¶, 1st, 2nd, 3rd sentences	AIP	Renumber as -23(F)(1) per action on 20-115
23(E)(1) Exception	25(b)(3) Exception	AIP	Renumber as -23(F)(1) Exception per action on 20-115
23(E)(2)	25(b)(1); 25(b)(4), 3rd sentence	AIP	Renumber as -23(F)(2) per action on 20-115. Incorporate through-wall lighting assemblies as covered in the panel action on Proposal 20-93.
23(E)(2) Ex.	25(b)(3) Ex.	AIP	Renumber as -23(F)(2) Exception per action on 20-115
23(E)(2)(a)	25(b)(4)(a)	AIP	Renumber as -23(F)(2)(a) per action on 20-115
23(E)(2)(b)	25(b)(4)(b)	AIP	Renumber as -23(F)(2)(b) per action on 20-115
23(E)(3)	5(c)	AIP	Renumber as -23(F)(3) per action on 20-115
24(A-E)	21	AIP	Minor edits for Style Manual
24(F)	25(b)(4), 1st, 2nd sentences	Accept	
25	25(d)	Accept	
25(A)		Accept	
25(A) Exception		Accept	
25(B)		Accept	
(1)		Accept	
(2)		Accept	
26	22		
26(A)		Accept	
26(B)		AIP	Deletion of "listed" in Section 680.22(B)(1) reflects action on Proposal 20-82. In Section 680.22(B)(4), add the second paragraph as accepted in the action on Proposal 20-84. Change (B)(5)(b) strikethrough to underline for "(b) Vertical. Within", corrects a typo in the submittal.
26(C)		Accept	Note that "(C) Common Bonding Grid. …" is a level one subsection to 680.26.

Submitter's Proposed Section	1999 NEC Section	Action	Statement
26(D)		Accept	
26(E)	22(c)	Accept	
27(A)	23	AIP	Insert "solid or stranded" to correlate with the panel action on Proposal 20-77 in a directly comparable application. Revise Section 680-27(A)(2) to include LFNC and change "suitable" to "listed" as covered in the action on Proposal 20-89. Add "equipment grounding" after "insulated copper"; add "equipment" prior to "grounding conductor"; add "equipment grounding after "of the No. 8, in 680.27(A)(2). This is for consistent use of terminology. See Panel action on Proposal 20-75.
27(B)	26	Accept	
27(C)	27	Accept	
30 (new)		AIP	Add the heading "General." Sections require titles.
31	30	Accept	
32	31	AIP	Reword the FPN per current style.
33	32	AIP	The Panel notes the last sentence of 680.33(A) to be newly relocated material from 680.32(a)(5). Remove the dash between "shall" and "be". Item (4) shall end with "…150 volts." Delete the comma and the word "and" at the end of item (4). In (B)(4), delete "is", and in (B)(5) change "It complies" to "Compliance" for style considerations on list items.
40 (new)		AIP	Add the heading "General." Sections require titles.
41	38	AIP	Use the phrase "not less than" per current style.
42	40	AIP	(The rewrite proposal already covered the panel action on the first half of Proposal 20-118 and on Proposal 20-119.) The proposed language is further changed by adding Section 680.42(C) as covered in the second half of Proposal 20-118, slightly modified with regard to the equipment grounding conductor to directly correlate with the language in 680.21(A)(4) of the rewrite. The title is more fully descriptive for clarity.
43	41	Accept	The word "Exception:" is new material.
43(A)	41(a)	AIP	Use "not less than", "not exceeding" per current style.
43(A)(4)	41(a)(2)FPN	AIP	Add after "ceiling,": "doorway with hinged or sliding door, window opening,". This is consistent with Panel action on 680.22(A)(5), which will be 680.22(A)(6). Change "is" to "shall be" for style.
43(B)(1)(a)	41(b)	AIP	Change "where" to "If" because it describes a condition of existence not location.
43(B)(2)	41(b)(2)	AIP	Change format of 680.43(B)(1)(1) and (2) to 680.43(B)(1)(a) and (b). Add titles "Without GFCI" to the first, and "With GFCI" to the second. Make the rules complete sentences: "Where no GFCI protection is provided, the mounting height shall be not less than 3.7 m (12 ft)." and, for the second item "Where GFCI protection is provided, the mounting height shall be permitted to be not less than 2.3 m (7 ft 6 in.)." Change 680.43(B)(2) in the proposal to 680.43(B)(1)(c) and rewrite as follows: "(c) Below 2.3 m (7 ft 6 in.). Lighting fixtures meeting the requirements of (1) or (2) and protected by a GFCI shall be permitted to be installed less than 2.3 m (7 ft 6 in.) over a spa or hot tub. (1) Recessed fixtures with a glass or plastic lens and nonmetallic or electrically isolated metal trim, and suitable for use in damp locations. (2) Surface-mounted fixtures with a glass or plastic globe, a nonmetallic body or a metallic body isolated from contact, and suitable for use in damp locations."
43(B)(3)		Accept	Item (3) in the proposal, covering "Underwater Applications, will now be 680.43(B)(2). This change and the one preceding it are editorial, addressing Style Manual rules about third level entries and list entries.
43(C)	41(c)	AIP	Use "not less than" per current Style Manual
43(D)	41(d)	AIP	Use "that are" consistently to maintain parallel construction on the list; reword (5) for style and proper grammar in a list

Submitter's Proposed Section	1999 NEC Section	Action	Statement
Between 43(F) and (G)	41(g) & (h)	Accept	Removed parts (g) and (h) from old 680-41(g) and (h).
43(G)	41(i)	Accept	
44	42	AIP	Change "where" to "if" in (A) and (B) (three places) because it is a condition of existence and not place.
44(A)	42 Exception	Accept	
44(B)		Accept	
44(C)	42	Accept	
44(D)	42	Accept	
44 FPN	42 FPN	AIP	Change reference to Section 680.2.
50	50	AIP	Specify applicable parts of Art. 422 per Style Manual
51	51	AIP	Section 680.51(A) reworded as covered in the panel action on Proposal 20-125. Section 680.51(C) changed from "approved" to "listed" as covered in the action on Proposal 20-126.
52(B)	52	AIP	At end of last sentence, delete the word "following", and remove colon and add "of (1) and (2) at the end." In (1) and (2), leave only the title, and restate the numbered paragraphs as rules instead of a list format, at the suggestion of the staff editor. This structure better complies with the Style Manual.
55(A)	55	AIP	Change to: "(A) Applied Provisions. The provisions of ~~680-25~~ 680-21(A), 680-23(B)(3), 680-23(E)(1-2), 680-24(F), and 680-25 shall apply." Editorial change to reduce the verbage.
56(B)	56(b)	AIP	Reworded to incorporate the panel action on the Panel proposal associated with Proposal 20-129.
57	57	AIP	Reworded to incorporate the concept of the panel action on Proposal 20-130. This wording supersedes the action on that proposal.
60	60	AIP	Reference to Article 517 changed from 3 to 2 to reflect likely reorganization of that article relative to mandatory Style Manual rule about definition locations. Statement made a fine print note because it is merely explanatory in nature. Applicable parts of Art. 422 specified per Style Manual requirements.
62(A)	62	Accept	
62(A)(1)		Accept	
62(A)(2)		Accept	
62(A)(3)		Accept	
62(B)(5)	62(c)(5)	AIP	Revised to better accommodate the status as a list item.
62(C) – (F)		AIP	Change items (d) to (C), (e) to (D), (g) to (E), and (h) to (F). Corrects numbering error in the submittal.
62(C)	62(d)	AIP	Reworded to incorporate the panel action on Proposal 20-132
70 (new)		Accept	
71	70	Accept	
72	71	Accept	
	72 (deleted)	Reject	Make as Section 680.73. The panel is concerned as to how accessible and well understood the rules are in Section 110-26 regarding access.
73	73	AIP	Change to Section 680.74.

(Log #4078)

20- 35 - (680-4-Through Wall Lighting Assembly (New)): Accept in Principle in Part

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-2 of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Gary Burkitt, PacFab, Inc.

RECOMMENDATION: New definition under heading.

Through Wall Lighting Assembly. A lighting assembly intended for installation above grade, on or through the wall of a pool, consisting of two interconnected groups of components separated by the pool wall. The design of the components outside of the pool wall addresses hazards related to these components being exposed above grade.

SUBSTANTIATION: This type of lighting assembly is currently being produced and installed without the benefit of a definition in Article 680.

This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of products conforming to these requirements.

PANEL ACTION: Accept in Principle in Part.

Accept as written, but without the last sentence. The definition will read:

"Through-Wall Lighting Assembly. A lighting assembly intended for installation above grade, on or through the wall of a pool, consisting of two interconnected groups of components separated by the pool wall."

PANEL STATEMENT: The last sentence of the suggested definition is not relevant.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #984)

20- 36 - (680-5(a)): Accept

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-23(A)(2) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise second sentence:

The transformer shall be an isolated winding type with an ungrounded secondary and having a grounded metal barrier between the primary and secondary windings.

SUBSTANTIATION: Editorial. "Isolated" while perceived to mean ungrounded also, does not specifically require "ungrounded". Many isolated winding types are grounded (See Section 250-26). Section 517-64(b) indicates an isolating transformer means not an autotransformer. Sections 668-20(b) and 668-21(a) specify an ungrounded secondary which clearly conveys what is required.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3850)

20- 37 - (680-6): Accept in Principle

SUBMITTER: J. Philip Simmons, Simmons Electrical Services

RECOMMENDATION: Revise existing Section 680-6 and create additional sections as follows:

680-6. Receptacle~~, Lighting Fixtures, Lighting Outlets, Switching Devices, and Ceiling Suspended (Paddle) Fans~~

(a) General. ~~Other~~ Unless otherwise provided in (b), receptacles on the property shall be located at least 10 ft (3.05 m) from the inside walls of a pool or fountain.

(b) Receptacles for Water-Pump Motor. 1. A receptacle(s) that provides power for a water-pump motor(s) for, or other loads directly related to the circulation and sanitation system, a permanently installed pool or fountain, as permitted in Section 680-7, shall be permitted between 5 ft and 10 ft (1.52 m and 3.05 m) from the inside walls of the pool or fountain, and, where so located, shall be single and of the locking and grounding types and shall be protected by a ground-fault circuit interrupter(s).

~~Other receptacles on the property shall be located at least 10 ft (3.05 m) from the inside walls of a pool or fountain.~~

(c) Receptacle Required ~~2.~~ Where a permanently installed pool is installed at a dwelling unit(s), at least one 125-volt 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located a minimum of 10 ft (3.05 m) from and not more than 20 ft (6.08 m) from the inside wall of the pool. This receptacle shall be located not more than 6 ft 6 in. (1.98 m) above the floor, platform, or grade level serving the pool.

(d) Ground-Fault Circuit-Interrupter Protection. ~~3.~~ All 125-volt receptacles located within 20 ft (6.08 m) of the inside walls of a pool or fountain shall be protected by a ground-fault circuit interrupter.

FPN: In determining the above dimensions, the distance to be measured is the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier.

680-7. ~~(b)~~ Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans.

(a). General. ~~In outdoor pool areas~~, Lighting fixtures, lighting outlets, and ceiling-suspended (paddle) fans shall not be installed over the pool or over the area extending 5 ft (1.52 m) horizontally from the inside walls of a pool unless no part of the lighting fixture or ceiling-suspended (paddle) fan is less than 12 ft (3.66 m) above the maximum water level.

~~(d).~~ Lighting fixtures and lighting outlets installed in the area extending between 5 ft (1.52 m) and 10 ft (3.05 m) horizontally from the inside walls of a pool shall be protected by a ground-fault circuit interrupter unless installed 5 ft (1.52 m) above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool.

(b) Outdoor Areas. In outdoor pool areas, existing lighting fixtures and lighting outlets located less than 5 ft (1.52 m) measured horizontally from the inside walls of a pool shall be at least 5 ft (1.52 m) above the surface of the maximum water level, shall be rigidly attached to the existing structure, and shall be protected by a ground-fault circuit interrupter.

(c). Indoor Areas. In indoor pool areas, the limitations of Section 680-7(a) shall not apply if all of the following conditions are complied with

1. Fixtures are of a totally enclosed type,

2. A ground-fault circuit interrupter is installed in the branch circuit supplying the fixture(s) or ceiling-suspended (paddle) fans, and

3. The distance from the bottom of the fixture or ceiling-suspended (paddle) fan to the maximum water level is not less than 7 ft 6 in. (2.29 m).

~~(d). Lighting fixtures and lighting outlets installed in the area extending between 5 ft (1.52 m) and 10 ft (3.05 m) horizontally from the inside walls of a pool shall be protected by a ground-fault circuit interrupter unless installed 5 ft (1.52 m) above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool.~~

(d) ~~(c)~~ Cord-Connected Fixtures. Cord-connected lighting fixtures shall meet the same specifications as other cord- and plug-connected equipment as set forth in Section 680-7 where installed within 16 ft (4.88 m) of any point on the water surface, measured radially.

680-8 ~~(c)~~ Switching Devices. Switching devices on the property shall be located at least 5 ft (1.52 m) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall, or other permanent barrier.

680-9 ~~(d)~~ Motors in Other than Dwelling Units. Wiring supplying pool pump motors rated 15 and 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.

Renumber following sections.

SUBSTANTIATION: This proposal does not intend to make any substantive changes to this section but is intended to be editorial in nature.

The present section combines too many requirements in one section and is confusing to read. Providing a general section for lighting fixtures and grouping similar requirements should make the section more user-friendly.

PANEL ACTION: Accept in Principle.

See Proposal 20-30a.

PANEL STATEMENT: Proposal 20-30a addresses the submitter's concerns.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2093)

20- 38 - (680-6(a)(1)): Accept
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-22(A)(1) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Delete "for" from the second sentence:
Create a new sentence by breaking the first sentence into two.
Will now read as follows:
(a) Receptacles.
1. A receptacle(s) that provides power for a water-pump motor(s) for, or other loads directly related to the circulation and sanitation system, a permanently installed pool or fountain, as permitted in Section 680-7, shall be permitted between 5 ft and 10 ft (1.52 m and 3.05 m) from the inside walls of the pool or fountain.
This receptacle(s) where so located, shall be single and of the locking and grounding types and shall be protected by a ground-fault circuit interrupter(s).
Other receptacles on the property shall be located at least 10 ft (3.05 m) from the inside walls of a pool or fountain.
SUBSTANTIATION: This will help in the user better understand the code requirements.
There was no technical change.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4303)

20- 39 - (680-6(a)(1), Exception (New)): Accept in Principle in Part
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-22(A)(4) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Glenn Soles, Clark County Building Dept./Rep. So. Nevada Electrical Code Committee
RECOMMENDATION: Add the following exception:
Exception: Where the authority having jurisdiction approves a pool or fountain on a residential lot the pool or fountain is within 10 in. of the dwelling, the existing receptacle outlet/s required by Section 210-52(e), shall be allowed to remain if they are at least 5 ft from the inside wall of the pool or fountain.
SUBSTANTIATION: Section 210-52(e) requires at least one receptacle outlet accessible at grade level at the front and back of the dwelling. Section 210-8(a)(3) requires those outlets to be GFCI protected. When the authority having jurisdiction approves a pool or fountain for a dwelling on a small lot, often this pool or fountain consumes this entire area. The pool or fountain could be designed in conjunction with the dwelling to come up to the outer wall of the dwelling. By removing the existing outlet a more hazardous situation has been created. the homeowner will plug their TV/Radio into the closest outlet they can find. This is often inside the rear door or slider in the living room, family room, dining room or a bedroom. Three problems are created b y this scenario:
1/ These outlets are not GFCI protected.
2/ The cords are routed through doorways or windows creating tripping hazards and subjecting these cords to physical damage.
3/ Due to this physical damage exposed bare conductors may be present to create more of a potential shock hazard.
PANEL ACTION: Accept in Principle in Part.
Revise 680-6(a) by adding a new item (3) to read:
"Where a pool or fountain is within 3m (10 ft) of a dwelling and the required clearances in (1) and (2) above cannot be met, one receptacle outlet shall be permitted if at least 1.5m (5 ft), measured horizontally, from the inside wall of the pool or fountain."
Renumber existing (3) to (4).
PANEL STATEMENT: The panel agrees that such situations exist and agrees with the necessity of this new requirement. In order to more clearly accomplish the objective of the submitter, the panel has revised the proposed exception as a positive requirement, has included a necessary reference to 680-6(a)(1) and has clarified the intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2481)

20- 40 - (680-6(a)(2)): Accept in Principle
SUBMITTER: Ronald M. DeGesero, Bldg Dept., City of Coral Springs, FL
RECOMMENDATION: Revise as follows:
In severe distance restrictions the authority having jurisdiction will allow the distance to be between 5 ft to 10 ft.
SUBSTANTIATION: Across the nation including the southern states, smaller building lots and zero lot restrictions in many communities force pools and hot tubs to be nested closer to buildings and with patios or decks being screened. The distance restriction should be eased. Many small appliances or devices are built with shorter cords and with ground-fault circuit protection Section 680-6(a)(2) already in tact nothing will be jeopardized.
PANEL ACTION: Accept in Principle.
See Proposal 20-39.
PANEL STATEMENT: The action on Proposal 20-39 addresses the concern of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #1143)

20- 41 - (680-6(b), (d)): Reject
SUBMITTER: Victor V. Timpanaro, Municipal Electrical Inspectors Assn. of NJ, Inc.
RECOMMENDATION: Change section heading to read:
"Motors in Other than One and Two Family Dwellings".
SUBSTANTIATION: Original submittal in 1999 was submitted with details of fatality which occurred in a multi-family apartment complex pool used by the public. We had neglected to specify the locations targeted then.
PANEL ACTION: Reject.
PANEL STATEMENT: This is covered by Proposal 20-30a. Refer to the panel statement for 680-22(A)(5) in Proposal 20-31.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #1799)

20- 42 - (680-6(b)(4)): Accept
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-22(B)(4) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Add the words "at least" before the second instance of "5 ft."
SUBSTANTIATION: The literal requirement as written requires that the fixture be 5 ft above the water rather than at least 5 ft. While this should be obvious, it is different than the language of 680-6(b)(2) and 680-6(c) which may mislead users into thinking the requirements are different.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #985)

20- 43 - (680-6(b)(5), (d)): Accept in Part

Note: It is the understanding of the Technical Correlating Committee that the rejected portion of the Proposal was addressed in the Substantiaton of Proposal 20-31. The Panel Action is covered by 680-22(B)(5) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(b)(5) Cord and plug-connected lighting fixtures shall meet the same specifications as set forth in Section 680-7 where installed within 16 ft (4.88 m) of any point on the water surface, measured radially.

(d) Motors ~~in Other than Dwelling Units.~~ ~~Wiring~~ Branch circuits supplying pool pump motors ~~rated 15 and 20 amperes, 125 volts or 240 volts, single phase, whether by receptacles or direct connection~~ from a grounded ac system shall be provided with ground-fault circuit-interruptor protection for personnel. Except as required in (a)(1) above this requirement shall not apply where the pool is located on the premises of a one family dwelling.

SUBSTANTIATION: The reference to Section 680-7 in (b)(5) covers cord and plug connected equipment while this section refers to Cord-connected fixtures which includes those of Section 410-30(b). The present wording applies the No. 12 EGC and attachment plug requirements to such fixtures.

The present syntax of (d) is awkward and confusing. It indicates the motors are rated 15- or 20-amperes, 125-or 240-volts single phase, not the circuits. The code uses nominal 120-volts for circuits and usually differentiates connections as cord-and plug or permanent. The reference to manner of connection is irrelevant to the requirement since it applies to either type of connection. Branch circuit should be specified as services and feeders are also wiring supplying the pump motor. Present wording applies to a 240-volt single-phase motor supplied from a 240-volt 3-phase 3-wire ungrounded system where the normal GFCI won't function and is limited by listing to grounded systems. Pool pumps in other than dwelling units may be supplied by grounded 3-phase systems. What is the rationale for limiting requirements to certain ampere and voltage ratings? If GFCI devices are not readily available for 480-volt grounded systems other circuits could be provided.

The proposed last sentence for (d) specifies one-family dwellings since "other dwelling units" in the heading may include multifamily dwellings, some hotels and motels, etc., which does not appear to be the intent.

This section, dealing with motors and GFCI protection is more appropriate for Section 680-5, or following Section 680-25(c), since the heading for this section doesn't include either item.

PANEL ACTION: Accept in Part.

Accept only the addition of "and Plug-" and reject the rest of the proposal.

PANEL STATEMENT: The panel agrees with the proposal only with respect to the addition of the words "and Plug-". The rejected portion of this proposal will be addressed in Proposal 20-30a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #1481)

20- 44 - (680-6(c)): Accept in Principle

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-22(C) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Gary A. Boughton, Town of Ridgefield, CT

RECOMMENDATION: In last sentence, change period to comma and add the following:

or the switch conforms to Section 9.7 of UL-1563 Standard and is listed for use within 5 feet [July 19, 1996 fourth edition.]

SUBSTANTIATION: Several companies makes switches that are tested to 9.7 of UL 1563 Standard and are listed for this use (Jandy, Compoo, and others I presume). The electrical code does not allow for their use. If the product has been tested as safe and listed it should be able to be used. I would also mention that the instructions for their installation should be looked at also. Some instructions allow the unit to be in the water submerged other subsections say that the water test is only a splash test. There is a problem with the installation of the switch if it is allowed to be submerged, as the conduit can bring water to the control panel.

PANEL ACTION: Accept in Principle.

Add a second sentence to 680-6(c) to read: "Alternatively, a switch that is listed as being acceptable for use within 1.5m (5 ft) shall be permitted."

PANEL STATEMENT: The Panel's rewrite of the submitter's proposal is to clarify the intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3226)

20- 45 - (680-6(c) Exception No. 1 (New)): Accept in Principle

SUBMITTER: Kevin Worswick, Teledyne Laars Jundy Products

RECOMMENDATION: Add an exception to read as follows:

Exception No. 1: Listed switching devices 15 volts or less specific to pool/spa applications may be accessible to occupants in circulating water.

SUBSTANTIATION: Many inspectors do not allow listed (UL 1563) switching devices within five feet of a permanent pool/spa. Portable spas already incorporate switching devices accessible to occupants. This would make an exception to allow listed devices to be used with permanent pool/spa installations.

PANEL ACTION: Accept in Principle.

See Proposal 20-44.

PANEL STATEMENT: The action on Proposal 20-44 addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #1764)

20- 46 - (680-6(d)): Accept in Principle

Note: It is the understanding of the Technical Correlating Committee that the Proposal was addressed in the Substantiaton of Proposal 20-31.

SUBMITTER: Andrew T. Crescuillo, Rep. Genesee Chapter IAEI

RECOMMENDATION: Revise as follows:

(d) Motors in Other Than Dwelling Units. ~~Wiring~~ Branch-Circuits supplying pool pump motors rated 15 and 20 amperes, 125 volts or 250 volts, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit interrupter protection for personnel.

SUBSTANTIATION: So as to only require ground fault protection for the branch-circuit not for the feeder or the service.

PANEL ACTION: Accept in Principle.

See Proposal 20-30a.

PANEL STATEMENT: This issue is being addressed by Proposal 20-30a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2094)

20- 47 - (680-6(d)): Accept in Principle

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Delete this section from 680-6 .

(d) Motors in Other than Dwelling Units. Wiring supplying pool pump motors rated 15 and 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.

SUBSTANTIATION: This Section does not belong here.

See 680-6 Title.

Motors are not included here.

Also does not require GFCI's on motors installed for pools located for dwelling units. Why

It does not seem that motor installations around dwelling units are more safe.

Other than dwelling units imply that pools are more unsafe in this environment. Untrue statement.

A pool is a pool wherever it is located.

All rules must apply to all pool installations unless this code panel distinguishes the differences.

PANEL ACTION: Accept in Principle.

See Proposal 20-30a.

PANEL STATEMENT: The proposal here is to delete 680-6(d), but the editorial rewrite in Proposal CP2001 deletes the section, but incorporates the concept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2451)

20- 48 - (680-6(d)):

Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" to correlate with the action on Proposal 20-31.

SUBMITTER: John A. Hoffman, Centre Region Code Admin.

RECOMMENDATION: Revise to read as follows:

(d) Motors in other than dwelling units. Branch circuit wiring supplying pool pump motors rated 15 and 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with a ground fault circuit interrupter type breaker for protection of personnel.

SUBSTANTIATION: This change clarifies use of mandated GFCI protection and eliminates use of GFCI receptacles and dead front GFCI protectors in other than dwelling units.

PANEL ACTION: Accept in Principle.

See Proposal 20-30a.

PANEL STATEMENT: This issue is being addressed by Proposal 20-30a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3643)

20- 49 - (680-6(d)): Accept in Principle

SUBMITTER: Timothy D. Curry, Curry Electric, Inc.

RECOMMENDATION: Revise text to read as follows:

"Wiring supplying motors, rated 15 and 20 amperes, 125 volts ~~or~~ to 240 volts, single phase...".

SUBSTANTIATION: This section deals with "other than dwelling units", i.e., public buildings, and hotels, etc. A very common voltage for these types of buildings is 208/120 volts, 3 phase, 4 wire. With the present wording, a single phase, 208 volt motor does not need to be GFCI protected. I believe that this very important safeguard should not be allowed to slip through a loop hole.

PANEL ACTION: Accept in Principle.

See Proposal 20-30a.

PANEL STATEMENT: The concept is being retained in the rewrite of Proposal 20-30a, but the lower end of the range of applicable voltages has been changed from 125 to 120. The word "or" after 120-volts has been changed to the word "to", as suggested by the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3797)

20- 50 - (680-6(d)): Accept in Principle

Note: The Technical Correlating Committee directs the Panel to clarify the Panel Action and Statement on this Proposal, specific to the proposed addition of "One and Two Family" to the section title. It is not clear where this action is covered by the rewrite of Article 680 in Proposal 20-30a. This action will be considered by the Panel as a Public Comment.

SUBMITTER: John I. Williamson, Minnesota Board of Electricity

RECOMMENDATION: Modify the wording in this section as follows:

"Motors in Other than One- and Two-Family Dwelling Units. Wiring supplying pool pump motors rated 15 and 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel."

SUBSTANTIATION: Based on the substantiation in Proposal 20-96 in the NFPA 70 A98 ROP, apartment complexes were listed along with other occupancies that constitute increased risks to life safety in and around pools. The title of this section has been changed to be clear that this section does not apply to one- and two-family dwellings, but in fact, it does apply to multifamily dwellings.

PANEL ACTION: Accept in Principle.

See Proposal 20-30a.

PANEL STATEMENT: The panel agrees with the concept set forth by the submitter and it has been incorporated into the editorial rewrite of Article 680 in Proposal 20-30a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #986)

20- 51 - (680-7, FPN No. 2 (New)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add a fine print note to read as follows:

FPN No. 2: See Section 680-20 for flexible cords for underwater pool lighting fixtures and Section 680-56 for flexible cords in fountains.

SUBSTANTIATION: Editorial. To provide correlation with the referenced sections which have equal rank, and remove a literal conflict. Section 680-50 indirectly requires fountains with water common to a pool to comply with this section. Referencing cords in fountains allows this section to apply to cords with attachment plugs as permitted by Section 680-56(d), if that is the intent.

PANEL ACTION: Reject.

PANEL STATEMENT: Proliferation of fine print notes that cross reference other sections of the same article is redundant. The specific requirements modify the general requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #1800)

20- 52 - (680-8): Accept in Principle

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: Revise as follows:

"Except where installations provide the clearances in Table 680-8, the following part of pools shall not be placed under existing service-drop conductors or any other open overhead wiring; nor shall such wiring be installed above the following:

(1) Pools and the area extending 10 ft (3.05 m) horizontally from the inside of the walls of the pool,

(2) Diving structure, or

(3) Observation stands, towers, or platforms."

SUBSTANTIATION: As currently written, the clearances in Table 680-8 do not apply as shown in Figure 680-8, because the clearances only apply to (3) in the list. Although Figure 680-8 applies the clearance dimensions to areas above or near a pool, the text of the rule prohibits the installation of conductors above the pool, the diving structure, or the area within 10 feet of the pool. The apparent intent of the rule, given Table 680-8 and Figure 680-8, is that overhead conductors be allowed in the area outside/above the dotted line in the diagram. However, in the current rule, the conductors are permitted only above observation stands, towers, or platforms, and would be prohibited at any height above most of the area designated by the dotted line.

If the panel intent is as written, the Figure should be revised to reflect the rule as written.

PANEL ACTION: Accept in Principle.

See Proposal 20-30a.

PANEL STATEMENT: The panel agrees with the concept suggested by the submitter and it has been incorporated into the editorial rewrite of Article 680 in Proposal 20-30a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3125)

20- 53 - (680-8): Accept in Principle
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: Change second paragraph that follows Figure 680-8 as follows:
Communication, radio and television ~~Community antenna system coaxial~~ cables complying with Articles 800 through 820 and the supporting messengers shall be permitted at a height of not less than 10 ft (3.05 m) above swimming and wading pools, diving structures, and observation stands, towers, or platforms.
~~FPN: See Sections 225-18 and 225-19 for clearances for conductors not covered by this section.~~
SUBSTANTIATION: The proposed revision recognizes those cable types which are ~~not~~ utility-owned that were intended to be covered by the NEC as in the 1996 edition of the Code. Also, this proposed revision to delete the Fine Print Note (FPN) after the second paragraph maintains the original CMP 20 intent during the 1999 NEC cycle's comment period as the references are not related to pools. Refer to NFPA 70 A98 ROC items 20-99 and 20-100.
PANEL ACTION: Accept in Principle.
See Proposal 20-30a.
PANEL STATEMENT: The panel agrees with the concept suggested by the submitter and it has been incorporated into the editorial rewrite of Article 680 in Proposal 20-30a. However, the words "complying with" have been changed to "covered by" to comply with the NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4109)

20- 54 - (680-8): Accept in Principle
SUBMITTER: Robert E. Molde, Northern States Power Co./Rep. Wisconsin Utilities Assn.
RECOMMENDATION: Revise as follows:
B Clearance in any direction to the diving platform, observation stand or tower.
SUBSTANTIATION: The diagram clearly states that clearance "B" applies to the observation stand. To promote consistency and lessen confusion, this change should be made.
PANEL ACTION: Accept in Principle.
See Proposal 20-57.
PANEL STATEMENT: Proposal 20-57 addresses the concerns of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4374)

20- 55 - (680-8): Reject
SUBMITTER: Joseph A. Hertel, Safety and Buildings Div., State of Wisconsin
RECOMMENDATION: Add a column to Table 680-8. Clearances to include:
Insulated communication conductors and cables.
Clearance
A. 6.7 m (22 ft)
B. 4.3 m (14 ft)
SUBSTANTIATION: Table 680-8 is extracted in part, from the National Electrical Safety Code (NESC) and while it prevents service or supply conductors from being installed above swimming pools it does not limit communication conductors with the exception of community antenna coaxial systems. By including the NESC table in its entirety it would restrict the installation of all types of conductors above or in proximity to a swimming pool. Addressing only service or supply conductors generates a degree of confusion and communication conductors can operate at voltages that may be lethal when experienced in a swimming pool.
PANEL ACTION: Reject.
PANEL STATEMENT: This is covered in the paragraph under Figure 680-8. The panel is reluctant to change the table.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #529)

20- 56 - (Table 680-8): Accept
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by Table 680-8 of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change Table 680-8 as shown below:
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

Table 680-8. Clearances

		Insulated Supply or Service Drop Cables, 0-750 Volts to Ground, Supported on and Cabled Together with an Effectively Grounded Bare Messenger or Effectively Grounded Neutral Conductor		All other supply or Service-Drop conductors Voltage to Ground			
				0-15 kV		Greater than 15-50 kV	
		m	ft	m	ft	m	ft
A	Clearance in any direction to the water level, edge of water surface, base of diving platform, or permanently anchored raft.	6.7	22	7.5	25	8.0	27
B	Clearance in any direction to the diving platform or tower	4.3	14	5.2	17	5.5	18
C	Horizontal limit of clearance measured from inside wall of the pool	This limit shall extend to the outer edge of the structures listed in (1) and (2) above but not less than 3.0 m (10 ft)					

(Log #3126)

20- 57 - (Table 680-8): Accept

Note: Table 680-8 It is the understanding of the Technical Correlating Committee that the Panel Action is covered by Table 680-8 of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.

RECOMMENDATION: Change item B in Table 680-8 as follows:

Table 680-8. Clearances

		Insulated Supply or Service Drop Cables, 0-750 Volts to Ground, Supported on and Cabled Together with an Effectively Grounded Bare Messenger or Effectively Grounded Neutral Conductor	All Other Supply or Service-Drop Conductors Voltage to Ground	
			0-15 kV	Greater than 15-50 kV
A	Clearance in any direction to the water level, edge of water surface, base of diving platform, or permanently anchored raft	22 ft (6.7 m)	25 ft (7.62 m)	27 ft (8.23 m)
B	Clearance in any direction to the observation stand, tower, or diving platform ~~or tower~~	14 ft (4.27 m)	17 ft (5.2 m)	18 ft (5.49 m)
C	Horizontal limit of clearance measured from inside wall of the pool	This limit shall extend to the outer edge of the structures listed in (1) and (2) but not less than 10 ft (3.05 m)		

SUBSTANTIATION: This change relates to the diagram in Figure 680-8 that clearly states clearance "B" applies to the observation stand. Also, this provides added clarity in the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #530)

20- 58 - (680-10): Accept

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-10 of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: In Section 680-10, replace "5 ft (1.52 m)" with "1.5 m (5 ft)" throughout and change Wiring Method table as follows:

	Minimum Burial	
Wiring Method	**mm**	**in.**
Rigid metal conduit	150	6
Intermediate metal conduit	150	6
Nonmetallic raceways listed for direct burial without concrete encasement	450	18
Other approved raceways*	450	18

~~For SI units: 1 in = 25.4 mm.~~

*Note: Raceways approved for burial only where concrete-encased shall require a concrete envelope not less than 50 mm(2 in.) (~~50.8 mm~~)thick

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #987)

20- 59 - (680-10): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise second sentence to read as follows:

Where space limitations prevent wiring from being routed 5 ft (1.52 m) or more from the pool such wiring shall be permitted where installed in rigid metal conduit or intermediate metal conduit bonded to a common bonding grid as covered in Section 680-22(b), or a nonmetallic raceway system.

SUBSTANTIATION: Such conduits may not be associated with the pool and thus are not covered by Section 680-22(a)(4) or (a)(5) since earth cover is a barrier. A metal service raceway with a low level ground fault could result in stray currents. Since this is a relaxation of the basic requirement, bonding may be warranted as it is for wiring that does supply pool equipment.

PANEL ACTION: Reject.

PANEL STATEMENT: The code now requires that conduit to be bonded. The panel does not consider earth to be a barrier.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2444)

20- 60 - (680-10): Reject

SUBMITTER: Michael J. Timpanaro, Silver Springs, FL

RECOMMENDATION: Revise text to read:

"Suitable for the location. The minimum burial depth for all underground wiring shall be as follows."

SUBSTANTIATION: The same hazards exist with wiring for pool equipment as with nonpool circuit wiring within the 5 ft zone. For example a 120 volt, GFCI protected circuit, for a wet-niche fixture installed within the 5 ft zone is the same as a 120 volt GFCI protected circuit for nonpool equipment or devices. All wiring within he 5 ft zone shall be installed at the same burial depth as in Table 680-10.

PANEL ACTION: Reject.

PANEL STATEMENT: The panel does not believe adding these words will enhance the level of safety. Additional supporting information is needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #403)

20- 61 - (680-11): Reject
SUBMITTER: Thomas Bond, Bond's Electric
RECOMMENDATION: Revise 680-11 to read as follows:
Equipment rooms and pits where equipment rooms or pits are installed, a receptacle shall be installed. This receptacle shall be protected by a ground fault circuit interrupter.
SUBSTANTIATION: In Article 680, there is no requirement requiring an outlet in the area to service the equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter does not provide technical justification for this requirement. In addition, the suggested wording eliminates the first sentence of 680-11, again without justification.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #1478)

20- 62 - (680-12): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-12 of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Joe Delallo, Jr., Dependable Electric Service LLC
RECOMMENDATION: Add the words "for pool equipment" after the words "disconnecting means."
To read as follows:
A disconnecting means for pool equipment shall be provided...
SUBSTANTIATION: Wording now is not clear. Is this for all pool equipment or just E.L. motors, lights blowers, etc.?
PANEL ACTION: Accept in Principle.
See Proposal 20-30a.
PANEL STATEMENT: The panel agrees that the original wording of 680-12 did not clearly communicate the panel's intention with respect to requirements for disconnects when this text was initially added to the 1996 edition of the Code. See Proposal 20-30a for the necessary changes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #CP2002)

20- 62a - (680-12): Accept
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-12 of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: CMP 20
RECOMMENDATION: Revise 680-12 to read:
"Maintenance Disconnecting Means. One or more disconnecting means from all ungrounded conductors shall be provided for all utilization equipment other than lighting. Each means shall be accessible and within sight from its equipment."
SUBSTANTIATION: The panel agrees that the original text did not clearly communicate the intent of the panel when it was originally added in 1996. This rewrite accomplishes the clarifications recommended in Proposals 20-62 and 20-69, and also incorporates the accepted elements of Proposals 20-64, 20-65, 20-67, and 20-68. None of the proposals offered technical justification. The panel has accepted only those recommended changes that relate to clarification of intent or improvement of style.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2088)

20- 63 - (680-12): Reject
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Revise the text so that clarity of requirement applies:
Section 680-12 reads as follows:
680-12. Disconnecting Means. A disconnecting means shall be provided and be accessible, located within sight from all pools, spas, and hot tub equipment, and shall be located at least 5 ft (1.52 m) from the inside walls of the pool, spa, or hot tub.
Revise to read as follows:
680-12. Disconnecting Means. A disconnecting means for all pools, spas, and hot tub equipment shall be provided and be accessible. The disconnecting means shall be located within sight from all pools, spas, and hot tub equipment. Where the disconnecting means is located adjacent to the pool, spa, or hot tub the disconnecting means shall be located at least 5 ft (1.52 m) from the inside walls of the pool, spa, or hot tub.
SUBSTANTIATION: This section is unclear as to how many disconnects are required around a pool or equipment room.
If the disconnect is located remote of the pool or hot tub or spa another disconnect would be required with the area adjacent to the pool etc.
Section 680-38 now requires an emergency disconnect accessible to the user in occupancies other than a single family dwelling.
Why not dwellings?
Why not pools in all occupancies ?
Since the emergency disconnect is not required than Section 680-12 should be and is creating an emergency disconnect by the way it is presently worded.
This was not the original intent of Section 680-12.
I hope the Panel can clear this up.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wording offers no effective change. The substantiation seems to indicate a desire to edit 680-38. See Proposal 20-62a for changes made which might satisfy the submitter's concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3013)

20- 64 - (680-12): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-12 of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Robert H. Keis, Dover, DE
RECOMMENDATION: Add text as follows:
680-12. Disconnecting Means. A disconnecting means to disconnect all associated motors shall be provided and be accessible, located within sight from all pools, spas, and hot tub equipment, ... (rest of paragraph remains as is).
SUBSTANTIATION: Disconnect what? This section falls under Part A General. Are we to disconnect all the lighting, all the receptacles, or switches, or all the motors, or maybe everything in and around the pool or spa or hot tub. This section could maybe apply to something else on the property. It would help if the panel would clear this up. Maybe a panel generated proposal would be in line.
PANEL ACTION: Accept in Principle.
See Proposal 20-62a.
PANEL STATEMENT: Proposal 20-62a addresses the submitter's concern and clarifies the requirements for disconnects.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ryan
EXPLANATION OF NEGATIVE:
EGAN: Panel action on January 18, 2000 was unanimous vote on a motion to reject. Letter ballot indicates a panel action of APR which is contrary to the vote taken.

(Log #3127)

20- 65 - (680-12): Accept in Part
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-12 of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: Change:
680-12. Disconnecting Means. An accessible single means for disconnecting ~~means~~ all ungrounded power conductors ~~shall be provided and be accessible, located within sight from~~ to all pools, spas, and hot tub equipment, shall be provided and located within

sight, ~~and shall be located~~ at least 5 ft (1.52 m) from the inside walls of the pool, spa, or hot tub.
SUBSTANTIATION: This change is necessary to clarify the reason for the disconnecting means to pools, spas, and hot tub equipment. Also, this improves the user-friendliness of the Code.
PANEL ACTION: Accept in Part.
Accept only the language "all ungrounded conductors"; reject all else. This is incorporated into Proposal 20-62a.
PANEL STATEMENT: A single disconnect is not intended and a disconnect for users is not intended.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3805)

20- 66 - (680-12): Reject
SUBMITTER: Ronald Robinson, City of East Orange, NJ
RECOMMENDATION: Revise as follows:
Disconnecting means shall be accessible, located within sight from pools, spas, or hot tubs equipment, and shall be located at least 5 ft horizontally from inside wall of pools, spas, or hot tubs.
SUBSTANTIATION: The wording needs to reflect that the disconnecting means is for related equipment for pools, spas, and hot tubs.
PANEL ACTION: Reject.
PANEL STATEMENT: This would eliminate the requirement for the disconnect. See Proposal 20-62a for changes made which might satisfy the submitter's concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3877)

20- 67 - (680-12): Accept in Part
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-12 of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: J. Philip Simmons, Olympia, WA
RECOMMENDATION: Delete Section 680-12.
SUBSTANTIATION: It appears this section is not needed as Section 680-3(a) requires "Except as modified by this section, wiring and equipment in or adjacent (to) pools and fountains shall comply with the applicable requirements of Chapters 1 through 4." As a result, rules for disconnecting means for motors and other equipment is adequately provided for in other parts of Chapters 1 through 4. It is not clear in the existing section what other equipment is special or unique to pools, spas or hot tubs that need this additional requirement for a disconnecting means.
In addition, new Section 680-38 to the 1999 NEC provides the requirement for an emergency disconnecting means for spas and hot tubs so the disconnecting means provided in Section 680-12 does not seem to be necessary, at least for those installations. There is no indication that the disconnecting means required in Section 680-12 is for emergency purposes as these disconnects apply to all installations covered in Part A while one family dwellings are excluded from Section 680-38.
Finally, it is not clear what equipment this section was intended to apply to or what electrical equipment is intended to be disconnected. The disconnecting means is required within sight of "all pools, spas, and hot tub equipment." As worded, the requirement can be interpreted to require a disconnecting means within sight of lighting fixtures, receptacles and pool lighting junction boxes that are located outside and panelboards, timers, motor controllers and pump motors that are located inside. It does not seem that this would be the panel intent.
PANEL ACTION: Accept in Part.
Accept the deletion of the redundant text at end of sentence beginning with " . . . , and shall be located". Reject deletion of requirement for service disconnect. This has been incorporated into Proposal 20-62a.
PANEL STATEMENT: The location requirement is covered in 680-6(c), Switching Devices. It is the panel's intent to require the diconnecting means. See Proposal 20-62a for changes made which might satisfy the submitter's concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3903)

20- 68 - (680-12): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-12 of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Alfred A. Fiorello, Fiorello Electric Inc.
RECOMMENDATION: Revise as follows:
Pools, spas and hot tub ~~equipment~~ motors.
SUBSTANTIATION: The word "equipment" could possible mean a light or heater, which is not the intent of this section.
PANEL ACTION: Accept in Principle.
See Proposal 20-62a.
PANEL STATEMENT: Proposal 20-62a addresses the submitter's concern and clarifies the requirements for disconnects. It is the panel's intent to include items such as heaters and sanitizers.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ryan
EXPLANATION OF NEGATIVE:
EGAN: Panel action on January 18, 2000 was unanimous vote on a motion to reject. Letter ballot indicates a panel action of APR which is contrary to the vote taken.

(Log #4257)

20- 69 - (680-12): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-12 of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Revise as follows:
"One or more ~~a~~ disconnecting means shall be ~~provided and be accessible, located within sight from all pools, spas, and~~ installed for motor-operated pool, spa, or hot tub equipment, and for pool, spa, or hot tub heating equipment. The disconnecting means shall be accessible and located within sight of the equipment supplied, at a point at least 5 feet (1.52 m) horizontally from the inside walls of the pool, spa, or hot tub.
SUBSTANTIATION: This revision corrects numerous problems in the 1999 wording. First, multiple disconnects may be required, and the present language suggests only one is allowed. In addition, the present rule imposes the requirement on literally all equipment, which would include light fixtures; motors and heaters should be enough at this point. In addition, the present literal text requires disconnects in sight of bodies of water ("pools, spas") in addition to "hot tub equipment" due to grammatical errors in the 1999 rewrite. The disconnect rule properly applies to electrical equipment, not to bodies of water.
PANEL ACTION: Accept in Principle.
See Proposal 20-62a.
PANEL STATEMENT: The panel agrees that the original wording of 680-12 did not clearly communicate the panel's intention with respect to requirements for disconnects when this text was initially added to the 1996 edition of the Code. See Proposal 20-62a for the necessary changes.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4371)

20- 70 - (680-12): Reject
SUBMITTER: Marcos Ramirez, Mr. Electric Service Co., Inc.
RECOMMENDATION: Revise as follows:
680-12. Disconnecting Means. A disconnecting means shall be provided and be accessible, clearly visible, located within sight ~~from~~ of all pools, spas, and hot tub equipment, and shall be located at least 5 ft (1.52 m) from the inside walls of the pool, spa, or hot tub.
SUBSTANTIATION: The phrase of is the acceptable terminology - better than the word from.
Clearly visible explains that there should not be anything that would obstruct the view of the switch, such as plants, shrubs, etc.
PANEL ACTION: Reject.
PANEL STATEMENT: "Clearly visible" is already required in "within sight" and the correct terminology as stated in Article 100 is "from".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3771)

20- 71 - (680-20(a)): Reject
SUBMITTER: Tarry L. Baker, Board of Rules and Appeals, Broward County, FL
RECOMMENDATION: Revise as follows:
~~In addition, a ground-fault circuit interrupter shall be installed in the branch circuit supplying fixtures operating a. more than 15 volts, so that there is no shock hazard during relamping. The installation of the ground-fault circuit interrupter shall be such that there is no shock hazard with any likely fault condition combination that involves a person in a conductive path from any ungrounded part of the branch circuit or the fixture to ground.~~ All underwater wet niche, dry-niche, and no-niche lighting fixtures shall be of the type for use with 15 volts or less.
SUBSTANTIATION: The ground-fault circuit interrupter receptacles installed in the field. (When reset) do not always give the GFCI protection. They give power to the circuit only. This code change provides a higher degree of safety. Eliminates hazards due to improper maintenance or installation of 110 Volt swimming pool underwater wet niche, dry-niche and no-niche lighting fixtures with false GFCI protection.
PANEL ACTION: Reject.
PANEL STATEMENT: The Panel does not wish to restrict the operating voltage to 15-volts or less. The submitter does not present any technical justification or safety data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #322)

20- 72 - (680-20(a)(1) and (2)): Reject
SUBMITTER: Henry Karnilowicz, Occidental Express
RECOMMENDATION: Modify the wording of (a) General (1) and (2).
Relocate (2) to (1) and state as follows:
(1) No lighting fixtures shall be installed for operation on supply circuits over 12 volts between conductors.
(2) The design of an underwater lighting fixture supplied from a branch circuit either directly or by way of a transformer meeting the requirements of Section 680-5(a) shall be such that, where the fixture is properly installed without a ground fault circuit-interrupter, there is no shock hazard with any likely combination of fault conditions during normal use (not relamping).
In addition, a ground-fault circuit-interrupter shall be installed in the branch circuit supplying the transformer ~~fixtures operating at more than 15 volts,~~ so that there is no shock hazard during relamping. The installation of the ground-fault circuit-interrupter shall be such that there is no shock hazard with any likely fault-condition combination that involves a person in a conductive path from any ungrounded part of the branch circuit or the fixture to ground.
Compliance with this requirement shall be obtained by the use of an approved underwater lighting fixture and by installation of an approved ground-fault circuit-interrupter in the branch circuit.
SUBSTANTIATION: This proposal would eliminate the possibility of voltage high enough, traveling through the water, which could cause a fatality.
PANEL ACTION: Reject.
PANEL STATEMENT: Having a GFCI on the primary of the transformer will not protect the secondary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #1797)

20- 73 - (680-20(b)): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Delete "intermediate metal" from the second paragraph.
SUBSTANTIATION: The third paragraph says metal conduits shall be of brass or other approved corrosion-resistant metal. However, Intermediate Metal Conduit is defined in Section 345-1 as a listed steel raceway. Listing standards also describe IMC as a steel conduit. While rigid metal conduit is available in other than steel construction , IMC is defined as steel and should not be included in this section because it is not available in brass or other suitable metals.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not want to restrict the future use of other materials that may meet these requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2439)

20- 74 - (680-20(b)): Reject
SUBMITTER: Mark E. Dunlap, Apex Electric Inc.
RECOMMENDATION: Revise text to read:
"Wet-niche fixtures, where metallic and nonmetallic is used. One insulated copper bounding conductor required on the outside lug only. Connected to bounding grid."
SUBSTANTIATION: You have a rivet connecting inside lug to outside lug no need to have a ground to inside lug.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter by his rewrite has removed several requirements that are crucial to a safe installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #391)

20- 75 - (680-20(b)(1)): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-23(B)(2)(b) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
RECOMMENDATION: In the first sentence of fourth paragraph after the words "insulated copper", add the words equipment grounding...
In the second sentence of the fourth paragraph after the words "No. 8", add the words equipment grounding...
SUBSTANTIATION: This revision is to identify the purpose of the conductor as an equipment grounding conductor (EGC) as opposed to a bonding conductor.
This conductor is terminated at the equipment grounding terminal within the junction box or transformer enclosure thus it is an EGC.
See 680-21(d) i.e. "Grounding Terminal".
PANEL ACTION: Accept in Principle.
See Proposal 20-30a.
PANEL STATEMENT: This suggesttion has been incorporated into Proposal 20-30a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3712)

20- 76 - (680-20(b)(1)): Reject
SUBMITTER: Gary Burkitt, KDI American Products, Inc.
RECOMMENDATION: Revise fourth paragraph, first sentence as follows:
Where a nonmetallic conduit is used, a No. 8 insulated copper conductor shall be installed in this conduit with provisions for terminating in the forming shell, junction box or transformer enclosure, or ground-fault circuit-interrupter enclosure unless a listed ~~low-voltage~~ lighting system is used, not requiring grounding.
SUBSTANTIATION: In addition to the low-voltage products currently listed for this application, new line voltage products have been proposed.
This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of these line-voltage products.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation has been submitted to support this code change. The submitter should provide safety data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3772)

20- 77 - (680-20(b)(1)): Accept
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-23(B)(2)(b) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Patrick White, City of Coral Springs, FL
RECOMMENDATION: Change fifth sentence to read as follows:
Where a nonmetallic conduit is used, a No. 8 insulated solid or stranded copper conductor shall be installed in this conduit with provisions for terminating in the forming shell, junction box or transformer enclosure, or ground-fault circuit-interrupter enclosure unless a listed low-voltage lighting system is used not requiring grounding.
SUBSTANTIATION: Section 310-3 requires conductors No. 8 or larger to be stranded except where permitted elsewhere in this code. Section 680-20(b)(1) only mentions No. 8 insulated conductor where rigid nonmetallic conduit is run to the wet niche shell. Previously this section specified a No. 8 solid conductor. It appears that the word solid was dropped to allow a stranded No. 8 conductor. In practice No. 8 solid is still commonly used where rigid nonmetallic conduit is installed and this change will allow either stranded or solid conductors.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3711)

20- 78 - (680-20(b)(3)): Reject
SUBMITTER: Gary Burkitt, KDI American Products, Inc.
RECOMMENDATION: Revise as follows:
The fixture shall be bonded to and secured to the forming shell by a positive locking device that ensures a low-resistance contact and requires a tool to remove the fixture from the forming shell. Bonding is not required for fixtures listed for the application. ~~having no noncurrent-carrying metal parts.~~
SUBSTANTIATION: Products listed for this application may have incidental metal fasteners and/or hardware items that pose no risk of becoming electrified. An example is an isolated metal screw joining two polymeric parts.
This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of products containing such fasteners and hardware items.
PANEL ACTION: Reject.
PANEL STATEMENT: No data on fixtures has been submitted to substantiate this code change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2437)

20- 79 - (680-21(a)): Reject
SUBMITTER: Mark E. Dunlap, Apex Electric Inc.
RECOMMENDATION: Add text to read:
"PVC FS boxes approved for use with one ground lug."
SUBSTANTIATION: Deck boxes have grounding lugs which are not as good of a connection as wire nuts and there is no need for one extra lug.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not believe that the requirement for one additional grounding lug should be removed. The panel believes that the ground lug provides a more effective ground connection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #1139)

20- 80 - (680-22): Reject
SUBMITTER: Nick Sasso, Pinellas County Bldg Dept., FL
RECOMMENDATION: Revise text to read:
680-22. Bonding. It shall not be the intent of this section to require that the No. 8 or larger solid copper bonding conductor be extended or attached to any remote panelboard, service equipment, equipment ground terminal bar, or any electrode, but only that it shall be employed to eliminate voltage gradients in the pool area as prescribed.
SUBSTANTIATION: The problem is that contractors continue to attach the No. 8 or larger solid copper bonding conductor to the equipment ground terminal bar provided in swimming pool light junction boxes 680-21(d). (Wording needs to be more explicit to prevent this condition.)
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is not sure how the submitter wants the text changed or for what reason. The submitter is asked to provide additional guidance and information during the comment period.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2436)

20- 81 - (680-22): Reject
SUBMITTER: Mark E. Dunlap, Apex Electric Inc.
RECOMMENDATION: Revise text to read:
"Coping sections shall have a bonding strap to make one continuous length and bounded in six places to bounding grid."
SUBSTANTIATION: Coping sections are not connected together and need to be.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel is not sure how the submitter wants the text changed or for what reason. The submitter is asked to provide additional guidance and information during the comment period.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4258)

20- 82 - (680-22(a)(1)): Accept in Principle

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-26(B)(1) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Delete the last sentence and add a new exception, as follows:

Exception: Where reinforcing steel is effectively insulated by an encapsulating nonconductive compound at the time of manufacture, it shall be permitted to be unbonded provided No. 8 or larger bare solid copper conductors are run in the pour around the perimeter of the pool below the normal water line, and through the pour at other locations such that no point in the pour, measured through the pour, is more than 15 ft (4.58 m) from a bonding conductor.

SUBSTANTIATION: This proposal is a resubmittal of the proposal that provoked the change in this section. Unlike the 1999 NEC, however, it aims at the objectives of bonding without imposing completely unrealistic requirements.

The present literal text requires bonding to every epoxy coated reinforcing bar (commonly supplied for corrosion resistance) unless the steel foundry that rolled the bar stock went out and had the epoxy coating listed. Some major pool installations use a double concrete pour with literally thousands of reinforcing members, every single one of which are epoxy coated. Even the tie wires are coated.

In the past a sensible inspector simply would have said that the reinforcing didn't involve "the usual steel tie wires" and agreed to other equivalent arrangements. Remember, even if someone did grind off the coating of all those steel rods, the construction specifications would have required repainting all the connections with epoxy so as to not defeat the objective of ordering the epoxy coating in the first place.

Now, however, the Code squarely addresses epoxy-coated reinforcing. The room for an inspector to maneuver has gotten far smaller. If enforced, this rule makes any such job prohibitive. No steel mill is going to go out and get 0.001% of its epoxy-coated steel bar stock listed when 99.999% of its market is for bridge construction and other venues for which listed epoxy is irrelevant. The 1999 NEC rule has not and will not see the light of day in Massachusetts. CMP 20 should step on this one quickly. Either accept some version of this proposal, or completely exempt coated reinforcing from consideration as a bonding candidate.

PANEL ACTION: Accept in Principle.

Revise the last sentence of 680-22(a)(1) to read: "Where reinforcing steel is effectively insulated by an encapsulating nonconductive compound at the time of manufacture and installation, it shall not be required to be bonded."

PANEL STATEMENT: The panel's action on this proposal meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3713)

20- 83 - (680-22(a)(2)): Reject

SUBMITTER: Gary Burkitt, KDI American Products, Inc.

RECOMMENDATION: Revise as follows:

All forming shells and mounting brackets of a no-niche fixture unless a listed ~~low-voltage~~ lighting system is used, not requiring bonding.

SUBSTANTIATION: In addition to the low-voltage products currently listed for this application, new line voltage products have been proposed.

This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of these line-voltage products.

PANEL ACTION: Reject.

PANEL STATEMENT: No technical substantiation has been submitted to support this code change. The submitter should provide safety data.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #4259)

20- 84 - (680-22(a)(4)): Accept

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-26(B)(4) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Add a second paragraph, as follows:

"Where a double-insulated water-pump motor is installed under the provisions of this exception, a solid No. 8 copper conductor that is of sufficient length to make a bonding connection to a replacement motor shall be extended from the bonding grid to an accessible point in the motor vicinity. Where there is no connection between the swimming pool bonding grid and the equipment grounding system for the premises, this bonding conductor shall be connected to the equipment grounding conductor of the motor circuit."

SUBSTANTIATION: The new allowance for double-insulated swimming-pool pump motors (and other "equipment") needs to be addressed for two reasons. First, if the DI motor is replaced by a conventional motor, qualified personnel may not be involved, and probably won't go to any great length to make a proper bonding connection if it isn't readily available. Second, for the first time in the history of the National Electrical Code, we now have a bonded structure that could be without any connection to the equipment grounding system for the premises. This would happen if a DI motor were the only electrical equipment at the pool (no wet-niche fixtures, etc.), a relatively common occurrence.

This proposal restores the equipment grounding connection in such cases. This removes the possibility, for example, that someone may be carrying a conductive object connected to the building equipment grounding system through an extension cord and touch a metal slide or ladder support at a different voltage although still grounded in the pool vicinity.

In the prior cycle, CMP 20 rejected this proposal on the grounds that the bonding conductor might get lost at the time of a future installation. That's both true and beside the point. If there isn't a bonding conductor, then at the time of the future installation the connection is much worse than misplaced; it's nonexistent. Depending on the pool construction, establishing a bonding connection after the fact my be extremely costly and difficult.

With respect to the second half of the proposal, the panel also referred to the former fine print note, now an improperly worded rule in Sec. 680-22. The Advisory Committee understands quite well that there isn't any need to make a direct bonding connection to a remote panelboard, and never suggested it. Having a bonded object of the nature of an entire swimming pool sitting without an equipment grounding reference to the local electrical system is quite different.

We understand that the bonding in place will create the necessary Faraday Cage effect to allow safety for the swimmers whether or not the pool sees the local equipment grounding reference. However, the pool doesn't sit in isolation. It may be served by a nearby cabana, or otherwise within access to someone electrically connected to the prevailing system ground, whether by walking nearby with a grounded object in one hand or otherwise. In that wet environment, the two systems should share a common reference.

I can't think of any other situation where a conductive object of that size gets a NEC blessing to live its useful life without any common reference. I also think this is the first time in the history of the NEC that such an allowance has ever been made. CMP 20 is being entirely too cavalier in failing to fully consider the enormity of this precedent and its eventual implications.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 1

NOT RETURNED: 1 Ryan

EXPLANATION OF NEGATIVE:
LABRAKE: The Electric Light and Power Group is negative to the panel's action with the following comment: This proposal action imposes additional unnecessary costs relative to a design issue and it implies that future work would not be performed according to code requirements, which is not a reasonable assumption.

(Log #3014)

20- 85 - (680-22(b)(1)): Reject
SUBMITTER: Robert H. Keis, Dover, DE
RECOMMENDATION: Add a new sentence to the end of (1) as follows:
The means of bonding to wire mesh shall be by pressure connectors or clamps of brass, copper, copper alloy, or an equally substantial approved means.
SUBSTANTIATION: During 29 years as an inspector I can't count the number of arguments about wire mesh not being the structural reinforcing steel mentioned in this section. People try to use wire (whatever kind that is laying around) to tie this wire mesh together and it just cannot be made tight like re-bar can. I have also seen wire mesh with a piece of itself bent over another piece just to hold it in place. Re-bar has many ties on each piece because of the length of each bar. Re-bar is usually installed by professionals who know what they are doing and when they are finished you can climb on it. Wire mesh is usually laid down by the home owner or concrete man who have no idea what stray currents are and could care less. Wire mesh is usually tied once or twice here and there. As for the precedent, Section 547-9 recognizes the problem and has addressed it. It seems that the human population deserves at least as much protection from electrocution or shock hazard as we are giving the cows.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation for this procedure.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ryan
EXPLANATION OF NEGATIVE:
EGAN: Section 680-22(b) of the 1999 Code was changed to recognize exothermic welding as a means of connecting to a common bonding grid. This change also recognizes pressure connectors and clamps that are specifically listed for the purpose. Since wire mesh is a metallic part of the pool structure, it should be required to be bonded according to 680-22(a)(1).
The submitter has presented a valid recommendation to require adequate bonding.

(Log #4429)

20- 86 - (680-22(b)(3)): Reject
SUBMITTER: Scott T. MacDonald, Collyn Ferris, Aquadoor Inc.
RECOMMENDATION: Add new text:
A bare solid copper conductor not smaller than No. 6 running the circumference of the pool and ending at the deep end of the pool with a driven rod or equivalent.
SUBSTANTIATION: 680-22(b)(3) does not state how long the wire should be or where it is going to end. Also, if wire has no contact with large conductive surfaces it will be useless. For example, if a No. 6 solid insulated wire runs the circumference of the pool, it does no good unless many other objects are attached to it.
This bonding grid often works in reverse, current will come to the pool on the ground wire because the power pole ground caps have too high of resistance to ground. The current seeks the path of least resistance which is the ground under the pool.
This is due to small amounts of water leaking out of the pool and seeping down into the ground.
This is the path lightning will take if it strikes a power pole nearby.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation to warrant this additional requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #1978)

20- 87 - (680-22(d) (New)): Reject
SUBMITTER: Carl T. Wall, Alabama Power Co.
RECOMMENDATION: Add a new paragrah (d) to read as follows:
(d) Equipotential Plane. A concrete pool deck shall have wire mesh, reinforcing metal or other conductive element(s) installed in the concrete to form an equipotential plane. A minimum #8 solid bare copper conductor installed in the concrete pool deck a distance of one foot from the edge of the pool and forming a loop around the perimeter of the pool shall be permitted to serve as the conductive element of the pool deck.
SUBSTANTIATION: The number of complaints from owners of swimming pools concerning voltage differentials experienced when persons enter or exit pools has dramatically increased with the use of nonconductive fiber reinforcing materials for concrete. These nonconductive reinforcing materials are used in the pool decks in lieu of metallic reinforcing. The NEC does not require concrete decks around pools to have metallic elements. Investigations frequently determine that the pools involved in the complaints are compliant with the NEC requirements for a common bonding grid, thus indicating that additional requirements are needed. It is the intent of this change to require concrete pool decks to have metallic elements connected to the common bonding grid. Installing conductive elements in the concrete deck will establish an equipotential plane in the pool area and eliminate the complaints. This requirement is similar to the requirement in Article 547-9(b) for an equipotential plane in livestock areas.
PANEL ACTION: Reject.
PANEL STATEMENT: The code does not prevent this concept from being used, but no substantiation is provided to indicate that this should be required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 1 Ryan
EXPLANATION OF NEGATIVE:
LABRAKE: The Electric Light and Power Group is negative to the panel's action with the following comment: Proposed new section 680-22(d) would be acceptable as a means to reduce shock hazards upon occurrence if it was reworded as follows:
(d) Equipotential Plane. Under engineering supervision to control surface voltage gradients, an equipotential plane shall be permitted in the area surrounding the pool to serve as the conductive element of the pool deck.

(Log #390)

20- 88 - (680-23(b)): Accept
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-27(A)(2) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Glenn W. Zieseniss, Crown Point, IN
RECOMMENDATION: In the second sentence, after the words "insulated copper" add the words equipment grounding...
SUBSTANTIATION: This revision is to identify the purpose of the conductor as an equipment grounding conductor (EGC) as opposed to a bonding conductor.
This conductor is terminated at the equipment grounding terminal within the junction box, thus it is an EGC. See 680-21(d) i.e., "Grounding Terminal".
PANEL ACTION: Accept.
PANEL STATEMENT: This is being incorporated into the rewrite of Article 680, Proposal 20-30a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2979)

20- 89 - (680-23(b)): Accept in Principle

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-27(A)(2) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions

RECOMMENDATION: Revise text to read as follows:

(b) Wiring Methods. Rigid metal conduit or intermediate metal conduit of brass or other identified corrosion-resistant metal, liquidtight flexible nonmetallic conduit (LFNC-B) or rigid nonmetallic conduit shall extend from the forming shell to a suitable junction box or other enclosure as provided in Section 680-21. Where rigid nonmetallic conduit or liquidtight flexible nonmetallic conduit (LFNC-B) is used, a No. 8 insulated copper conductor shall be installed in this conduit with provisions for terminating in the forming shell and the junction box. The termination of the No. 8 conductor in the forming shell shall be covered with, or encapsulated in, a suitable potting compound to protect such connection from the possible deteriorating effect of pool water.

SUBSTANTIATION: Liquidtight flexible nonmetallic conduit (LFNC-B) is a listed conduit with equal, if not better, physical properties as the current wire methods listed. Liquidtight flexible nonmetallic conduit (LFNC-B) is can be listed for direct burial applications and approved for lengths longer than 6 ft.

Liquidtight flexible nonmetallic conduit is approved for use in 680-20 and 680-25. Liquidtight flexible nonmetallic conduit should be approved for use for Underwater Audio Equipment.

PANEL ACTION: Accept in Principle.

Use the text recommended by the submitter, but, in addition, change the word "suitable" to "listed".

PANEL STATEMENT: The minor change is to be consistent with other parts of the code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 1

NOT RETURNED: 1 Ryan

EXPLANATION OF NEGATIVE:

EGAN: There has never been any substantiation that LFNC-B is suitable for a chlorine rich environment.

(Log #3714)

20- 90 - (680-24(1)): Reject

SUBMITTER: Gary Burkitt, KDI American Products, Inc.

RECOMMENDATION: Revise as follows:

Wet-niche and no-niche underwater lighting fixtures, other than those ~~low voltage~~ systems listed for the application without a grounding conductor.

SUBSTANTIATION: In addition to the low-voltage products currently listed for this application, new line voltage products have been proposed.

This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of these line-voltage products.

PANEL ACTION: Reject.

PANEL STATEMENT: No technical substantiation has been submitted to support this code change. The submitter should provide safety data.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #4085)

20- 91 - (680-24(1)): Accept in Principle

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-6 of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Gary Burkitt, PacFab, Inc.

RECOMMENDATION: Revise as follows:

(1) Wet-niche, Through-Wall Assembly, and no-niche underwater lighting fixtures, other than those low-voltage systems listed for the application without a grounding conductor.

SUBSTANTIATION: This proposal implements the addition of the new definition of a Through-Wall Lighting Assembly to 680-4.

This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of these types of lighting assemblies.

PANEL ACTION: Accept in Principle.

Revise 680-24(1) to read:

"(1) Through-Wall Lighting Assemblies, wet-niche, and no-niche underwater lighting fixtures, other than those low-voltage systems listed for the application without a grounding conductor."

PANEL STATEMENT: The changes reflect editorial improvement and consistency. Acceptance of this proposal is contingent on the acceptance of Proposal 20-35.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2899)

20- 92 - (680-25(b)): Reject

SUBMITTER: Patrick White, Pompano Beach, FL

RECOMMENDATION: Revise as follows:

Where installed on buildings, electrical metallic tubing shall be permitted to be used to protect conductors. where installed within buildings, ~~electrical nonmetallic tubing or electrical metallic tubing~~ any raceway method installed per this code shall be permitted to be used to protect conductors.

SUBSTANTIATION: This section is overly restrictive as there are situations where the ability to use alternate raceways would simplify installations, i.e., fishing in walls to panels or through floor trusses etc. All raceways recognized by this code are safe when installer per the NEC and should be allowed by this section.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no technical substantiation to support the change to allow any raceway method.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #4084)

20- 93 - (680-25(b)(1)): Accept in Principle

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-6 of the rewrite of Article 680-23(F)(2) in Proposal 20-30a.

SUBMITTER: Gary Burkitt, PacFab, Inc.

RECOMMENDATION: Revise as follows:

(1) Wet-Niche, Through-Wall Lighting Assembly, dry-niche, or no-niche lighting fixtures shall be connected to an equipment grounding conductor sized in accordance with Table 250-122 but not smaller than No. 12.

SUBSTANTIATION: This proposal implements the addition of the new definition of a Through-Wall Lighting Assembly to 680-4.

This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of these types of lighting assemblies.

PANEL ACTION: Accept in Principle.

Revise 680-25(1) to read:

"(1) Through-Wall Lighting Assemblies, wet-niche, dry-niche, or no-niche lighting fixtures shall be connected to an equipment grounding conductor sized in accordance with Table 250-122 but not smaller than AWG12."

PANEL STATEMENT: The changes reflect editorial improvement and consistency. Acceptance of this proposal is contingent on the acceptance of Proposal 20-35.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #4359)

20- 94 - (680-25(b)(1), Exception (New)): Reject
SUBMITTER: Gary Burkitt, PacFab, Inc.
RECOMMENDATION: Add an exception to read as follows:
Exception: Lighting fixtures listed for the application without a grounding conductor.
SUBSTANTIATION: Products are currently listed for this application that do not require a grounding conductor. There have been instances where the authority having jurisdiction has demanded the addition of a ground wire for these listed products.
This proposal is intended to clarify the NEC for products listed for the purpose without a ground conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation has been submitted to support this code change. The submitter should provide safety data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3780)

20- 95 - (680-25(b)(2)): Reject
SUBMITTER: Lynn Adams, Escambia County, FL
RECOMMENDATION: Revise text to read as follows:
680.25(b)(2) The equipment grounding conductor shall be an insulated copper conductor and shall be installed with the circuit conductors in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid nonmetallic conduit
(add) "Where the grounding conductor to the wet-niche, dry-niche, or no-niche lighting fixture is connected to an insulated copper conductor installed in the proper raceway; a switch loop may be installed in the building, to a dedicated switch outlet box, using any of the wiring methods of Chapter 3 that include an insulated copper conductor, not smaller than No. 12."
SUBSTANTIATION: This would allow MC or HCF-AC cable to be routed inside the building for a pool light switch inside the dwelling or on the patio area. Requiring an insulated ground would reduce the likelihood of inadvertent contact with energized terminals in the switch box. Requiring the light to be grounded, as now required, would continue the additional level of safety provided by raceway protection of the grounding conductor. Requiring the switch outlet box to be dedicated would prevent other circuits in the box.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation has been submitted to support this code change. The submitter should provide safety data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2089)

20- 96 - (680-25(b)(3), Exception): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-23(F)(1) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Joel A. Rencsok, Scottsdale, AZ
RECOMMENDATION: Delete the exception or move to a new location.
3. Where installed on buildings, electrical metallic tubing shall be permitted to be used to protect conductors. Where installed within buildings, electrical nonmetallic tubing or electrical metallic tubing shall be permitted to be used to protect conductors.
FPN: For requirements of electrical nonmetallic tubing, see Article 331.
~~Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted to be used when installed in accordance with Article 351 and does not exceed 6 ft (1.83 m) for any one length or 10 ft (3.05 m) of total length used.~~
SUBSTANTIATION: This Exception makes no sense located here.
The main article refers to EMT and ENT not LFMC or LFNMC so the exception does not apply.
See NEC Style Manual.
Wiring methods also do not belong in 680-25 since the TITLE states " Methods of grounding" and not "Wiring methods".
PANEL ACTION: Accept in Principle.
See Proposal 20-30a.
PANEL STATEMENT: Proposal 20-30a addresses this issue.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2980)

20- 97 - (680-25(b)(3), Exception): Reject
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:
Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit or liquidtight flexible nonmetallic conduit shall be permitted to be used when installed in accordance with Article 351 and does not exceed 6 ft (1.83 m) for any one length or 10 ft (3.05 m) of total length used. Liquidtight Flexible Nonmetallic Conduit, Type B (LFNC-B), 3/8 Trade Size or larger, shall be permitted to be installed in lengths longer than 6 ft (1.83 m).
SUBSTANTIATION: This proposal allows Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) to be used in lengths longer than 6 feet. Section 351-23(a)(5) permits LFNC-B to be used in lengths longer than 6 feet.
PANEL ACTION: Reject.
PANEL STATEMENT: One-half in. trade size has been the norm for such installations. The Panel believes that 3/8 in. size is too small to accomodate the wiring needed for the installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4360)

20- 98 - (680-25(b)(4), Exception (New)): Reject
SUBMITTER: Gary Burkitt, PacFab, Inc.
RECOMMENDATION: Add an exception to read as follows:
Exception: Lighting fixtures listed for the application without a grounding conductor.
SUBSTANTIATION: Products are currently listed for this application that do not require a grounding conductor. There have been instances where the authority having jurisdiction has demanded the addition of a ground wire for these listed products.
This proposal is intended to clarify the NEC for products listed for the purpose without a ground conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation has been submitted to support this code change. The submitter should provide safety data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4361)

20- 99 - (680-25(b)(5), Exception (New)): Reject
SUBMITTER: Gary Burkitt, PacFab, Inc.
RECOMMENDATION: Add an exception to read as follows:
Exception: Lighting fixtures listed for the application without a grounding conductor.
SUBSTANTIATION: Products are currently listed for this application that do not require a grounding conductor. There have been instances where the authority having jurisdiction has demanded the addition of a ground wire for these listed products.
This proposal is intended to clarify the NEC for products listed for the purpose without a ground conductor.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation has been submitted to support this code change. The submitter should provide safety data.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2445)

20- 100 - (680-25(d)(3) (New)): Reject
SUBMITTER: Michael J. Timpanaro, Silver Springs, FL
RECOMMENDATION: Add new text to read as follows:
"In the interior of a one-family dwelling or in the interior of another building associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code that contain a copper equipment grounding conductor that is insulated or covered by the outer sheath, and not smaller than No. 12, shall be permitted between the service equipment and the remote panelboard where the panelboard does not supply underwater lighting fixtures in accordance with Section 680-20."
SUBSTANTIATION: Not all permanently installed pools for one-family dwellings are wired with underwater lighting fixtures in accordance with Section 680-20. Many new pools have fiber optic lighting installed and not required to comply with Sections 680-20 and 680-25(b). Since the only equipment installed and wired from the pool panelboard may be pool pump motors, receptacles required by 680-6(a)(2), pool heaters, or spa pump motors, the same wiring methods in Section 680-25(c) for one-family dwelling motors should be permitted for panelboards.
PANEL ACTION: Reject.
PANEL STATEMENT: A more protective installation is required because the panelboard may be called upon to supply other equipment in the pool area.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4312)

20- 101 - (680-26): Reject
SUBMITTER: Scott T. MacDonald, Collyn Ferris, Aquadoor Inc.
RECOMMENDATION: Add new text:
The pool cover housing lids shall be strong enough to protect the pool cover equipment from damage due to normal pedestrian traffic.
SUBSTANTIATION: Pool covers are listed products, so there is a general assumption that because the 110 section requires testing of the lids that these lids are safe for this application. We have not found this to be true. Many pool cover lids carry a warning sticker that states "DO NOT STAND ON LIDS". This presents a collapse and drowning risk to the public and could damage the cover preventing it from operating.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a listing issue, not an installation issue. The issue concerns the mechanical design of the lid, which is beyond the scope of the code. This issue should be referred to a third-party certification agency. In addition, no substantiation is provided that a problem exists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4315)

20- 102 - (680-26): Reject
SUBMITTER: Scott T. MacDonald, Collyn Ferris, Aquadoor Inc.
RECOMMENDATION: Add new text:
The pool cover controller shall stop all current to the other pool cover components when not in use.
SUBSTANTIATION: It would be best for the public if the power stopped at the controller and only passed through when motion is requested. The design of our current pool cover is such that power is in the cover housing at all times, this is normal construction procedure for most pool covers and should be stopped. If a pool cover housing floods it is likely the water will become electrified if the GFCI fails.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a design issue, not an installation issue, which is beyond the scope of the code. This issue should be referred to a third-party certification agency. In addition, no substantiation is provided that a problem exists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4316)

20- 103 - (680-26): Reject
Note: It was the action of the Technical Correlating Committee that the Panel reconsider this Proposal as it is within the Scope of the NEC. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Scott T. MacDonald, Collyn Ferris, Aquadoor Inc.
RECOMMENDATION: Add new text:
The GFCI shall be located within five ft of the pool cover controller and only protect the pool cover circuit.
SUBSTANTIATION: This is necessary because sometimes the GFCI is located too far from the controller. The pool cover's owner often cannot find the GFCI switch to reset it. If the pool cover fails to operate, this becomes an extreme risk to children around a pool. Many children drown each year, a pool cover that does not operate because the GFCI cannot be found, could easily contribute to this tragedy! Pool covers need an exclusive GFCI because often the pool lights are connected to the same circuit. If the pool light trips the GFCI, the pool cover won't cover the pool increasing the risk of drowning due to a failure of the lights.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a design issue, not an installation issue, which is beyond the scope of the code. This issue should be referred to a third-party certification agency. In addition, no substantiation is provided that a problem exists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4317)

20- 104 - (680-26): Reject
SUBMITTER: Scott T. MacDonald, Collyn Ferris, Aquadoor Inc.
RECOMMENDATION: Add new text:
Power for a pool cover shall only be provided to a remote controller. Power shall not be provided directly to the pool cover housing.
SUBSTANTIATION: This is necessary because even with good drains, a below grade housing can flood. I have personally seen no less than 35 GFCIs that are frozen in the on position. This means that a live circuit can be completely under water. When you combine these facts you can end up with electrified water in the pool cover housing chamber. GFCIs are rarely replaced when they fail to the on position and always replaced when they fail to the off position. Here is an example of how it really happens. The controller is in pool cover housing, everything in the housing is always damp or wet. The person closing the pool cover is dripping wet from swimming, they put one or two knees on the ground to open the housing lid and reach down, below grade, with a soaking wet hand to the controller and run the cover while water runs down their arm onto the controller.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a design issue, not an installation issue, which is beyond the scope of the code. This issue should be referred to a third-party certification agency. In addition, no substantiation is provided that a problem exists.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4318)

20- 105 - (680-26): Reject

Note: It was the action of the Technical Correlating Committee that the Panel reconsider this Proposal as it is within the Scope of the NEC. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Scott T. MacDonald, Collyn Ferris, Aquadoor Inc.

RECOMMENDATION: Add new text:

The controller for the pool cover shall be located such that a person cannot touch the water of the pool and the controller at the same time.

SUBSTANTIATION: This addition is necessary because the code allows the controller to be located about 1 1/2 feet away from the water. Section 680-26 states "unless separated from the pool by a wall, cover or other" and most electric covers are enclosed by "a cover". Since installing the controller right next to the motor is cheaper, it is sometimes still done this way, allowing a person to easily touch the water and controller at the same time.

PANEL ACTION: Reject.

PANEL STATEMENT: This is a design issue, not an installation issue, which is beyond the scope of the code. This issue should be referred to a third-party certification agency. In addition, no substantiation is provided that a problem exists.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #4319)

20- 106 - (680-26): Reject

Note: It was the action of the Technical Correlating Committee that the Panel reconsider this Proposal as it is within the Scope of the NEC. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Scott T. MacDonald, Collyn Ferris, Aquadoor Inc.

RECOMMENDATION: Add new text:

The controller shall be located in full view of the pool and not more than 35 feet from the inside wall of the pool.

SUBSTANTIATION: a. This addition is necessary because the 430-103 is almost never invoked. When it is, people say, "that is intended for industrial applications only." In reality the controller is often located where only part of the pool can be viewed.

b. Sometimes the controller is located in excess of 200 feet. Even though the pool may be in full view it is too far away to be safely operated. This could be compared to driving your car around your backyard by remote control from 200 feet away with small children present.

PANEL ACTION: Reject.

PANEL STATEMENT: This is a design issue, not an installation issue, which is beyond the scope of the code. This issue should be referred to a third-party certification agency. In addition, no substantiation is provided that a problem exists.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2897)

20- 107 - (680-29 (New)): Reject

SUBMITTER: James Maldonado, City of Tempe, AZ/Rep. Central Arizona Chapter IAEI

RECOMMENDATION: Add new Section 680-29 to read as follows:

Mechanical and Electrical Equipment Location. Mechanical and electrical equipment not addressed in other sections in Article 680, shall not be permitted within the area extending 5 ft (1.52 mm) horizontally from the inside wall of the pool.

FPN: In determining the above dimension the distance to be measured is the shortest path to the equipment without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other similar effective permanent barrier.

SUBSTANTIATION: The code currently restricts the installation of motors associated with pools, pool cover motors, underground conduit and disconnects from with 5 ft of a pool wall. This is hard to justify the logic when a motor not associated with the pool or air conditioning unit can be placed within this 5 ft zone. Even if it is bonded there is still a hazard that if corrosion occurs to this equipment since it will be splashed with chemically treated water on a continuous basis.

PANEL ACTION: Reject.

PANEL STATEMENT: No substantiation has been provided to justify this additional restriction that would be imposed by this proposal.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2438)

20- 108 - (680-31): Reject

SUBMITTER: Mark E. Dunlap, Apex Electric Inc.

RECOMMENDATION: Revise text to read:

"GFCI required on all 125 volt equipment."

SUBSTANTIATION: 240 volts GFCI on pumps not required because of nuisance tripping.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no substantiation that nuisance tripping is a problem.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3709)

20- 109 - (680-32(a)(1)): Reject

SUBMITTER: Gary Burkitt, KDI American Products, Inc.

RECOMMENDATION: Revise as follows:

Have no exposed metal parts <u>likely to become energized.</u>

SUBSTANTIATION: Products listed for this application may have incidental metal fasteners and/or hardware items that pose no risk of becoming electrified. An example is an isolated metal screw joining two polymeric parts.

This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of products containing such fasteners and hardware items.

PANEL ACTION: Reject.

PANEL STATEMENT: No data on fixtures has been submitted to substantiate this code change.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #4082)

20- 110 - (680-32(a)(1) (New)): Reject

SUBMITTER: Gary Burkitt, PacFab, Inc.

RECOMMENDATION: Delete 680-32(a)(1).

Add a new 680-32(a)(1): <u>(1) Have no metal parts which are immersed or accessible to contact and that are likely to become energized.</u>

SUBSTANTIATION: Products listed for this application may have incidental parts, metal fasteners and/or hardware items that pose no risk of becoming electrified. An example is an isolated metal screw joining two polymeric parts.

This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of products containing such parts, fasteners and hardware items.

PANEL ACTION: Reject.

PANEL STATEMENT: No data on fixtures has been submitted to substantiate this code change.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #4080)

20- 111 - (680-32(a)(5)): Reject
SUBMITTER: Gary Burkitt, PacFab, Inc.
RECOMMENDATION: Delete 680-32(a)(5).
Add a new 680-32(a)(5):
(5) Be listed for the purpose as a Through-Wall Lighting Assembly.
SUBSTANTIATION: This proposal implements the addition of the new definition of a Through-Wall Lighting Assembly to 680-4.
This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of these types of lighting assemblies.
PANEL ACTION: Reject.
PANEL STATEMENT: This is already allowed in 680-32(a) of the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3710)

20- 112 - (680-32(b)(1)): Reject
SUBMITTER: Gary Burkitt, KDI American Products, Inc.
RECOMMENDATION: Revise as follows:
Have no exposed metal parts likely to become energized.
SUBSTANTIATION: Products listed for this application may have incidental metal fasteners and/or hardware items that pose no risk of becoming electrified. An example is an isolated metal screw joining two polymeric parts.
This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of products containing such fasteners and hardware items.
PANEL ACTION: Reject.
PANEL STATEMENT: No data on fixtures has been submitted to substantiate this code change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4083)

20- 113 - (680-32(b)(1) (New)): Reject
SUBMITTER: Gary Burkitt, PacFab, Inc.
RECOMMENDATION: Delete 680-32(b)(1).
Add a new 680-32(b)(1):
(1) It has no metal parts which are immersed or accessible to contact and that are likely to become energized.
SUBSTANTIATION: Products listed for this application may have incidental parts, metal fasteners and/or hardware items that pose no risk of becoming electrified. An example is an isolated metal screw joining two polymeric parts.
The proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of products containing such parts, fasteners and hardware items.
PANEL ACTION: Reject.
PANEL STATEMENT: No data on fixtures has been submitted to substantiate this code change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4079)

20- 114 - (680-32(b)(6)): Reject
SUBMITTER: Gary Burkitt, PacFab, Inc.
RECOMMENDATION: Delete 680-32(b)(6).
Add a new 680-32(b)(6):
It is listed for the purpose as a Through-Wall Lighting Assembly.
SUBSTANTIATION: This proposal implements the addition of the new definition of a Through-Wall Lighting Assembly to 680-4.
This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of these types of lighting assemblies.
PANEL ACTION: Reject.
PANEL STATEMENT: This is already allowed in 680-32(b) of the code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4081)

20- 115 - (680-32(e) (New)): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-23(E) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Gary Burkitt, PacFab, Inc.
RECOMMENDATION: Add a new 680-32(e):
(e) Through-Wall Lighting Assembly. A through wall lighting assembly shall be as follows:
(1) Listed for the purpose.
(2) Equipped with a threaded entry or hub or a nonmetallic hub listed for the purpose for the termination of the supply circuit conduit.
SUBSTANTIATION: This proposal implements the addition of the new definition of a Through-Wall Lighting Assembly to 680-4.
This proposal is intended to provide Article 680 wording that would allow changes to be made to UL Standard 676 addressing the testing and listing of these types of lighting assemblies.
PANEL ACTION: Accept in Principle.
Accept the proposed text as a new paragraph (e) to 680-20 and add a new item (3) to read as follows:
"(e) Through-Wall Lighting Assembly. A through wall lighting assembly shall be as follows:
(1) Listed for the purpose.
(2) Equipped with a threaded entry or hub or a nonmetallic hub listed for the purpose for the termination of the supply circuit conduit.
(3) Installed in accordance with the requirements of 680-20(b)."
In addition, the first sentence of 680-20 should read "Paragraphs (a) through (e)..."
PANEL STATEMENT: The panel agrees with the proposed text, but believes that this should properly be a new paragraph to Section 680-20 and also believes that a reference to 680-20(b) is needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2472)

20- 116 - (680-38): Reject
SUBMITTER: Daniel T. Murphy, Local Union #98
RECOMMENDATION: Revise as follows:
680-38 Emergency Switch for Spas and Hot tubs. A clearly labeled emergency shut off or control switch for the purpose of stopping the motor(s) that provide power to the recirculation system and jet system shall be installed readily accessible to the users and at least 5 ft away, adjacent to and within sight of the spa or hot tub. ~~This requirement shall not apply to single family dwellings.~~
SUBSTANTIATION: With the number of hot tubs and spas in single family dwellings, and the potential for hazard from the intake motors, it seems only sensible to require the same shutoff requirements for single family dwellings. If such a potential hazard is so easily preventable, I feel it would only be common sense to require an emergency shutoff in single family homes as well.
PANEL ACTION: Reject.
PANEL STATEMENT: This section does not restrict the homeowner from installing an emergency switch, but does not require one.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4018)

20- 117 - (680-38): Reject

SUBMITTER: Christopher Pharo, Rep. IBEW

RECOMMENDATION: This proposal is to delete the last sentence.

Article 680-38... adjacent to, and within sight of the spa or hot tub. (DELETE THE NEXT SENTENCE):

~~This requirement shall not apply to single family dwellings.~~

SUBSTANTIATION: The requirement of a local disconnect within sight and labeled emergency shut-off pertaining to spas and hot tubs came about in the previous code cycle. A tragic accident had claimed the life of a teenage girl because the teenagers using the hot tube with her did not know where the shutoff for the equipment was located. It can be argued that the homeowner would not experience this degree of frustration because they do know the location of the circuit breakers. However, one would have to leave the equipment run inside the house, down the steps of the basement, move some storage boxes and then open the panel box in order to turn the power off to the equipment. This may take up to a minute and everyone know that in an emergency every minute counts. Other hazards exist in and around spas and hot tubs why not protect the homeowner. The homeowner would be more than willing to pay for a "safety feature" such as a local emergency disconnect switch adjacent to the equipment.

PANEL ACTION: Reject.

PANEL STATEMENT: This section does not restrict the homeowner from installing an emergency switch, but does not require one.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2047)

20- 118 - (680-40): Accept in Principle

SUBMITTER: Robert A. McCullough, Ocean County Construction Insp. Dept., NJ

RECOMMENDATION: Modify 680-40 as follows:

680-40 Outdoor Installations. A spa or hot tub installed outdoors shall comply with the provisions of Parts A and B of this article that would otherwise apply to pools installed outdoors except as permitted in (a) ~~and~~, (b,)or (c).

(c) Interior Wiring. In the interior of a one-family dwelling or in the interior of another building or structure associated with a one-family dwelling, any of the wiring methods recognized in Chapter 3 of this Code that contain a copper equipment grounding conductor that is insulated or covered by the outer sheath of the wiring method and is not smaller than No. 12 shall be permitted to be used for the connection to a self-contained spa or hot tub, or a packaged spa or hot tub equipment assembly.

SUBSTANTIATION: The language added to the main rule is that which was accepted by the Panel by its action on Proposal 20-170 Log #1280, in the A98 ROP. This was subsequently incorporated into the Panel's action on Proposal 20-171 Log #2048. The Panel accepted revisions to 680-1 in Proposal 20-80a (Log #CP2002), which also clarified the points made in the substantiation to Proposal 20-170. At the comment stage, the Panel accepted with a minor change, Comment 20-135 Log #2747 that modified Proposal 20-171. The language in Comment 20-135 did not include the already accepted language from Proposal 20-170. The Technical Correlating Committee then rejected the Panel's action on Proposal 20-80a, modifying 680-1 and removing the clarifying language. The net result of all these actions is that the points made in the original substantiation to Proposal 20-170 are still valid and this revision is needed.

A new paragraph (c) is proposed to clear up the confusion that exists with regards to the wiring methods to be employed. Current Code language requires a spa or hot tub installed outdoors to be wired as a permanently installed pool in accordance with Part B. If the spa or hot tub contains a light, 680-25(b) requires basically conduit back to the panelboard. If I install this same spa or hot tub indoors, 680-41 allows me to use any wiring methods of Chapter 3 whether or not there is a light installed. There should be no difference in the wiring methods in the interior of a dwelling. The unit doesn't know where it is installed. If we are to insist on the "conduit" rules in 680-25, shouldn't we insist that all of the other rules for lighting fixtures in Part B be applied? If a Cord- and Plug-Connected Lighting Assembly is used do we require the receptacle it plugs into be wired in conduit? The light assemblies used in the types of spas and hot tubs mentioned are part of the package, they have been investigated for that purpose and presumably are safe when applied within their listing.

PANEL ACTION: Accept in Principle.

This proposal is accepted and has been incorporated into 680-42 of the Article 680 rewrite, Proposal 20-30a.

PANEL STATEMENT: The panel agrees with the first part of this proposal.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3858)

20- 119 - (680-40(a)): Accept in Principle

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-42(A) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: J. Philip Simmons, Olympia, WA

RECOMMENDATION: Revise as follows:

680-40. Outdoor Installations. A spa or hot tub installed outdoors shall comply with the provisions of Parts A and B of this article except as permitted in (a) and (b).

(a) Flexible Connections. Self-contained spas or hot tubs, or units supplied by a listed packaged spa or hot tub equipment assembly, ~~Listed packaged units utilizing a factory installed remote panelboard~~ shall be permitted to be connected with not more than 6 ft (1.828 m) of liquidtight flexible conduit or be cord and plug connected with a cord not longer than 15 ft (4.57 m) if protected by a ground-fault circuit interrupter.

SUBSTANTIATION: This proposal is both editorial and substantive.

It is editorial so far as incorporating the defined terms "Packaged Spa or Hot Tub Equipment Assembly" and "Self-Contained Spa or Hot Tub" that were accepted for the 1996 NEC.

It is substantive so far as accepting factory installed or assembled control panels is concerned. Most self-contained spas do not have a panelboard, in the control equipment, at least so far as the definition in Article 100 is concerned. If they do have a panelboard, it commonly is contained within the control equipment assembly where the feeder or branch circuit terminates.

The control panel often includes additional equipment like GFCIs, contactors, transformers and timers. The word "remote" should be deleted as the panelboard or control equipment is a part of the packaged spa or hot tub equipment assembly and is by nature of its installation installed "remote" from the service.

PANEL ACTION: Accept in Principle.

See Proposal 20-30a.

PANEL STATEMENT: Proposal 20-30a addresses the submitter's concerns.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3621)

20- 120 - (680-40(c) (New)): Reject

SUBMITTER: Robert T. Baird, City of Idaho Falls, ID

RECOMMENDATION: Add new text to read as follows:

680-40(c) Service-drop conductors over residential property, where not in excess of 300 volts to ground and a swimming pool is not located on the same property, shall have 12 ft (3.66 m) minimum clearance over the spa or hot tub. This distance shall be measured from the top of the spa or hot tub to the service-drop conductors.

SUBSTANTIATION: When a spa or hot tub is not located on the same property as a swimming pool, long handled tools will not be used to clean the spa or hot tub. The electrical hazard, from the sevice-drop conductors over the spa or hot tub, would be no different than the service-drop conductors over the backyard of residential property. The 22 ft clearance is difficult to meet on smaller residential lots.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has not provided sufficient technical justification that would warrant a change to a lesser height.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #4260)

20- 121 - (680-41(b)): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-43(B) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Change the title to read:
"Installation of Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans." Insert a new numbered paragraph (3) as follows:
(3) Underwater lighting fixtures shall comply with the provisions of Part B or Part C of this article.
SUBSTANTIATION: In the process of converting the exceptions in this subsection to regular text, and in spite of Correlating Committee direction, the panel lost track of 1996 NEC paragraph (2), covering underwater lighting fixtures. This verbatim transcription from the 1996 NEC constitutes former 680-41(b)(2); after the reorganization, this proposal suggests (3) as its new location. Although Sec. 680-41 indicates compliance with Parts A and B of the article except as modified within this section, that doesn't bring back the full requirement.
PANEL ACTION: Accept in Principle.
See Proposal 20-30a.
PANEL STATEMENT: This has been incorporated into Proposal 20-30a.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #988)

20- 122 - (680-41(d)(3), (e)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(3) Metal ~~conduit,~~ raceways, metal enclosed cables, and metal piping within 5 ft (1.52 m) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub by a permanent barrier.
(e) Methods of Bonding. All metal parts ~~associated with the spa or hot tub~~ required to be bonded by (d) above, shall be bonded by any of the following methods:
(1) No change.
(2) No change.
(3) The provisions of a solid copper bonding jumper, insulated covered, or bare, not smaller than No. 8 ~~solid.~~
SUBSTANTIATION: Editorial. Exposed metal raceways not limited to conduit, and also metal cables not covered by (d)(2) should be included in (d)(3), as they are in Section 680-62(c)(3).
Metal enclosed wiring methods of (d)(3) which may not be associated with the spa or tub should also be required to be bonded in (e).
"Covered" conductors as defined in Article 100 appears to apply to an individually encased conductor for which (e)(3) may apply. Such conductors do not appear to be a listed product and are only indicated in one code table.
Literal wording of (e)(3) does not require a solid conductor only a copper conductor not smaller than No. 8 solid. A stranded copper No. 8 is not smaller than No. 8 solid copper in circular mil area and is larger in diameter.
PANEL ACTION: Reject.
PANEL STATEMENT: There is no technical substantiation to support the change to allow any raceway method.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2792)

20- 123 - (680-41(g)): Reject
SUBMITTER: Jonathan DaBoi Saravia, E. Freetown, MA
RECOMMENDATION: Delete present 680-41(g)(1), 680-41(g)(2) and replace with the following:
The provisions of 680-25 shall apply to the grounding of all electrical equipment and enclosures associated with the spa or hot tub.
SUBSTANTIATION: Modern spas and hot tubs are equipment with everything from lighting, televisions, communications, and sound systems. Grounding requirements need to be as stringent for spas and hot tubs as they are for pools.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation to warrant the change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #3015)

20- 124 - (680-42, FPN No. 2 (New)): Reject
SUBMITTER: Robert H. Keis, Dover, DE
RECOMMENDATION: Add new FPN No. 2 to end of section and renumber existing FPN as No. 1.
FPN No. 2: See Article 100 for definition of Outlet.
SUBSTANTIATION: Every time I teach a class or a continuing education seminar I ask the students what they think is meant by the word "outlet" when they read this section. The answer is always, "a receptacle." This is obviously not true when I read the definition of "outlet" in Article 100. If it is the intent of the panel that ALL spas and hot tubs are to have GFCI protection then we must either change the word "outlet" to something else, or else call the code user's attention to what this word means.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a common term used throughout the code and is defined in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #989)

20- 125 - (680-51(a)): Accept in Principle in Part
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-51(A) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) Ground-Fault Circuit-Interruptor. ~~A ground-fault circuit interrupter shall be installed in the~~ A branch circuit supplying fountain equipment shall be protected by a ground-fault circuit-interruptor unless the equipment is listed for operation at 15-volts or less and is supplied by a transformer complying with Section 680-5(a).
SUBSTANTIATION: Editorial. Present wording permits the GFCI anywhere in the circuit, perhaps "downstream" of a location where water or appurtenances could be energized. Sections 680-26(b) and 680-56(a) indicate supply conductors are to be protected. The proposal provides correlation with those sections.
PANEL ACTION: Accept in Principle in Part.
Revise 680-51(a) to read:
"(a) Ground-Fault Circuit-Interrupter. Fountain equipment, unless the equipment is listed for operation at 15-volts or less and is supplied by a transformer complying with Section 680-5(a), shall be protected by a ground-fault circuit-interrrupter."
PANEL STATEMENT: This will meet the submitter's concern of requiring the fountain equipment to be protected by a GFCI. See Proposal 20-30a for final wording.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #2090)

20- 126 - (680-51(c)): Accept

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-51(C) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Change the word "approved" to "listed".

Will now read as follows:

(c) Lighting Fixture Lenses. Lighting fixtures shall be installed with the top of the fixture lens below the normal water level of the fountain unless listed ~~approved~~ for above-water locations. A lighting fixture facing upward shall have the lens adequately guarded to prevent contact by any person.

SUBSTANTIATION: The word approved is difficult to install by and the many hazards associated with the corrosive atmosphere surrounding the treated water can not be judged by the authority having jurisdiction.

This requirement should be left to the Testing agency's and not to the authority having jurisdiction.

PANEL ACTION: Accept.

PANEL STATEMENT: This will be incorporated in the editorial rewrite of Article 680. See Proposal 20-30a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2917)

20- 127 - (680-51(h) (New)): Reject

SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.

RECOMMENDATION: Add new text to read:

(h) Clearance and Accessibility of Control Equipment. Control equipment shall be located at least 5 ft from the maximum level at the body of water. Area in front of control equipment shall be flat and not part of the shoreline. All equipment shall open away from the body of water, disconnects shall be visible looking at the body of water.

SUBSTANTIATION: While doing an inspection I found that the contractor installed the control box on the shoreline of the pond. It was inaccessible due to the steepness of the shoreline. The water level was also low and upon rise the clearance would be gone. The box also opened towards the water and the disconnect was not able to be seen posing a danger.

PANEL ACTION: Reject.

PANEL STATEMENT: See 110-26 for workspace. A detailed analysis and possibly substantial expansion of requirements should be performed to justify such a revision. With further justification, this issue should be addressed in a separate code article or by a different code-making panel.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #2091)

20- 128 - (680-52(a)): Accept

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-52(A) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Revise section 680-52 to read as follows:

(a) General. Junction boxes and other enclosures used for other than underwater installation shall comply with all parts of Section ~~Sections~~ 680-21~~(a), (b), (c), (d), and (e)~~.

SUBSTANTIATION: Since all of Section 680-21 needs to be complied with there is no need to address each one.

PANEL ACTION: Accept.

PANEL STATEMENT: This will be incorporated in the editorial rewrite of Article 680. See Proposal 20-30a.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #1798)

20- 129 - (680-56(b)): Accept in Principle in Part

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: Replace the term "hard-service" with "hard usage or extra hard usage."

SUBSTANTIATION: The term "hard-service" is not used in Table 400-4. In addition, the existing language does not actually permit the use of extra hard usage types even though they are often used and may be preferable.

PANEL ACTION: Accept in Principle in Part.

See Proposal 20-129a.

PANEL STATEMENT: Proposal 20-129a addresses this issue.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #CP2003)

20- 129a - (680-56(b)): Accept

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-56(B) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: CMP 20

RECOMMENDATION: Revise the text to read:

"Flexible cord immersed in or exposed to water shall be of a type for "extra hard usage", as designated in Table 400-4, and shall be listed and marked for the purpose."

SUBSTANTIATION: This revised language clarifies the intent of this requirement.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 9

NEGATIVE: 1

NOT RETURNED: 1 Ryan

EXPLANATION OF NEGATIVE:

PEARSE: The intent of the present Section 680-56(b) has been modified where the marking requirement for "water resistant" has been changed to "mark for the purpose" without providing technical substantiation for the change.

(Log #2092)

20- 130 - (680-57(a)): Accept in Principle

Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-57(C) of the rewrite of Article 680 in Proposal 20-30a.

SUBMITTER: Joel A. Rencsok, Scottsdale, AZ

RECOMMENDATION: Add a new paragraph after the first one to read as follows:

"Portable electric signs shall not be placed within the pool or fountain, or within 5 ft (1.52 m) measured horizontally from the inside walls of the pool or fountain."

SUBSTANTIATION: The way this paragraph is now written would appear that I can place portable signs in a pool or fountain because they are not exempted by the main statement.

It also appears that this section only applies to fixed signs.

This will clarify this requirement.

Portable electric signs create a greater electrical shock risk than permanent mounted signs due to the many methods of installing these signs.

PANEL ACTION: Accept in Principle.

Revise 680-57(a) to read: "General. This section covers electric signs installed within or adjacent to fountains."

Add a new paragraph (g) to read as follows: "Portable Electric Signs. Portable electric signs shall not be placed within the fountain or within 5 ft (1.5 m) measured horizontally from the inside walls of the fountain."

PANEL STATEMENT: The panel believes that this revision will address the submitter's concerns more clearly. This will be incorporated in the editorial rewrite of Article 680, Proposal 20-30a, but in slightly revised language.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 1 Ryan

(Log #3016)

20- 131 - (680-62(a), FPN (New)): Reject
SUBMITTER: Robert H. Keis, Dover, DE
RECOMMENDATION: Add the following FPN to the end of the section.
FPN: See Article 100 for definition of Outlet.
SUBSTANTIATION: Every time I teach a class or a continuing education seminar I ask the students what they think is meant by the word "outlet" when they read this section. The answer is always, "a receptacle." This is obviously not true when I read the definition of "outlet" in Article 100. If it is the intent of the panel that ALL spas and hot tubs are to have GFCI protection then we must either change the word "outlet" to something else, or else call the code user's attention to what this word means.
PANEL ACTION: Reject.
PANEL STATEMENT: This is a common term used throughout the code and is defined in Article 100.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #990)

20- 132 - (680-62(d)): Accept in Principle
Note: It is the understanding of the Technical Correlating Committee that the Panel Action is covered by 680-62(C) of the rewrite of Article 680 in Proposal 20-30a.
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(d) Methods of Bonding. All metal parts ~~associated with the tub~~ required to be bonded by (c) above, shall be bonded by any of the following methods: (remainder unchanged).
SUBSTANTIATION: Editorial. Cables, raceways, and metal piping covered by (c)(3) but not associated with the tub are required to be bonded, and the method of bonding in this subsection should apply.
PANEL ACTION: Accept in Principle.
Revise to 680-62(d) to read as follows:
"(d) Methods of Bonding. All metal parts required to be bonded by this section shall be bonded by any of the following methods: (remainder unchanged)."
PANEL STATEMENT: The panel's version is simpler.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

(Log #991)

20- 133 - (680-73): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Bonding. All metal piping systems, noncurrent-carrying metal parts of ~~electric equipment and~~ pump motors, and other electric equipment associated with the hydromassage tub, and other metal piping, raceways, cables, or electric equipment within 5 ft (1.52 m) measured horizontally, of the inside walls of the tub and not separately from the tub area by a permanent barrier shall be bonded together using a solid copper bonding jumper, insulated ~~covered~~ or bare, not smaller than No. 8 ~~solid.~~ (remainder unchanged).
SUBSTANTIATION: "Electric equipment and pump motors" is a redundancy. It seems prudent to include metal electric equipment not associated with the tub if within 5 ft and not separately by a barrier. "Noncurrent-carrying" is technically more correct. Literal wording does not require a solid conductor, only one not smaller than No. 8 solid. A stranded No. 8 is not smaller in circular mil area and is larger in diameter than a solid No. 8.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not consider a hydromassage tub the same as a hot tub, spa, or pool. The submitter does not provide substantiation to support these additional requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 1 Ryan

ARTICLE 685 — INTEGRATED ELECTRICAL SYSTEMS

(Log #2157)

12- 120 - (685-1(3)): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
Approved, effective safeguards, ~~acceptable to the authority having jurisdiction,~~ are established and maintained.
SUBSTANTIATION: "Approved" is defined in Article 100 of the NEC as "acceptable to the authority having jurisdiction."
"Standard terms have been established through accepted use or by definition and are to be used..." [NEC Style Manual 3.2.4 Standard Terms]. "Approved" is listed as one of the standard terms in Annex B of the Style Manual and defined in the Code; therefore, "approved" should be used in place of its definition.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided adequate substantiation to document problems with the current language.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #595)

12- 121 - (685-2): Accept
SUBMITTER: C. James Erickson, Newark, DE
RECOMMENDATION: Add: Uninterruptible Power Supplies (UPS) 645-11(a)
SUBSTANTIATION: This reference was added to Article 645 in the 1999 NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

(Log #2123)

12- 122 - (685-2): Accept in Principle in Part
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Revise "Grounding ac systems of 50 to 1000 volts 250-21(3)~~(c)~~."
SUBSTANTIATION: This is an editorial revision. The reference should be to 250-21(3) instead of 250-21(c).
PANEL ACTION: Accept in Principle in Part.
Accept the proposal as modified by referring to 250-21.
PANEL STATEMENT: The entire section (250-21) is the correct reference. The Panel action should meet the submitter's intent.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NOT RETURNED: 2 Kelly, Laney

ARTICLE 690 — SOLAR PHOTOVOLTAIC SYSTEMS

(Log #3961)

3- 142 - (690): Reject
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: Revise and change Article 690 in its entirety as shown:
ARTICLE 690 – Alternate Energy Source Systems: Solar Photovoltaic, Fuel Cell, Etc. ~~Systems~~
A. General
690-1. Scope. The provisions of this article apply to alternate ~~solar photovoltaic~~ electrical energy systems including the array circuit(s), reformer, stack, inverter(s), transfer switch(es), and controller(s) for such systems [See Figure 690-1(a) and (b)]. Alternate energy source ~~Solar photovoltaic~~ systems covered by this article may be interactive with other electrical power production sources or stand alone, with or without electrical energy storage such as batteries. These systems may have ac or dc output for utilization.
FPN: NFPA 853 categorizes fuel cells of 50 kVA or smaller differently than fuel cells sized larger than 50 kVA. Fuel cells with ratings greater than 50 kVA are generally used in structures larger than single-family dwellings. However, single fuel cell systems may be paralleled with other fuel cell systems in order to increase the overall output rating at a site.
Some fuel cell designs do not require the storage of hydrogen. The hydrogen is used up in the fuel cell stack immediately after being reformed from another fuel. Fuel cell exhaust products may contain a small quantity of hydrogen gas. Proper ventilation and exhaust dilution using approved venting techniques will render the unit safe in non-hazardous classified areas. In compliance with all applicable codes it shall be permissible for the fuel cell system to be installed and operated in a non-hazardous classified location. An example of such a non-hazardous designation applied to a device that uses a potentially combustible gas is a natural gas or propane forced air furnace installed in a single-family dwelling.
Figure 690-1(a) Identification of solar photovoltaic system components.
<<Show existing NEC figure here.>>
Figure 690-1(b) Identification of solar photovoltaic system components in common system configurations.
<<Show existing NEC figure here.>>
690-2. Definitions
Alternating-Current Module (Alternating-Current Photovoltaic Module). A complete, environmentally protected unit consisting of solar cells, optics, inverter, and other components, exclusive of tracker, designed to generate ac power when exposed to sunlight.
Array. A mechanically integrated assembly of modules or panels with a support structure and foundation, tracker, and other components, as required, to form a direct-current power-producing unit.
Backfeed. To energize a section of premises wiring that is supplied from a source other than its normal source.
Blocking Diode. A diode used to block reverse flow of current into a photovoltaic source circuit.
Charge Controller. Equipment that controls dc voltage or dc current, or both, used to charge a battery.
Charge Controller. Equipment that controls dc voltage or dc current, or both, used to charge a battery.
Electrical Production and Distribution Network. A power production, distribution, and utilization system, such as a utility system and connected loads, that is external to and not controlled by the alternate energy source ~~photovoltaic power~~ system.
Fuel Cell. An electrochemical system that continuously consumes a fuel to produce an electrical current. The main chemical reaction used in a fuel cell for producing electrical power is not combustion as defined by other codes. There may, however, be forms of combustion used within the overall fuel cell system.
Fuel Cell System. The complete aggregate of equipment used to convert gas fuel into usable electricity. A fuel cell system typically consists of a reformer, stack, power conditioner, and auxiliary equipment.
Hybrid System. A system comprised of multiple power sources. These power sources may include photovoltaic, wind, micro-hydro generators, engine-driven generators, and others, but do not include electrical production and distribution network systems. Energy storage systems, such as batteries, do not constitute a power source for the purpose of this definition.
Interactive System. An alternate energy source ~~solar photovoltaic~~ system, such as fuel cell or solar photovoltaic types, that operates in parallel with and may deliver power to an electrical production and distribution network. For the purpose of this definition, an energy storage subsystem of a solar photovoltaic system, such as a battery, is not another electrical production source.
Inverter. Equipment that is used to change voltage level or waveform, or both, of electrical energy. Commonly, an inverter [also known as a power conditioning unit (PCU) or power conversion system (PCS)] is a device that changes dc input to an ac output. Inverters may also function as battery chargers that use alternating current from another source and convert it into direct current for charging batteries.
Inverter Input Circuit. Conductors between the inverter and the battery in stand-alone systems or the conductors between the inverter

and the alternate energy source ~~photovoltaic~~ output circuits for electrical production and distribution network.

Inverter Output Circuit. Conductors between the inverter and an ac load center for stand-alone systems or the conductors between the inverter and the service equipment or another electric power production source, such as a utility, for electrical production and distribution network.

Module. A complete, environmentally protected unit consisting of solar cells, optics, and other components, exclusive of tracker, designed to generate dc power when exposed to sunlight.

Output Circuit. The equipment used to connect an alternate energy source such as a fuel cell system to its electrical point of delivery to the premise wiring. In the case of sites that have paralleled, multiple units connected together, the term *output circuit* refers also to the equipment used to electrically interconnect the individual systems.

Panel. A collection of modules mechanically fastened together, wired, and designed to provide a field-installable unit.

Photovoltaic Output Circuit. Circuit conductors between the photovoltaic source circuit(s) and the inverter or dc utilization equipment.

Photovoltaic Power Source. An array or aggregate of arrays that generates dc power at system voltage and current.

Photovoltaic Source Circuit. Circuits between modules and from modules to the common connection point(s) of the dc system.

Piping System. All piping, valves and fittings used to connect the fuel cell system to the point of delivery.

Point of Common Coupling. The point at which the premises wiring and output circuit of an alternate energy source interface occurs. Typically, this is within the premise side of the service point.

Power Conditioner. The subsystem that converts the direct current from an alternate energy source such as a fuel cell stack subsystem, into alternating current of the proper voltage, frequency and phase angle compatible with power quality and power demand of the electrical load supplied.

Reformer. The subsystem that converts the gas supplied to the fuel cell into a hydrogen-rich mixture capable of being used by the fuel cell stack for producing electrical power.

Solar Cell. The basic photovoltaic device that generates electricity when exposed to light.

Solar Photovoltaic System. The total components and subsystems that, in combination, convert solar energy into electrical energy suitable for connection to a utilization load.

Stand-Alone System. A solar photovoltaic system that supplies power independently of an electrical production and distribution network.

System Voltage. The dc voltage output of the alternate energy source (e.g. solar photovoltaic array or fuel cell stack) or ac output voltage of the power conditioner, whichever is larger. For 3-wire or multiwire installations, including 2-wire circuits connected to 3-wire systems, the system voltage shall be the highest voltage between any two conductors that supplies the load.

~~**System Voltage.** The dc voltage of any photovoltaic source circuit or output circuit. For 3-wire or multiwire installations, including 2-wire circuits connected to 3-wire systems, the system voltage shall be the highest voltage between any two conductors.~~

690-3. Other Articles. Wherever the requirements of other articles of this Code and Article 690 differ, the requirements of Article 690 shall apply.

690-4. Installation

(a) Alternate Energy Source ~~Solar Photovoltaic~~ System. An alternate energy source ~~solar photovoltaic~~ system, such as a solar photovoltaic or fuel cell system, shall be permitted to supply a building or other structure in addition to any service(s) of another electricity supply system(s).

(b) Conductors of Different Systems. Alternate energy ~~Photovoltaic~~ source circuits and alternate energy ~~photovoltaic~~ output circuits shall not be contained in the same raceway, cable tray, cable, outlet box, junction box, or similar fitting as feeders or branch circuits of other systems, unless the conductors of the different systems are separated by a partition or are connected together.

(c) Module Connection Arrangement. The connections to a module or panel shall be arranged so that removal of a module or panel from a photovoltaic source circuit does not interrupt a grounded conductor to another photovoltaic source circuit. Sets of modules interconnected as systems rated at 50 volts or less, with or without blocking diodes, and having a single overcurrent device shall be considered as a single-source circuit. Supplementary overcurrent devices used for the exclusive protection of the photovoltaic modules are not considered as overcurrent devices for the purpose of this section.

(d) Grounded Conductor. Alternate energy source power conditioner grounded conductors shall not be disconnected while the alternate energy source output circuit is energized. Bonding shall be in accordance with Article 250. A power conditioner package that incorporates the dwelling's main distribution panel as a single unit shall be treated as a separately derived system in accordance with Article 250.

(e) ~~(d)~~ Equipment. Power conditioners using inverters or motor generators shall be identified for use in alternate energy source ~~solar photovoltaic~~ systems.

690-5. Ground-Fault Protection. Alternate energy sources ~~Roof-mounted dc photovoltaic arrays~~ located in ~~on~~ dwellings shall be provided with dc ground-fault protection to reduce fire hazards.

(a) Ground-Fault Detection and Interruption. The ground-fault protection device or system shall be capable of detecting a ground fault, interrupting the flow of fault current, and providing an indication of the fault.

(b) Disconnection of Conductors. The ungrounded conductors of the faulted source circuit shall be automatically disconnected. If the grounded conductors of the faulted source circuit are disconnected to comply with the requirements of Section 690-5(a), all conductors of the faulted source circuit shall be opened automatically and simultaneously. Interrupting the ground-fault current path to open the grounded conductor of the alternate energy source ~~array~~ or faulted sections of the alternate energy source ~~array~~ shall be permitted.

(c) Labels and Markings. Labels and markings shall be applied near the ground-fault indicator at a visible location stating that if a ground fault is indicated, the normally grounded conductors may be energized and ungrounded.

690-6. Alternating-Current Modules for Photovoltaic Sources

(a) Photovoltaic Source Circuits. The requirements of Article 690 pertaining to photovoltaic source circuits shall not apply to ac modules. The photovolaic source circuit, conductors, and inverters shall be considered as internal wiring of an ac module.

(b) Inverter Output Circuit. The output of an ac module shall be considered an inverter output circuit.

(c) Disconnecting Means. A single disconnecting means, in accordance with Sections 690-15 and 690-17, shall be permitted for the combined ac output of one or more ac modules. Additionally, each ac module in a multiple ac-module system shall be provided with a connector, bolted, or terminal-type disconnecting means.

(d) Ground-Fault Detection. Alternating-current-module systems shall be permitted to use a single detection device to detect only ac ground faults and to disable the array by removing ac power to the ac module(s).

(e) Overcurrent Protection. The output circuits of ac modules shall be permitted to have overcurrent protection and conductor sizing in accordance with Section 240-4(b)(2).

B. Circuit Requirements

690-7. Maximum Voltage

(a) Maximum System Voltage. In a dc photovoltaic source circuit or output circuit, the maximum system voltage for that circuit shall be computed as the sum of the rated open-circuit voltage of the series-connected photovoltaic modules corrected for the lowest expected ambient temperature. For crystalline and multi-crystalline silicon modules, the rated open-circuit voltage shall be multiplied by the correction factor provided in Table 690-7. This voltage shall be used to determine the voltage rating of cables, disconnects, overcurrent devices, and other equipment. Where the lowest expected ambient temperature is below -40ºC (-40ºF), or where other than crystalline or multi-crystalline silicon photovoltaic modules are used, the system voltage adjustment shall be made in accordance with the manufacturer's instructions.

The maximum ac system voltage in a fuel cell output circuit is the highest nominal fuel cell power conditioner output voltage between any ungrounded conductor and ground. The maximum dc system voltage is the highest fuel cell stack output voltage.

(b) Direct-Current Utilization Circuits. The voltage of dc utilization circuits shall conform to ~~with~~ Section 210-6.

Table 690-7. Voltage Correction Factors for Crystalline and Multi-Crystalline Silicon Modules

Ambient Temperature (°C)	Correction factors for ambient temperatures below 25°C (77°F), multiply the rated open-circuit voltage by the appropriate correction factor shown below.	Ambient Temperature (°F)
25 to 10	1.06	77 to 50
9 to 0	1.10	49 to 32
-1 to -10	1.13	31 to 14
-11 to -20	1.17	13 to -4
-21 to -40	1.25	-5 to -40

(c) Photovoltaic Source and Output Circuits. In one- and two-family dwellings, alternate energy ~~photovoltaic~~ source circuits and alternate energy ~~photovoltaic~~ output circuits that do not include lampholders, fixtures, or receptacles shall be permitted to have a maximum system voltage up to 600 volts. Other installations with a maximum system voltage over 600 volts shall comply with Article 690, Part I

(d) Circuits Over 150 Volts to Ground. In one- and two-family dwellings, live parts in alternate energy ~~photovoltaic~~ source circuits and alternate energy ~~photovoltaic~~ output circuits over 150 volts to ground shall be contained within the alternate energy source enclosure and shall not be accessible to other than qualified persons while energized.

FPN: See Section 110-27 for guarding of live parts, and Section 210-6 for voltage to ground and between conductors.

690-8. Circuit Sizing and Current

(a) Computation of Maximum Circuit Current. The maximum current for the specific circuit shall be computed as follows.

(1) Photovoltaic Source Circuit Currents. The maximum current shall be the sum of parallel module rated short-circuit currents multiplied by 125 percent.

(2) Photovoltaic Output Circuit Currents. The maximum current shall be the sum of parallel source circuit maximum currents as calculated in (1).

(3) Fuel Cell Output Instantaneous Current. The maximum current shall be 50% of the rated instantaneous output current rating of the power conditioner.

(4) Fuel Cell Output Continuous Current. The maximum current shall be 100% of the rated continuous current output of the power conditioner or fuel cell stack when no power conditioner subsystem is used.

(5) The instantaneous current rating of a power conditioner shall be considered for the starting of motors. A load-shedding scheme may be used to prevent coincident starts of motors if inadequate motor starting capability is anticipated.

(6) ~~(3)~~ Inverter Output Circuit Current. The maximum current shall be the inverter continuous output current rating.

(7) ~~(4)~~ Stand-Alone Inverter Input Circuit Current. The maximum current shall be the stand-alone continuous inverter input current rating when the inverter is producing rated power at the lowest input voltage.

(b) Ampacity and Overcurrent Device Ratings. Alternate energy source ~~Photovoltaic~~ system currents shall be considered continuous. The circuit conductors and overcurrent devices shall be sized to carry not less than 125 percent of the maximum currents as computed in (a). The rating or setting of overcurrent devices shall be permitted in accordance with Sections 240-3(b) and (c). Additional circuit overcurrent devices are not required if the alternate energy source power conditioner is provided with overcurrent protection that is sufficient to protect the circuit conductors that supply the load. Equipment and conductors connected to more than one electrical source shall have sufficient protection from all sources. The contribution of fault currents from the alternate energy source output circuit and the service point supply at the point of common coupling shall be considered, such that the equipment will be capable to withstand and interrupt short circuit current.

Exception No. 1: Circuits containing an assembly together with its overcurrent device(s) that is listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.

Exception No. 1: Service conductors covered by Section 240-31 and equipment covered by Section 230-42.

(c) Systems with Multiple Direct-Current Voltages. For a photovoltaic power source that has multiple output circuit voltages and employs a common-return conductor, the ampacity of the common-return conductor shall not be less than the sum of the ampere ratings of the overcurrent devices of the individual output circuits.

690-9. Overcurrent Protection

(a) Circuits and Equipment. Alternate energy ~~Photovoltaic~~ source ~~circuit, photovoltaic~~ and output circuits, inverter output circuit, and storage battery circuit conductors and equipment shall be protected in accordance with the requirements of Article 240. Circuits connected to more than one electrical source shall have overcurrent devices located so as to provide overcurrent protection from all sources. The output circuits of alternate energy source systems shall be permitted to have overcurrent protection and conductor sizing in accordance with Section 240-4(b)(2).

Exception: An overcurrent device shall not be required for circuit conductors sized in accordance with Section 690-8(b) and located where
a. There are no external sources such as parallel-connected source circuits, batteries, or backfeed from inverters, or
b. The short-circuit currents from all sources do not exceed the ampacity of the conductors.

FPN: Possible backfeed of current from any source of supply, including a supply through an inverter into the alternate energy ~~photovoltaic~~ output ~~circuit~~ and ~~photovoltaic~~ source circuits, is a consideration in determining whether adequate overcurrent protection from all sources is provided for conductors and modules.

(b) Power Transformers. Overcurrent protection for a transformer with a source(s) on each side shall be provided in accordance with Section 450-3 by considering first one side of the transformer, then the other side of the transformer, as the primary.

Exception: A power transformer with a current rating on the side connected toward the alternate energy ~~photovoltaic~~ power source not less than the short-circuit output current rating of the inverter shall be permitted without overcurrent protection from that source.

(c) Alternate Energy ~~Photovoltaic~~ Source Circuits. Branch-circuit or supplementary-type overcurrent devices shall be permitted to provide overcurrent protection in alternate energy ~~photovoltaic~~ source circuits. The overcurrent devices shall be accessible, but shall not be required to be readily accessible.

(d) Direct-Current Rating. Overcurrent devices, either fuses or circuit breakers, used in any dc portion of an alternate energy ~~a photovoltaic~~ power system shall be listed for use in dc circuits and shall have the appropriate voltage, current, and interrupt ratings.

690-10. Stand-Alone Systems. The premises wiring system shall be adequate to meet the requirements of this Code for a similar installation connected to a service. The wiring on the supply side of the building or structure disconnecting means shall comply with this Code except as modified by (a), (b), and (c).

(a) Inverter Output. The ac inverter output from a stand-alone system shall be permitted to supply ac power to the building or structure disconnecting means at current levels below the rating of that disconnecting means.

(b) Sizing and Protection. The circuit conductors between the inverter output and the building or structure disconnecting means shall be sized based on the output rating of the inverter. These conductors shall be protected from overcurrents in accordance with Article 240. The overcurrent protection shall be located at the output of the inverter.

(c) Single 120-Volt Supply. The inverter output of a stand-alone alternate energy source ~~solar photovoltaic~~ system shall be permitted to supply 120 volts to single-phase, 3-wire 120/240-volt service equipment or distribution panels where there are no 240-volt outlets and where there are no multiwire branch circuits. In all installations, the rating of the overcurrent device connected to the output of the inverter shall be less than the rating of the neutral bus in the service equipment. This equipment shall be marked
WARNING — SINGLE 120-VOLT SUPPLY — DO NOT CONNECT MULTIWIRE BRANCH CIRCUITS!

C. Disconnecting Means

690-13. All Conductors. Means shall be provided to disconnect all current-carrying conductors of an alternate energy ~~a photovoltaic~~ power source from all other conductors in a building or other structure. Where a circuit grounding connection is not designed to be automatically interrupted as part of the ground-fault protection system required by Section 690-5, a switch or circuit breaker used as a disconnecting means shall not have a pole in the grounded conductor.

FPN: The grounded conductor may have a bolted or terminal disconnecting means to allow maintenance or troubleshooting by qualified personnel.

690-14. Additional Provisions. The provisions of Article 230, Part F, as modified by (a) and (b), shall apply to the alternate energy ~~photovoltaic~~ power source disconnecting means.

(a) Disconnecting Means. The disconnecting means shall not be required to be suitable as service equipment and shall be rated in accordance with Section 690-17.

(b) Photovoltaic System Equipment. Equipment such as photovoltaic source circuit isolating switches, overcurrent devices, and blocking diodes shall be permitted on the photovoltaic side of the photovoltaic disconnecting means.

690-15. Disconnection of Photovoltaic Equipment. Means shall be provided to disconnect equipment, such as inverters, batteries, charge controllers, and the like, from all ungrounded conductors of all sources. If the equipment is energized from more than one source, the disconnecting means shall be grouped and identified.

A single disconnecting means in accordance with Section 690-17 shall be permitted for the combined ac output of one or more inverters or ac modules in an interactive system.

690-16. Fuses. Disconnecting means shall be provided to disconnect a fuse from all sources of supply if the fuse is energized from both directions and is accessible to other than qualified persons. Such a fuse in an alternate energy ~~a photovoltaic~~ source circuit shall be capable of being disconnected independently of fuses in other alternate energy ~~photovoltaic~~ source circuits.

690-17. Switch or Circuit Breaker. The disconnecting means for ungrounded conductors shall consist of a manually operable switch(es) or circuit breaker(s)

1. Located where readily accessible,
2. Externally operable without exposing the operator to contact with live parts,
3. Plainly indicating whether in the open or closed position, and
4. Shall have an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment.

Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and shall read substantially:

WARNING — ELECTRIC SHOCK HAZARD — DO NOT TOUCH TERMINALS — TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

Exception No. 1: A disconnecting means located on the dc side shall be permitted to have an interrupting rating less than the current-carrying rating where the system is designed so that the dc switch cannot be opened under load.

Exception No. 2: A connector shall be permitted to be used as an ac or dc disconnecting means provided that it complies with the requirements of Section 690-33 and is listed and identified for the use.

690-18. Installation and Service of an Array. Open circuiting, short circuiting, or opaque covering shall be used to disable an array or portions of an array for installation and service.

FPN: Photovoltaic modules are energized while exposed to light. Installation, replacement, or servicing of array components while a module(s) is irradiated may expose persons to electric shock.

D. Wiring Methods

690-31. Methods Permitted

(a) Wiring Systems. All raceway and cable wiring methods included in this Code and other wiring systems and fittings specifically intended and identified for use on alternate energy source systems ~~a photovoltaic arrays~~ shall be permitted. Where wiring devices with integral enclosures are used, sufficient length of cable shall be provided to facilitate replacement.

(b) Single Conductor Cable. Types SE, UF, and USE single-conductor cable shall be permitted in alternate energy ~~photovoltaic~~ source circuits where installed in the same manner as a Type UF multiconductor cable in accordance with Article 339. Where exposed to direct rays of the sun, Type UF cable identified as sunlight-resistant or Type USE cable shall be used.

(c) Flexible Cords and Cables. Flexible cords and cables, where used to connect the moving parts of tracking photovoltaic ~~PV~~ modules, shall comply with Article 400 and shall be of a type identified as a hard service cord or portable power cable; shall be suitable for extra-hard usage, listed for outdoor use, water resistant, and sunlight resistant. Allowable ampacities shall be in accordance with Section 400-5. For ambient temperatures exceeding 30ºC (86ºF), the ampacities shall be derated by the appropriate factors given in Table 690-31(c).

Table 690-31(c). Correction Factors

Ambient Temperature (ºC)	Temperature Rating of Conductor Ambient Temperature 60ºC(140ºF) 90ºC(194ºF)	75ºC(167ºF) 105ºC(221ºF)	Ambient Temperature (ºF)
30	1.00	1.00	1.00
	1.00	86	
31–35	0.91	0.94	0.96
	0.97	87–95	
36–40	0.82	0.88	0.91
	0.93	96–104	
41–45	0.71	0.82	0.87
	0.89	105–113	
46–50	0.58	0.75	0.82
	0.86	114–122	
51–55	0.41	0.67	0.76
	0.82	123–131	
56–60	—	0.58	0.71
	0.77	132–140	
61–70	—	0.33	0.58
	0.68	141–149	
71–80	—	—	0.41
	0.58	150–158	

(d) Small Conductor Cables. Single-conductor cables listed for outdoor use that are sunlight resistant and moisture resistant with sizes No. 16 and No. 18 shall be permitted for module interconnections where such cables meet the ampacity requirements of Section 690-8. Section 310-15 shall be used to determine the cable ampacity and temperature derating factors.

690-32. Component Interconnections. Fittings and connectors that are intended to be concealed at the time of on-site assembly, where listed for such use, shall be permitted for on-site interconnection of alternate energy system modules, array or other ~~array~~ system components. Such fittings and connectors shall be equal to the wiring method employed in insulation, temperature rise, and fault-current withstand, and shall be capable of resisting the effects of the environment in which they are used.

690-33. Connectors. The connectors permitted by Article 690 shall comply with (a) through (e).

(a) Configuration. The connectors shall be polarized and shall have a configuration that is noninterchangeable with receptacles in other electrical systems on the premises.

(b) Guarding. The connectors shall be constructed and installed so as to guard against inadvertent contact with live parts by persons.

(c) Type. The connectors shall be of the latching or locking type.

(d) Grounding Member. The grounding member shall be the first to make and the last to break contact with the mating connector.

(e) Interruption of Circuit. The connectors shall be capable of interrupting the circuit current without hazard to the operator.

690-34. Access to Boxes. Junction, pull, and outlet boxes located behind modules or panels shall be installed so that the wiring contained in them can be rendered accessible directly or by displacement of a module(s) or panel(s) secured by removable fasteners and connected by a flexible wiring system.

E. Grounding

690-41. System Grounding. For an alternate energy ~~a photovoltaic~~ power source, one conductor of a 2-wire system rated over 50 volts and a neutral conductor of a 3-wire system shall be solidly grounded.

Exception: Other methods that accomplish equivalent system protection and that utilize equipment listed and identified for the use shall be permitted.

FPN: See Section 250-2(a).

690-42. Point of System Grounding Connection. The dc circuit grounding connection shall be made at any single point on the alternate energy source ~~photovoltaic~~ output circuit.

FPN: Locating the grounding connection point as close as practicable to the alternate energy ~~photovoltaic~~ source will better protect the system from voltage surges due to lightning.

690-43. Equipment Grounding. Exposed noncurrent-carrying metal parts of module frames, equipment, and conductor enclosures shall be grounded regardless of voltage.

690-45. Size of Equipment Grounding Conductor. The equipment grounding conductor shall be not smaller than the required size of the circuit conductors in systems where the available alternate energy ~~photovoltaic~~ power source short-circuit current is less than twice the current rating of the overcurrent device. In other systems, the equipment grounding conductor shall be sized in accordance with Section 250-122.

690-47. Grounding Electrode System. A grounding electrode system shall be provided in accordance with Sections 250-50 through 250-60.

F. Marking

690-51. Modules. Modules shall be marked with identification of terminals or leads as to polarity, maximum overcurrent device rating for module protection, and with rated

1. Open-circuit voltage
2. Operating voltage
3. Maximum permissible system voltage
4. Operating current
5. Short-circuit current, and
6. Maximum power

690-52. Alternating-Current Photovoltaic Modules. Alternating-current modules shall be marked with identification of terminals or leads, and with identification of the rated

1. Nominal operating ac voltage
2. Nominal operating ac frequency
3. Maximum ac power
4. Maximum ac current, and
5. Maximum overcurrent device rating for ac module protection

690-53. Photovoltaic Power Source. A marking, specifying the photovoltaic power source rated as follows shall be provided by the installer at the site at an accessible location at the disconnecting means for the photovoltaic power source:

1. Operating current
2. Operating voltage
3. Maximum system voltage, and
4. Short-circuit current

FPN: Reflecting systems used for irradiance enhancement may result in increased levels of output current and power.

690-54. Interactive System Point of Interconnection. All interactive system(s) points of interconnection with other sources shall be marked at an accessible location at the disconnecting means as a power source with the maximum ac output operating current and the operating ac voltage.

690-55. Fuel Cell Power Sources. A marking, specifying the fuel cell power source rating as follows shall be provided by the installer at the site at an accessible location at the disconnecting means for the fuel cell power source.

(1) Operating Voltage
(2) Output Power Rating
(3) Short Circuit Current
(4) Maximum System Voltage

690-56. Fuel Shut-Off. At the location of the primary disconnecting means of the building or circuits supplied, the location of the manual fuel shut-off valve shall be marked.

690-57. Fuel Cell Stored Energy. At the location of the primary disconnecting means of the building or circuits supplied, it shall be marked that the fuel cell unit stores electrical energy, if batteries or other energy storage device is used in the power conditioner section of the fuel cell.

690-58. DC Capacitors. DC capacitors shall have a means of discharging any stored charge whenever they are disconnected from their power source, or a warning label will be visible that warns of the hazard posed by their stored electrical energy. This label will be visible wherever a physical contact with these capacitors can be made.

G. Connection to Other Sources

690-60. Identified Interactive Equipment. Only inverters and ac modules listed and identified as interactive shall be permitted in interactive systems.

690-61. Output Characteristics. The output of an alternate energy source system operating in parallel with another electric supply system shall be compatible with the voltage, wave shape, and frequency of the system to which it is connected.

FPN: The term compatible does not necessarily mean matching the primary source wave shape.

690-62~~61~~. Loss of Interactive System Power. An inverter or an ac module in an interactive alternate energy ~~solar photovoltaic~~ system shall automatically de-energize its output to the connected electrical production and distribution network upon loss of voltage in that system and shall remain in that state until the electrical production and distribution network voltage has been restored.

A normally interactive alternate energy ~~solar photovoltaic~~ system shall be permitted to operate as a stand-alone system to supply loads that have been disconnected from electrical production and distribution network sources.

690-63. Non-Interactive Equipment. For alternate energy source systems installed in non-interactive systems, it shall be permitted to maintain isolation between the service point electric supply system and the alternate energy source system by means of either a manual or an automatic bus transfer switch, which may be located external or internal to the alternate energy source system enclosure. The contacts of the transfer switch shall be break-before-make to prevent interaction between the service point and the alternate energy source system. When the service conductors are connected to the transfer switch, the switch shall comply with Article 230, Parts E and F.

690-64~~62~~. Ampacity of Neutral Conductor. If a single-phase, 2-wire inverter output is connected to the neutral and one ungrounded conductor (only) of a 3-wire system or of a 3-phase, 4-wire, wye-connected system, the maximum load connected between the neutral and any one ungrounded conductor plus the inverter output rating shall not exceed the ampacity of the neutral conductor.

690-65~~63~~. Unbalanced Interconnections

(a) Single Phase. Single-phase inverters for alternate energy ~~photovoltaic~~ systems and ac modules in interactive solar photovoltaic systems shall not be connected to 3-phase power systems unless the interconnected system is designed so that significant unbalanced voltages cannot result.

(b) Three Phase. Three-phase inverters and 3-phase ac modules in interactive systems shall have all phases automatically de-energized upon loss of, or unbalanced, voltage in one or more phases unless the interconnected system is designed so that significant unbalanced voltages will not result.

690-66~~64~~. Point of Connection. The output of an alternate energy ~~a photovoltaic~~ power source shall be connected as specified in (a) or (b).

(a) Supply Side. An alternate energy ~~A photovoltaic~~ power source shall be permitted to be connected to the supply side of the service disconnecting means as permitted in Section 230-82(5).

(b) Load Side. An alternate energy ~~A photovoltaic~~ power source shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises provided that all of the following conditions are met.

1. Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.
2. The sum of the ampere ratings of overcurrent devices in circuits supplying power to a busbar or conductor shall not exceed the rating of the busbar or conductor.

Exception: For a dwelling unit, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.

3. The interconnection point shall be on the line side of all ground-fault protection equipment.

Exception: Connection shall be permitted to be made to the load side of ground-fault protection, provided that there is ground-fault protection for equipment from all ground-fault current sources.

4. Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.

Exception: Equipment with power supplied from a single point of connection.

5. Equipment such as circuit breakers, if backfed, shall be identified for such operation.

FPN: Backfeeding certain devices such as ground fault circuit interrupter breakers or outlets can damage them. Manufacturers should be consulted or listing and labeling should indicate that the device may be safely backfed before subjecting the device to possible backfeed of electrical energy.

H. Storage Batteries

690-71. Installation. The power conditioner consisting of various components contained in a single enclosure shall be installed as a single unit or as a sub-component contained inside the main alternate energy source enclosure. Proper housing and guarding shall be maintained.

(a) General. Storage batteries in an alternate energy source ~~a solar photovoltaic~~ system shall be installed in accordance with the provisions of Article 480. The interconnected battery cells shall be considered grounded where the alternate energy source ~~photovoltaic~~ power source is installed in accordance with Section 690-41, Exception. Storage batteries used as part of a power conditioning section of an alternate energy source shall be installed and operated with proper safeguards.

(b) Dwellings.

1. Storage batteries for dwellings shall have the cells connected so as to operate at less than 50 volts.

Exception: Where live parts are not accessible during routine battery maintenance, a battery system voltage in accordance with Section 690-7 shall be permitted.

2. Live parts of battery systems for dwellings shall be guarded to prevent accidental contact by persons or objects, regardless of voltage or battery type.

FPN: Batteries in solar photovoltaic systems are subject to extensive charge-discharge cycles and typically require frequent maintenance, such as checking electrolyte and cleaning connections.

(c) Current Limiting. A listed, current-limiting, overcurrent device shall be installed in each circuit adjacent to the batteries where the available short-circuit current from a battery or battery bank exceeds the interrupting or withstand ratings of other equipment in that circuit. The installation of current-limiting fuses shall comply with Section 690-16.

(d) Solid State Components. Where solid state components are used as circuit elements and are not individually protected by current limiting fuses, a listed current-limiting overcurrent protective device shall be installed and comply with Section 690-16. This fusing shall coordinate to allow the alternate energy source control system to function normally and permit an orderly shutdown of the alternate energy source system. Listed surge protection devices shall be included to protect solid state components. This surge protection shall include an indicating target or circuit annunciating compromised surge protection capability.

(e) Motor Generator Combination. A motor-generator is permitted to be used as an alternate energy source power conditioner. The motors shall comply with Article 430 and the generator shall comply with Article 445.

690-72. Charge Control. Equipment shall be provided to control the charging process of the battery. Charge control shall not be required where the design of the photovoltaic source circuit is matched to the voltage rating and charge current requirements of the interconnected battery cells, and the maximum charging current multiplied by 1 hour is less than 3 percent of the rated battery capacity expressed in ampere-hours or as recommended by the battery manufacturer. All adjusting means for control of the charging process shall be accessible only to qualified persons.

FPN: Certain battery types such as valve-regulated lead acid or nickel cadmium can experience thermal failure when overcharged.

690-73. Orderly Shutdown. The alternate energy source power conditioner shall disconnect its output to the premises wiring in an orderly manner if the battery is about to discharge below a level where it would be susceptible to damage.

690-74. Battery Interconnections. Flexible cables, as identified in Article 400, in sizes No. 2/0 and larger shall be permitted within the battery enclosure from battery terminals to nearby junction box where they shall be connected to an approved wiring method. Flexible battery cables shall also be permitted between batteries and cells within the battery enclosure. Such cables shall be listed for hard service use and identified as moisture resistant.

690-75. Equalize Voltage. On a semiannual basis a controlled overcharge shall be permitted to equalize the battery cell voltages.

FPN: Safeguards are needed to avoid thermal failure or excessive gassing when overcharging or recharging depleted batteries. Some types of batteries when severely depleted of charge will develop shorted cells. This will result in excessive gassing and heating when recharging is attempted. Nickel Cadmium batteries can be shorted when discharged to prevent voltage memory problems.

I. Systems Over 600 Volts

690-80. General. Alternate energy source ~~Solar photovoltaic~~ systems with a maximum system voltage over 600 volts dc shall comply with Articles 490, 685, 705, and other requirements applicable to installations rated over 600 volts.

690-85. Definitions. For the purposes of Part I of this article, the voltages used to determine cable and equipment ratings shall be defined as follows.

Battery Circuits. In battery circuits, the voltage shall be the highest voltage experienced under charging conditions.

Alternate Energy Source ~~Photovoltaic~~ Circuits. In dc alternate energy ~~photovoltaic~~ source circuits and alternate energy ~~photovoltaic~~ output circuits, the voltage shall be the maximum system voltage.

690-90. Interactive Systems Above 600 Volts. For single and multiple interconnected systems, the alternate energy source(s) shall not backfeed power to the service point upon a loss of electric service.

SUBSTANTIATION: This change in the Code is necessary to encompass the growing new techological sources of electrical power becoming available in the marketplace. Article 690 presently covers only photovoltaic sources. This article is the best application for this revision as these techologies are typically interconnected in premise wiring through an inverter for AC power use. Also, fuel cell technology is advancing into the marketplace as commercial units have been installed since 1997 and residential units are forthcoming within the next two years where this code change timing will meet the need. This proposal provides for a user-friendly format to avoid creating new articles in the Code that are managed in the same manner.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and panel statement on Proposal 3-206.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:

KREINER: I agree with the Panel Action but disagree with the Panel Statement. The Panel Action on Proposal 3-142 is to reject with a Panel Statement of a reference to Proposal 3-206 to Accept in Principle. A Panel Statement reflecting the reason for not incorporating the new text into existing Article 690 more appropriately provides the reason for rejecting this proposal. Change the Panel Statement to:

The new fuel cell technology is sufficiently different from solar photovoltaic systems to warrant its own Article and not be incorporated into Article 690. A separate Article will make it much easier for the user of this technology to determine the requirements without having to wade through the requirements for photovoltaic systems.

(Log #4060)

3- 143 - (690): Reject

SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.

RECOMMENDATION: Move Article 690 into CMP 15.

SUBSTANTIATION: Panel #15 is responsible for all of the articles involving auxiliary power, i.e., batteries, generators, legally required generators, optional standby generators and interconnected systems. Article 690 is no longer a stand-alone article because of the interconnection capabilities and the frequent use of Solar Photovoltaic Systems as an integral part of an auxiliary power system. Distributed Resources (DR) are becoming one of the fastest growing industries. A unified safety standard containing a set of fundamental rules applicable to any and all types of DR equipment installations, including Solar Photovoltaic Systems is currently under development by the IEEE. These rules will cover the basic requirements for connecting a DR system to the customer's wiring and/or the utility grid. These rules are needed to protect both life and property. Hopefully, these rules will be compatible with the NEC. But should need arise, having all of the Articles that pertain to DR within one Code Making Panel will make it easier to develop any NEC changes that may be appropriate.

PANEL ACTION: Reject.

PANEL STATEMENT: The assignment of Articles to the various NEC Panels is under the jurisdiction of the NEC Technical Correlating Committee and not Panel 3. This should not be submitted as a proposal to CMP-3 but as a letter to the NEC TCC.

Photovoltaic systems are a unique technology , unlike rotating machines that are the main focus of Article 705 and the other Articles addressed in CMP15.

CMP3 is a very capable, diverse group that is already educated in Photovoltaics.

Article 690 is concerned with the installation of photovoltaic systems that are 60% wiring methods (and thus appropriate for CMP3).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2307)

3- 144 - (Figure 690-1(a)): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: In this figure, the Blocking Diodes have been drawn incorrectly as an arrow with a line on top. They need to be redrawn with the correct symbol for an electronic diode. See Figure 690-7 in the NEC Handbook.
SUBSTANTIATION: Corrects drafting error.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2308)

3- 145 - (690-1(b)): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: In the Stand-Alone System figure, label the unmarked box at the bottom of the figure: "Energy Storage".
SUBSTANTIATION: This label was accidentally left off the submission for the 1999 NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2311)

3- 146 - (690-2-Bipolar Photovoltaic Array (New)): Accept in Principle
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Add the following definition:
Bipolar Photovoltaic Array. A photovoltaic array that has two outputs, each having opposite polarity with respect to a common reference point, sometimes called a center tap.
SUBSTANTIATION: Required to define devices and connections used in this article.
PANEL ACTION: Accept in Principle.
Delete the phrase "with respect" and "sometimes called a" to read as follows:
"Bipolar Photovoltaic Array. A photovoltaic array that has two outputs, each having opposite polarity to a common reference point or center tap."
PANEL STATEMENT: Small editorial corrections were made for clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2310)

3- 147 - (690-2-Diversion Charge Controller (New)): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Add the following definition:
Diversion Charge Controller. Equipment that regulates the charging process of a battery by diverting power from energy storage to direct-current or alternating-current loads or to an interconnected utility service.
SUBSTANTIATION: Required to define devices used in this article.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3770)

3- 148 - (690-2-System Voltage): Reject
SUBMITTER: Robert H. Wills, Advanced Energy, Inc.
RECOMMENDATION: Change the definition of System Voltage in 690-2 Definitions to read:
"...the system voltage shall be the highest voltage between any two conductors in the circuit."
SUBSTANTIATION: As written, this definition could be interpreted to mean the highest voltage between any two conductors in the system, including ac output conductors. There are two reasons for requesting this change:
1 for clarity, to ensure that it is the dc voltage difference on the input circuits that is used.
2 to allow for inverter topologies that have multiple array connections, or multipolar arrays in separate segments. In particular, the lowest cost inverter topology for PV systems is a bipolar PV array connected to a half-bridge inverter. Currently, this topology is not allowed due to this definition (a change that was made to the 1996 code). As cost is a major factor in the viability of PV technology, we must ensure that lowest cost designs are possible unde the code, providing that they meet safety requirements.
See proposal following for addition to 690-7 regarding bipolar arrays.
PANEL ACTION: Reject.
PANEL STATEMENT: The addition of the phrase "in the circuit" does not provide clarity as to which conductors are being referenced. The definition clearly indicates that the system voltage is determined by the output circuit but the substantiation indicates that the system voltage is determined by the input circuit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2312)

3- 149 - (690-2-System Voltage, Photovoltaic Systems Voltage (New)): Accept in Principle
Note: The Technical Correlating Committee directs the Panel to revise the definition to remove the requirement in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Delete the definition of System Voltage and replace with the following:
Photovoltaic Systems Voltage. The direct current (dc) voltage of any photovoltaic source or photovoltaic output circuit. For bipolar or multiwire installations including 2-wire circuits connected to bipolar systems, the PV systems voltage shall be the highest voltage between any two dc conductors.
SUBSTANTIATION: Defines terms used in this article and updates terminology.
PANEL ACTION: Accept in Principle.
Delete the definition of System Voltage in the existing code, change "direct current (dc) in the first phrase of the proposal to "dc" in the proposed text, change "PV" in the second sentence of the proposal to "photovoltaic" to read as follows:
"Photovoltaic Systems Voltage. The direct current (dc) voltage of any photovoltaic source or photovoltaic output circuit. For bipolar or multiwire installations, ~~including 2-wire circuits connected to bipolar systems~~ the PV systems voltage shall be the highest voltage between any two dc conductors."
PANEL STATEMENT: The reference to 2-wire circuits connected to Bipolar systems was removed as the maximum voltage would be established between any two DC conductors. The changes were editorial in nature to provide consistency and clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4061)

3- 150 - (690-3): Reject

SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.

RECOMMENDATION: Revise text to read as follows:

690.3 Other Articles. Wherever the requirements of other articles of this code and Article 690 differ, the requirements of Article 690 shall apply, unless the system is operated in parallel with another source of power, then Article 705 shall apply.

SUBSTANTIATION: Many States require utilities to buy back power produced by Independent Power Producers (IPPs). Solar Photovoltaic Systems (SPVS) are one of the sources used by the IPPs to supply this power. The States require that the amount of power supplies by the IPPs be measured VIA "net metering". Net metering implies parallel operation with the utility grid. Parallel operation requires compliance with Article 705. This Code change will help assure proper Code compliance whenever the SPVS are being operated in parallel with the utility grid or some other source of power.

PANEL ACTION: Reject.

PANEL STATEMENT: The requirements for parallel operation of inverters with other systems have been carefully and thoroughly included in Article 690 over the last 6 code cycles. Article 690 was deliberately removed from Article 705 in 1999 to prevent confusion with the 705 requirements that are largely associated with rotary equipment. Fifteen years of working with PV installers, nationally recognized testing laboratories, and AHJs have established the suitability of 690 language as is. Current code language in 705-3 Exception indicates the separation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HORMAN: The proposal should be accepted in principle. The EEI Electric Light and Power Group believes the requirements of Article 705 should apply to installations of interconnected solar power production systems typically installed under the provisions of Article 690 and to be operated in parallel with the supply to the premises wiring. Specifically, the requirements of Section 705-12 Point of Connection, Section 705-14 Output Characteristics, Section 705-22 Disconnect Device, and section 705-40 Loss of Primary Source need to be incorporated in Article 690, Part G.

Section 705-12 Point of Connection is necessary to ensure that interconnected power production systems are connected to the premises wiring system at the service rather than on a feeder or a branch circuit as permitted by 690-64(b).

Section 705-14 Output characteristics is necessary to ensure that interconnected power production systems do not adversely affect the supply system by outputting power with improper wave shape, voltage, or frequency. This requirement is necessary to limit harmonic distortion on supply voltage for other customers served from the electric utility supply system.

Section 705-22 Disconnect Device is necessary to provide a method of disconnecting the interconnected power production system from the electric supply system when the solar photovoltaic system malfunctions or requires maintenance.

Section 705-40 Loss of Primary Source and Section 690-61 should be identical. Upon loss of primary source, all electric power production sources shall be automatically disconnected from all ungrounded conductors of the primary source and shall not be reconnected until the primary source is restored.

Considering the application of Article 705 rules within Article 690 provides for the safety of the premises wiring system and the safety of the supply system or its workers when photovoltaic systems are operated in parallel with the utility supply.

(Log #2313)

3- 151 - (690-4(b)): Reject

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Delete the text in this section and replace with the following:

"Photovoltaic (PV) source and PV output circuits having disconnects from the PV energy source shall be permitted in the same raceway or junction box with circuits from nonphotovoltaic systems. Photovoltaic source and PV output circuits shall be permitted in the same raceway or junction box with other circuits from the same PV system."

SUBSTANTIATION: The intent of the basic requirement is to prevent PV source and output circuits that may normally be energized during daylight periods from being in the same raceway with circuits of other electrical systems that are unrelated to the PV system. In many cases, there are no disconnects in these PV circuits and they are always energized during daylight hours. Repairs and operations on these "other system" circuits might be affected by the always-energized PV circuits. "Other system" circuits include ac grid power conductors, telecomm circuits, or radio frequency cables. The term "other systems" was not clear, and the text has been revised accordingly. The text was also revised from the negative to the positive.

The first sentence of the proposed addition allows same-raceway installations if the PV circuits have an available disconnect provision that can deenergize these PV circuits. These PV source and output circuits then become no different than any other circuit in a multiple circuit raceway.

The second sentence recognizes that persons working on any circuits associated with the PV system (inverter ac outputs, control circuits, etc.) will be aware of the nature of the PV source circuits and take proper precautions. It allows any circuits from the same PV system to be in the same raceway without restriction.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed addition of a disconnect to the PV system would not keep inadvertent interconnection of the regular power system, if used, or the possible shorting of the regular system to the PV system , from occurring which was the reason for the wording in this section of the present Code. The title of this Section, Conductors of Different Systems, makes the second sentence in the proposal unnecessary. PV circuits of the same system can already be installed in the same raceway or junction box.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

BOWER: I vote in the negative because the Panel Statement does not appear to be consistent with the rest of the NEC, where multiple power systems are not prevented from being in the same raceway. Interconnection is not the issue here. Cutting into a live PV source circuit when working on the other system is the issue here. This is why the original 690-4(b) spelled out PV source circuits and not all PV circuits. Inspectors are often confused in this area. They generally do not interpret the current wording as allowing even circuits from the same PV system (e.g., inverter circuits) in the same raceway with the PV source circuits. The proposed requirement for a disconnect on the PV source circuit provides the ability to make this circuit as dead as any other circuit and should be no different than any other combination of ac circuits. I do affirm the elimination of the proposed second sentence.

(Log #2314)

3- 152 - (690-4(c)): Accept in Part

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Delete the last two sentences from this paragraph.

They are: "Sets of modules interconnected as systems rated at 50 volts or less, with or without blocking diodes, and having a single overcurrent device shall be considered as a single-source circuit. Supplementary overcurrent devices used for the exclusive protection of the photovoltaic modules are not considered as overcurrent devices for the purpose of this section."

SUBSTANTIATION: These sentences conflict with the requirement established by labels on listed photovoltaic modules for a series module protective fuse on each module or string of modules. The first sentence in this section establishes the safety requirement. The industry is now using source circuit combiners to meet the requirement.

The labeling requirements for modules are being coordinated with Underwriters Laboratories (UL) to indicate on the module label or in the instructions, the maximum number of modules that may be connected in parallel.

PANEL ACTION: Accept in Part.
Delete the following sentence from the existing code text:
"Sets of modules interconnected as systems rated at 50 volts or less, with or without blocking diodes, and having a single overcurrent device shall be considered as a single-source circuit."
Retain the last sentence in the existing code text that reads as follows: "Supplementary overcurrent devices used for the exclusive protection of the photovoltaic modules are not considered as overcurrent devices for the purpose of this section."
PANEL STATEMENT: The present wording of the second sentence in this section was removed since a single overcurrent protection device might allow backfed fault current to the individual circuit. Sets of modules with a series protective fuse on each module or string of modules could still be considered as a single source circuit. The last sentence provides clarity that individual fuses used as supplementary protection of modules, series or parallel, are not considered as the overcurrent protection devices required by 690-9. To delete this last sentence may provide more questions in the field and may even cause some inspectors to require these overcurrent protection devices to comply with Article 240 as stated in Section 690-9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3790)

3- 153 - (690-4(c)): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
RECOMMENDATION: Revise the existing:
"Sets of modules interconnected as systems rated at 50 volts or less,"
to read as:
"Sets of modules interconnected as systems with a rated operating voltage of 80 volts or less,"
SUBSTANTIATION: The intent of this 690-4(c) is to reduce the potential shock hazard when removing PV modules or panels for repair or replacement. The restrictions on wiring arrangements created by this article do not substantially improve safety beyond that already provided by 690-18. In practice, it is very simple to minimize the shock hazards of interrupted PV source circuit conductors by disconnecting the grounded and ungrounded conductors at affected PV modules prior to removal of any modules or panels.
Normally, if the removal of a module or panel interrupts the grounded conductor to another PV source circuit, it also interrupts the ungrounded conductor. (This is universally true when the grounded and ungrounded conductors are in the same conduit, and generally true even when single-conductor cable is used.) When both the grounded and ungrounded conductors are interrupted, the primary shock hazard exists between these two conductors rather than between either conductor and ground. This is the same shock hazard that exists in the source circuit in which a panel or module is being removed.
So if the person(s) removing a module or panel can safely service that source circuit, they should also be able to safely handle additional interrupted source circuits as required.
It should also be noted that PV modules are typically warranted from 10 to 25 years -- longer than most products addressed by the NEC. It seems unwise to add complexity and expense to systems when it is very unlikely that modules or panels will need replacement.
This proposal is an attempt to balance the desire to reduce shock hazards while minimizing system complexity and cost. The suggested limit of 80 volts can be safely managed using the practices required in 690-18. This voltage level applies to systems using readily available 48 volt nominal equipment.
PANEL ACTION: Reject.
PANEL STATEMENT: Increasing from 50 volts or less to 80 volts or less does not reduce the potential hazard but seems to increase the potential hazard. The submitter did not provide any technical substantiation for this increase in voltage from 50 to 80 volts.
The recognized cutoff level for safety in OSHA regulation 29CFR1910.333 is 50 volts.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1679)

3- 154 - (690-4(e)): Reject
SUBMITTER: Steve M. Rion, Colorado State Electrical Board
RECOMMENDATION: Sufficient space shall be provided and maintained about solar voltaic equipment to permit ready and safe operation in accordance with section 110-26[a].
SUBSTANTIATION: I made this proposal last code cycle and the code panel missed my point. Electricians and electrical inspectors are aware of the working clearance requirements found elsewhere in the NEC. Unfortunately many solarvoltaic systems are being installed by homeowners, quasi "solar contractors" and other individuals or firms that are not electricians. Whether you want to admit it or not the NEC is being used as a design manual, even by the installer most qualified to do this work. Working clearance is often overlooked, especially above the battery box, where it is not uncommon to have several thousand amperes of fault current available at the battery terminals with the inverter and charge controller mounted above. Imagine if you will, leaning over the battery box to service the photovoltaic equipment, the consequences could be fatal. We routinely inspect these systems in a varitey of applications and working clearance is the most common code violation found in stand alone systems, often times requiring great expense to bring into compliance. Section 110-26 is referenced in other NEC articles, by including it in Article 690 everyone from the professional installer to the grass roots solar installer would understand that it is required. One of the largest manufacturers of
inverters used in photovoltaic systems has an installation drawing included with its inverters that shows an inverter with an A/C panelboard mounted next to it with a large battery system mounted below, completely encroaching into the working clearance. Let's help the industry and include a reference to 110-26 in Article 690, whether it be the text suggested or a fine print note.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 90-3 already states that Chapters 1 through 4 apply except as amended or supplemented by Chapters 5, 6, or 7. Section 110-26 would then apply, unless amended by Article 690, so the addition of the proposed text is not necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2315)

3- 155 - (690-5(b)): Accept in Principle
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Revise the last sentence to read as follows:
"Opening the grounded conductor of the array or faulted sections of the array shall be permitted to interrupt the ground-fault current path."
SUBSTANTIATION: Corrects grammatical error in the 1999 NEC.
PANEL ACTION: Accept in Principle.
Add the word "opening" after "or" and before "faulted" in the proposal to read as follows:
"Opening the grounded conductor of the array or opening the faulted sections of the array shall be permitted to interrupt the ground-fault current path."
PANEL STATEMENT: Adding the additional wording "opening" provides clarity to the sentence.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2351)

3- 156 - (690-6(a)): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Correct the spelling of "photovoltaic" in the second sentence.
SUBSTANTIATION: Corrects spelling error in the 1999 NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2550)

3- 157 - (690-6(a)): Reject
SUBMITTER: Gregory A. Kern, Applied Power Corp.
RECOMMENDATION: Add the following to the end of the last sentence "and is investigated as part of the Listing of the ac module."
SUBSTANTIATION: The purpose is to make clear that the internal dc circuits of an ac module have been investigated as part of the Listing process and need not be investigated by the inspector.
Applied Power Corporation is a distributor, systems integrator and manufacturer of pv systems and ac modules. Applied Power Corporation owns and operates Solar Electric Specialties, Alternative Energy Engineering and Ascension Technology.
PANEL ACTION: Reject.
PANEL STATEMENT: If the ac module is listed, Section 90-7 already states repetition of examinations or inspections is not necessary. It further states that factory installed internal wiring or the construction of equipment need not be inspected at the time of installation, except to detect alterations or damage. Section 90-7 makes the additional text in this Section unnecessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3007)

3- 158 - (690-6(a)): Reject
SUBMITTER: William M. Kanzer, Evergreen Solar, Inc.
RECOMMENDATION: Add the following to the end of the last sentence:
"and is investigated as part of the Listing of the ac module."
SUBSTANTIATION: The purpose is to make clear that the internal dc circuits of an ac module have been investigated as part of the listing process and need not be investigated by the inspector.
Evergreen Solar, Inc., is a manufacturer of photovoltaic modules and AC Modules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-157.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3194)

3- 159 - (690-6(a)): Reject
SUBMITTER: Gregory A. Kern, Applied Power Corp.
RECOMMENDATION: Add the following to the end of the last sentence "and is investigated as part of the Listing of the ac module."
SUBSTANTIATION: The purpose is to make clear that the internal dc circuits of an ac module have been investigated as part of the Listing process and need not be investigated by the inspector.
Applied Power Corporation is a distributor, systems integrator and manufacturer of pv systems and ac modules. Applied Power Corporation owns and operates Solar Electric Specialities, Alternative Energy Engineering and Ascension Technology.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-157.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3303)

3- 160 - (690-6(a)): Reject
SUBMITTER: William M. Kanzer, Evergreen Solar, Inc.
RECOMMENDATION: Add the following to the end of the last sentence "and is investigated as part of the listing of the ac module."
SUBSTANTIATION: The purpose is to make clear that the internal dc circuits of an ac module have been investigated as part of the listing process and need not be investigated by the inspector.
Evergreen Solar, Inc., is a manufacturer of photovoltaic modules and AC modules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-157.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2551)

3- 161 - (690-6(c)): Reject
SUBMITTER: Gregory A. Kern, Applied Power Corp.
RECOMMENDATION: Delete the sentence, "~~Additionally, each ac module in a multiple ac module system shall be provided with a connector, bolted, or terminal-type disconnecting means.~~"
SUBSTANTIATION: This statement combined with 690-33, which appears to provide a definition of "connectors, and 690-3, which states that the requirements of 690 override all other sections of the Code, can be interpreted by inspectors to preclude the use of pressure connectors for connection of ac modules to a branch circuit. Also, this is not a requirement for other ac appliances, why must we make it one for ac modules? By deleting this sentence, we allow other, more appropriate, sections of the Code to define how the ac module may be connected to a branch circuit. This appears to be a carry over from dc modules, but should not apply to ac modules.
Also, in 690-15, the Code states "A single disconnecting means in accordance with Section 690-17 shall be permitted for the combined ac output of one or more inverters or ac modules in an interactive system." So this requirement in 690-6(c) conflicts with the existing language in 690-15.
Applied Power Corporation is a distributor, systems integrator and manufacturer of pv systems and ac modules. Applied Power Corporation owns and operates Solar Electric Specialties, Alternative Energy Engineering and Ascension Technology.
PANEL ACTION: Reject.
PANEL STATEMENT: The last sentence in Section 690-6(c) provides three different methods of disconnecting each ac module in a multiple ac module system that allows easy disconnection of the system. This section ties in with Sections 690-15, 690-17, and 690-33 to allow easy disconnection of modules. Section 690-33 provides very specific information on connectors for photovoltaic systems and since this equipment is very unique, it should remain in Article 690.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3008)

3- 162 - (690-6(c)): Reject
SUBMITTER: William M. Kanzer, Evergreen Solar, Inc.
RECOMMENDATION: Delete the sentence:
"Additionally each ac module in a multiple ac module system shall be provided with a connector, bolted, or terminal-type disconnecting means."
SUBSTANTIATION: This statement combined with 690-33, which appears to provide a definition of "connectors", and 690-3, which states that the requirements of 690 override all other sections of the code, can be interpreted by inspectors to preclude the use of pressure connectors for connection of ac modules to a branch circuit. Also, this is not a requirement for other ac appliances, why must we make it one for ac modules? By deleting this sentence, we allow other, more appropriate, sections of the code to define how the ac module may be connected to a branch circuit. This appears to be a carry over from dc module, but should not apply to ac modules.
Also, in 690-15, the code states "A single disconnecting means in accordance with Section 690-17 shall be permitted for the combined ac output of one or more inverters or ac modules in an interactive system." So this requirement in 690-6(c) conflicts with the existing language in 690-15.
Evergreen Solar, Inc., is a manufacturer of photovoltaic modules and AC Modules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-161.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3195)

3- 163 - (690-6(c)): Reject
SUBMITTER: Gregory A. Kern, Applied Power Corp.
RECOMMENDATION: Delete the sentence, "Additionally, each ac module in a multiple ac module system shall be provided with a connector, bolted, or terminal-type disconnecting means."
SUBSTANTIATION: This statement combined with 690-33, which appears to provide a definition of "connectors", and 690-3, which states that the requirements of 690 override all other sections of the code, can be interpreted by inspectors to preclude the use of pressure connectors for connection of ac modules to a branch circuit. Also, this is not a requirement for other ac appliances, why must we make it one for ac modules? By deleting this sentence, we allow other, more appropriate, sections of the code to define how the ac module may be connected to a branch circuit. This appears to be a carry over from dc modules, but should not apply to ac modules.

Also, in 690-15, the code states "A single disconnecting means in accordance with Section 690-17 shall be permitted for the combined ac output of one or more inverters or ac modules in an interactive system." So this requirement in 690-6(c) conflicts with the existing language in 690-15.

Applied Power Corporation is a distributor, systems integrator and manufacturer of pv systems and ac modules. Applied Power Corporation owns and operates Solar Electric Specialties, Alternative Energy Engineering and Ascension Technology.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-161.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3304)

3- 164 - (690-6(c)): Reject
SUBMITTER: William M. Kanzer, Evergreen Solar, Inc.
RECOMMENDATION: Delete the sentence, "Additionally, each ac module in a multiple ac module system shall be provided with a connector, bolted, or terminal-type disconnecting means."
SUBSTANTIATION: This statement combined with 690-33, which appears to provide a definition of "connectors", and 690-3, which states that the requirements of 690 override all other sections of the code can be interpreted by inspectors to preclude the use of pressure connectors for connection of ac modules to a branch circuit. Also, this is not a requirement for other ac appliances why must we make it one for ac modules? By deleting this sentence, we allow other, more appropriate, sections of the code to define how the c module may be connected to a branch circuit. This appears to be a carry over from dc modules, but should not apply to ac modules.

Also, in 690-15, the code states "A single disconnecting means in accordance with Section 690-17 shall be permitted for the combined ac output of one or more inverters or ac modules in an interactive system." So this requirement in 690-6(c) conflicts with the existing language in 690-15.

Evergreen Solar, Inc., is a manufacturer of photovoltaic modules and AC modules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-161.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2352)

3- 165 - (690-6(d)): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Replace the existing text with the following:
"Alternating current (ac)-module systems shall include a ground-fault detection device to reduce fire hazards. A single detection device shall be permitted for each system (one or more modules). That device shall detect ac ground faults, indicate the fault, and disconnect the alternating-current module(s) from the ac source."
SUBSTANTIATION: Revised text requires the device and clarifies the requirement. The 1999 NEC did not require the device, only permitted it.
PANEL ACTION: Reject.
PANEL STATEMENT: Technical substantiation should have been provided with the proposal to make this a requirement instead of just permitting the use of a ground fault device for the ac ground fault. The detection device referenced in this Section is not ground fault protection for personnel and should not be used for this application. The ground fault protection devices allowed by this section are designed to disable the array by removing power to the ac modules. This may help reduce fire hazards where a ground fault does occur.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2552)

3- 166 - (690-6(d)): Reject
SUBMITTER: Gregory A. Kern, Applied Power Corp.
RECOMMENDATION: Delete the entire paragraph 690-6(d).
SUBSTANTIATION: Such standard equipment does not exist. Therefore, we suggest even this permissive language be removed from the Code.

Existing GFCIs are not rated for backfeed operation and are not tested by UL 943, "Ground-Fault Circuit Interrupters" for use with ac modules or other pv inverters connected to the Load side of the GFCI. My company's SunSine AC Modules will typically shutdown in 4 to 6 milliseconds on a ground fault GFCI trip, such as pushing the Trip button. However, I cannot guarantee that other companies AC Modules will shut down as fast. There are NO tests in UL1741 or UL943 that verify compatibility between AC Modules and GFCIs. The problem is that if an ac module inverter fails to shut down fast enought it is possible to burn up the trip coil which is connected to the Load side of the GFCI. GFCI installation instructions typically indicate "not for backfeed operation" just to prevent such burning up of the trip coil. In an extreme case, it might be possible to start a fire in the GFCI, we don't know because GFCIs are not tested for this condition.

It might be possible that expensive industrial ground-fault relay equipment could be found and used for such ground fault detection. But this would impose a severe cost penalty on ac modules which is not applied to other pv inverters or systems, and we believe was not the original intent of adding this to the Code in the first place. AC ground-fault protection is not permitted or required for inverter output circuits, so it should not be permitted or required for ac modules. 690-6(b) states "The output of an ac module shall be considered an inverter output circuit". Lets treat it as such.

AC module systems are the safest kind of system with respect to dc ground faults and fire prevention. In our units, there is transformer isolation between dc circuits of each module in the system and the branch circuit. UL 1741 requires and tests for isolation between the dc and ac circuits of an ac module. There is NO way for a ground fault in the dc circuit of one module to be fed by dc from any other modules in the system or by ac from the branch circuit. A dc ground fault in one module of an ac module system will not produce ac ground fault current. This is a level of safety presently not possible with a dc array. Therefore, this ground fault detection requirement has NO impact on the fire safety of ac module systems, and should not be permitted or required by this Code.

The only reason for ground fault detection and tripping is for personnel safety. GFCIs are typically used for personnel safety and are covered by UL 943. If personnel safety was the intention of the Code, then that should have been stated in the Code. But as mentioned above, we are not aware of any GFCIs that are suitable for backfeed operation, hence this equipment does not exist and should not be permitted or required by this Code.

Applied Power Corporation is a distributor, systems integrator and manufacturer of pv systems and ac modules. Applied Power Corporation owns and operates Solar Electric Specialties, Alternative Energy Engineering and Ascension Technology.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-165.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3009)

3- 167 - (690-6(d)): Reject
SUBMITTER: William M. Kanzer, Evergreen Solar, Inc.
RECOMMENDATION: Revise as follows:
(d) Ground-Fault Detection. Alternating-current module systems shall not be required or permitted to use a ground fault detection device.
SUBSTANTIATION: Existing GFCIs are not rated for backfeed operation and are not tested by UL 943, "Ground-Fault Circuit Interrupters" for use with ac modules or other pv inverters connected to the Load side of the GFCI. The problem is that if an ac module inverter fails to shut down fast enough it is possible to burn up the trip coil which is connected to the load side of the GFCI. GFCI installation instructions typically indicate, "not for backfeed operation" just to prevent such burning up of the trip coil. In an extreme case, it might be possible to start a fire in the GFCI, we don't know because GFCI's are not tested for this condition.
AC ground-fault protection is not permitted or required for inverter output circuits, so it should not be permitted or required for ac modules. Section 690-6(b) states "The output of an ac module shall be considered an inverter output circuit." Let's treat it as such.
AC module systems are the safest kind of system with respect to dc ground faults and fire prevention. UL 1741 requires and tests for isolation between the dc and ac circuits of an ac module. There is NO way for a ground fault in the dc circuit of one module to be fed by dc from any other modules in the system or by ac from the branch circuit. A dc ground fault in one module of an ac module system will not produce ac ground fault current. This is a level of safety presently not possible with a dc array. Therefore, this ground fault detection requirement has NO ability to increase the fire safety of ac module systems, and should not be permitted or required by this code.
Evergreen Solar, Inc., is a manufacturer of photovoltaic modules and AC modules.
PANEL ACTION: Reject.
PANEL STATEMENT: The detection device referenced in this Section is not ground fault protection for personnel and should not be used for this application. The ground fault protection devices allowed by this Section are designed to disable the array by removing power to the ac modules. This may help reduce fire hazards where a ground fault does occur.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3196)

3- 168 - (690-6(d)): Reject
SUBMITTER: Gregory A. Kern, Applied Power Corp.
RECOMMENDATION: Delete the entire paragraph 690-6(d).
SUBSTANTIATION: Such standard equipment does not exist. Therefore, we suggest even this permissive language be removed from the code.
Existing GFCIs are not rated for backfeed operation and are not tested by UL 943, "Ground-Fault Circuit Interrupters" for use with ac modules or other pv inverters connected to the Load side of the GFCI. My company's SunSine AC Modules will typically shutdown in 4 to 6 milliseconds on a ground fault GFCI trip, such as pushing the trip button, However, I cannot guarantee that other companies. AC Modules will shut down as fast. There are NO tests in UL 1741 or UL 943 that verify compatibility between AC Modules and GFCIs. The problem is that if an ac module inverter fails to shut down fast enough it is possible to burn up the trip coil which is connected to the load side of the GFCI. GFCI installation instructions typically indicate, "not for backfeed operation" just to prevent such burning up of the trip coil. In an extreme case, it might be possible to start a fire in the GFCI, we don't know because GFCIs are not tested for this condition.
It might be possible that expensive industrial ground-fault relay equipment could be found and used for such ground fault detection. But this would impose a severe cost penalty on ac modules which is not applied to other pv inverters or systems, and we believe was not the original intent of adding this to the code in the first place. AC ground-fault protection is not permitted or required for inverter output circuits, so it should not be permitted or required for ac modules. Section 690-6(b) states "The output of an ac module shall be considered an inverter output circuit." Let's treat it as such.
AC module systems are the safest kind of system with respect to dc ground faults and fire prevention. In our units, there is transformer isolation between the dc circuits of each module in the system and the branch circuit. UL 1741 requires and tests for isolation between the dc and ac circuits of an ac module. There is NO way for a ground circuit in the dc circuit of one module to be fed by dc from any other modules in the system or by ac from the branch circuit. A dc ground fault in one module of an ac module system will not produce ac ground fault current. This is a level of safety presently not possible with a dc array. Therefore, this ground fault detection requirement has NO impact on the fire safety of ac module systems, and should not be permitted or required by this code.
The only other reason for ground fault detection and tripping is for personnel safety. GFCIs are typically used for personnel safety and are covered by UL 943. If personnel safety was the intention of the code, then that should have been stated in the code. But as mentioned above, we are not ware of any GFCIs that are suitable for backfeed operation, hence this equipment does not exist and should not be permitted or required by this code.
Applied Power Corporation is a distributor, systems integrator and manufacture of pv systems and ac modules. Applied Power Corporation owns and operates Solar Electric Specialties, Alternative Energy Engineering an Ascension Technology.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-165.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3305)

3- 169 - (690-6(d)): Reject
SUBMITTER: William M. Kanzer, Evergreen Solar, Inc.
RECOMMENDATION: Revise as follows:
(d) Ground-Fault Detection. Alternating-current-module systems shall not be required or permitted to use ground fault detection device.
SUBSTANTIATION: Existing GFCIs are not rated for backfeed operation and are not tested by UL 943, "Ground-Fault Circuit Interrupters" for use with ac modules or other pv inverters connected to the load side of the GFCI. The problem is that if an ac module inverter fails to shut down fast enough it is possible to burn up the trip coil which is connected to the load side of the GFCI. GFCI installation instructions typically indicate, "not for backfeed operation" just to prevent such burning up of the trip coil. In an extreme case, it might be possible to start a fire in the GFCI, we don't know because GFCIs are not tested for this condition.
AC ground-fault protection is not permitted or required for inverter output circuits, so it should not be permitted or required for ac modules. Section 690-6(b) states "The output of an ac module shall be considered an inverter output circuit." Lets treat it as such.
AC module systems are the safest kind of system with respect to dc ground faults and fire prevention. UL 1741 requires and tests for isolation between the dc and ac circuits of an ac module. There is no way for a ground fault in the dc circuit of one module to be fed by dc from any other modules in the system or by ac from the branch circuit. A dc ground fault in one module of an ac module system will not produce ac ground fault current. This is a level of safety presently not possible with a dc array. Therefore, this ground fault detection requirement has no ability to increase the fire safety of ac module systems, and should not be permitted or required by this code.
Evergreen Solar Inc., is a manufacturer of photovoltaic modules and AC modules.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-167.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3006)

3- 170 - (690-6(f) (New)): Reject
SUBMITTER: William M. Kanzer, Evergreen Solar, Inc.
RECOMMENDATION: Create a new paragraph 690-6 (f) to read:
(f) Point of Connection. AC module systems shall be permitted to be connected to a receptacle of a branch circuit when the branch circuit wiring is rated for 1.25 times the maximum operating current of the ac module system plus the installed branch circuit protection rating.
SUBSTANTIATION: Small 100W ac module systems are becoming widely available and there is a need for safe simple connection of such systems. Many people are connecting such systems to branch circuits with 3 prong plug/receptacles on 120V circuits because they are unwilling to go to the cost and expense of installing a dedicated branch circuit. It is possible to prevent an overcurrent condition on the branch circuit conductors by following the above guideline. For example, a homeowner could then install a 300W system on a 120V 20A branch circuit, replace the 20A breaker with a 15A breaker, and be protected against overcurrent of the branch circuit wiring.
PANEL ACTION: Reject.
PANEL STATEMENT: A homeowner installing a cord and plug connected unit to a receptacle will not know what the branch circuit rating is and probably would not be able to do the calculation necessary outlined in the proposal. This proposal seems to imply that a receptacle connection would be made to an ac module developing power and transferred into the wiring system using a male attachment plug into the receptacle. This would be a violation of Section 410-56(g), last two sentences and could be a serious hazard with the energized cord cap. The proposed calculation also implies that the size of the circuit conductors would be 125% times the current of the ac module plus the rating of the branch circuit overcurrent protection device. A 15 ampere circuit breaker (120 volts times 15 amperes = 1800 watts) plus a 300 watt unit times 125% = 375 watts plus 1800 = 2175 watts divided by 120 volts = 18.125 amp conductor protected by a 15 ampere circuit breaker.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3031)

3- 171 - (690-6(f) (New)): Reject
SUBMITTER: Gregory A. Kern, Applied Power Corp.
RECOMMENDATION: Create a new paragraph, 690-6(f):
(f) Point of Connection. AC module systems shall be permitted to be connected to a receptacle of a branch circuit when the branch circuit wiring is rated for 1.25 times the maximum operating current of the ac module system plus the installed branch circuit protection rating.
SUBSTANTIATION: Small 100W ac module systems are becoming widely available and there is a need for safe simple connection of such systems. Many people are connecting such systems to branch circuits with 3 prong plug/receptacles on 120V circuits because they are unwilling to go to the cost and expense of installing a dedicated branch circuit. It is possible to prevent an overcurrent condition on the branch circuit conductors by following the above guideline. For example, a homeowner could then install a 300W system on a 120V 20A branch circuit, replace the 20A breaker with a 15A breaker, and be protected against overcurrent of the branch circuit wiring.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-170.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3193)

3- 172 - (690-6(f) (New)): Reject
SUBMITTER: Gregory A. Kern, Applied Power Corp.
RECOMMENDATION: Create a new paragraph, 690-6(f):
(f) Point of Connection. AC module systems shall be permitted to be connected to a receptacle of a branch circuit when the branch circuit wiring is rated for 1.25 times the maximum operating current of the ac module system plus the installed branch circuit protection rating.
SUBSTANTIATION: Small 100W ac module systems are becoming widely available and there is a need for safe simple connection of such systems. Many people are connecting such systems to branch circuits with 3 prong plug/receptacles on 120V circuits because they are unwilling to go to the cost and expense of installing a dedicated branch circuit. It is possible to prevent an overcurrent condition on the branch circuit conductors by following the above guideline. For example, a homeowner could then install a 300W system on a 120V 20A branch circuit, replace the 20A breaker with a 15A breaker, and be protection against overcurrent of the branch circuit wiring.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-170.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3302)

3- 173 - (690-6(f) (New)): Reject
SUBMITTER: William M. Kanzer, Evergreen Solar, Inc.
RECOMMENDATION: Create a new paragraph 690-6(f).
(f) Point of Connection. AC module systems shall be permitted to be connected to a receptacle of a branch circuit when the branch circuit wiring is rated for 1.25 times the maximum operating current of the ac module system plus the installed branch circuit protection rating.
SUBSTANTIATION: Small 100W ac module systems are becoming widely available and there is a need for safe simple connection of such systems. Many people are connecting such systems to branch circuits with 3 prong plug/receptacles on 120V circuits because they are unwilling to go to the cost and expense of installing a dedicated branch circuit. It is possible to prevent an overcurrent condition on the branch circuit conductors by following the above guideline. For example, a homeowner could then install a 300W system on a 120V 20A branch circuit, replace the 20A breaker with a 15A breaker, and be protected against overcurrent of the branch circuit wiring.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-170.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2353)

3- 174 - (690-7(a)): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Change the title of the section to:
(a) Maximum Photovoltaic System Voltage and add the word "photovoltaic" in the first sentence between the words "maximum" and "system".
SUBSTANTIATION: Clarifies the section and makes it consistent with new definitions and other sections of this article.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3769)

3- 175 - (690-7(e) (New)): Accept in Principle
SUBMITTER: Robert H. Wills, Advanced Energy, Inc.
RECOMMENDATION: Add Section 690-7(e) to read as follows:
(e) Multipole Source and Output Circuits. The maximum system voltage for 2-wire subcircuits of multipole photovoltaic arrays shall be the highest voltage between the conductors of that circuit providing:
(1) one conductor of each circuit is solidly grounded, or connected to a grounded power system conductor
(2) each subcircuit is connected to a separate subarray and is carried in separate cables or conduit
(3) the equipment is clearly marked:
Warning — multipole photovoltaic array. Removal of neutral or grounding conductors may result in overvoltage on array or inverter.

If these provisions are not met, the maximum system voltage shall be the highest voltage between any conductors in the photovoltaic source or input circuits.

SUBSTANTIATION: This allows for inverter topologies that have multiple array connections, or multipolar arrays in separate segments. In particular, the lowest cost inverter topology for PV systems is a bipolar PV array connected to a half-bridge inverter. Currently, this topology is not allowed due to the definition of system voltage (a change that was made to the 1996 code). As cost is a major factor in the viability of PV technology, we must ensure that lowest cost designs are possible under the code, providing that they meet safety requirements.

The likely configuration for such a system is two-dc subarrays, each 350 V dc peak, connected separately to the inverter. One subarray would be negative ground, the other, positive ground. The inverter would have 700 V available to it internally, and so would need to be listed for such service.

PANEL ACTION: Accept in Principle.

Rewrite proposal to read as follows:

"(e) Bipolar ~~Multipole~~ Source and Output Circuits. For 2-wire circuits connected to bipolar systems, the maximum system voltage shall be the highest voltage between the conductors of the 2-wire circuit if:

(1) one conductor of each circuit is solidly grounded, ~~or connected to a grounded power system conductor~~

(2) each circuit is connected to a separate subarray and ~~is carried in separate cables or conduit,~~

(3) the equipment is clearly marked with a label as follows: Warning-Bipolar ~~multipole~~ photovoltaic array. Disconnection ~~removal~~ of neutral or grounded conductors may result in overvoltage on array or inverter."

~~If these provisions are not met, the maximum system voltage shall be the highest voltage between any conductors in the photovoltaic source or input circuits.~~

PANEL STATEMENT: The word "multipole" was changed to "bipolar" where ever it appears in the proposal to match the new proposed definition in Proposal 3-146. The text in the introduction to this section was changed to be consistent with the accepted text in Proposal 3-149 which updates terminology and more clear definition of system voltage.

The phrase "or connected to a grounded power system conductor" was deleted since connection to a grounded power conductor would constitute a solidly grounded conductor already stated in (1).

The phrase "is carried in separate cables or conduit" would not be necessary if the conductor insulation is sufficient for the voltage.

In the warning marking, removal was replaced with the word "disconnection" to more accurately relate to the disconnecting of conductors in Section 690-13.

The last sentence of the proposal was deleted since the new section basically already implies that if the three provisions are not met, the maximum voltage would be between any two conductors of the system.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #2354)

3- 176 - (690-8(b)(1) (New)): Accept in Principle

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add new text to read:

"Overcurrent protection for photovoltaic output circuits that supply devices that internally limit the current drawn from that photovoltaic output circuit shall be permitted to be rated at less than the value computed in 690-8(b). This reduced rating shall be at least 125 percent of the limited-current value. An overcurrent device in an assembly listed for continuous operation at 100 percent of its rating shall be permitted to be used at 100 percent of its rating.

Photovoltaic output circuit conductors shall be sized in accordance with Section 690-8(b)."

SUBSTANTIATION: This addition allows the use of a smaller overcurrent device than the calculation in 690.8(B) normally requires. The reduction is allowable because certain listed devices such as charge controllers and inverters can limit the maximum current that can be drawn from a source circuit.

The second sentence ensures that the overcurrent device will not be operated at more than 80% of its rating.

The final sentence ensures that the conductors are properly sized to handle fault currents from the photovoltaic source that could result from faults on the photovoltaic side of the overcurrent device.

PANEL ACTION: Accept in Principle.

Rewrite Section 690-8(b) to incorporate the proposed change into the existing Code text as a new subsection to read as follows:

"(b) Ampacity and Overcurrent Device Ratings. Photovoltaic system currents shall be considered continuous.

(1) Sizing of Conductors and Overcurrent Devices. The circuit conductors and overcurrent devices shall be sized to carry not less than 125 percent of the maximum currents as computed in (a). The rating or setting of overcurrent devices shall be permitted in accordance with Sections 240-3(b) and (c).

Exception: Circuits containing an assembly together with its overcurrent device(s) that is listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.

(2) Internal Current Limitation. Overcurrent protection for photovoltaic output circuits with ~~that supply~~ devices that internally limit the current ~~drawn~~ from the photovoltaic output circuit shall be permitted to be rated at less than the value computed in 690-8(b)(1). This reduced rating shall be at least 125 per cent of the limited current value. Photovoltaic output circuit conductors shall be sized in accordance with Section 690-8(b)(1).

Exception: An overcurrent device in an assembly listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating."

PANEL STATEMENT: Titles were added and separate subsections were established since the new proposed text provides an alternative to the standard calculation. The words "that" and "drawn" were removed or replaced strictly as editorial corrections.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #2355)

3- 177 - (690-9(c)): Accept in Principle

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add the following second paragraph:

"The standard values of supplementary-type overcurrent devices allowed by this section shall have ratings in one-ampere increments from one to 15 amperes. Higher standard values shall comply with Section 240-6(a)."

SUBSTANTIATION: Section 240-6(a) sets standard values for class-type fuses. This Section allows listed supplementary-type fuses. Module-protection fuse requirements established by UL and the module label require fuses with ratings between 5 and 20 amps. For example, to increase the 8 amp required value of a module-protection fuse to the first standard value of 15 amps would create a safety problem. This proposal defines and requires that the proper fuse value be used.

PANEL ACTION: Accept in Principle.

Change the proposed text to read as follows:

"Standard values of supplementary fuse-type overcurrent devices allowed by this section shall be in one ampere size increments starting at one ampere up to and including 15 amperes. Higher standard values above 15 amperes for supplementary overcurrent devices shall be based upon the standard sizes provided in Section 240-6(a)."

PANEL STATEMENT: The proposed text was changed to provide clearer direction on the sizing of supplementary overcurrent devices for 15 ampere and smaller fuses for photovoltaic source circuits.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #2356)

3- 178 - (690-9(e)): Accept in Principle

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add new text to read:

"A single overcurrent device shall be permitted to meet the conductor protection requirements established by Sections 690-8 and

690-9 and the photovoltaic module overcurrent protection requirements established by labels on the module."
SUBSTANTIATION: UL instructions and labeling require that a series module-protection fuse be used to protect each module from reverse currents. In series-connected strings of two or more modules, only a single overcurrent device is required to protect all of the modules in the string. The rating of this overcurrent device is normally the same as or greater than the rating of the code-required overcurrent device to protect the module interconnection conductors. Frequently, a single overcurrent device can be used to meet both of these requirements.
PANEL ACTION: Accept in Principle.
Revise the proposed text to read as follows:
"(e) Series Overcurrent Protection. In series-connected strings of two or more modules, a single overcurrent protection device shall be permitted."
PANEL STATEMENT: The new proposed text more closely follows the substantiation provided in the proposal for the suggested protection of the series connected system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2358)

3- 179 - (690-9(f) (New)): Accept in Principle
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Add new text to read:
"Where a single overcurrent device, allowed by Section 690-9(e), is used to protect a set of two or more parallel-connected module circuits, the ampacity of each of the module interconnection conductors shall not be less than the sum of (1) and (2).
(1) The rating of the single fuse.
(2) 125 percent of the short-circuit current from the other parallel-connected modules."
SUBSTANTIATION: Under fault conditions, the individual module conductors will be required to carry currents through the fuse from batteries or other sources plus 125 percent of the short-circuit currents from the other modules.
PANEL ACTION: Accept in Principle.
Change the proposed text to read as follows:
"690-8(d). Sizing of Module Interconnection Conductors. Where a single overcurrent device is used to protect a set of two or more parallel-connected module circuits, the ampacity of each of the module interconnection conductors shall not be less than the sum of the rating of the single fuse plus 125 percent of the short-circuit current from the other parallel-connected modules."
PANEL STATEMENT: The proposed new subsection reference to 690-9(e) is not relevant since 690-9(e) is dealing with series circuits, not parallel circuits. The title was added to more accurately reflect the intent of the proposal and comply with the Style Manual. This was relocated to 690-8 since it deals with conductor sizing. The other changes are editorial. The panel suggests for clarity the submitter provide a figure to depict the intent of the proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3280)

3- 180 - (690-10(c)): Accept
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise the last sentence of 690-10(c) with the addition (underlined) as shown. The entire text is shown for clarity, but only those changes shown underlined are part of this proposal.
This equipment shall be marked <u>with the following words or equivalent</u>:
WARNING - SINGLE 120-VOLT SUPPLY - DO NOT CONNECT MULTIWIRE BRANCH CIRCUITS!
SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.
The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2359)

3- 181 - (690-14): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Delete the existing sentence and replace with:
"Photovoltaic disconnecting means shall comply with (a) through (c)."
SUBSTANTIATION: Photovoltaic source circuits have unique properties that are different from utility service entrances. The unnecessary reference to Article 230 causes some authorities having jurisdiction to require unnecessary or unsafe equipment. Article 690 contains all necessary requirements for disconnecting means. Section 690-14(c) is added in a separate proposal.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2360)

3- 182 - (690-14(c) (New)): Accept in Principle
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Add new text to read:
"The photovoltaic disconnecting means shall be grouped with other disconnecting means for the system. A photovoltaic disconnecting means shall not be required at the photovoltaic module or array location."
SUBSTANTIATION: To comply with the code requirements for grouping all disconnects of a power system in a single location, it is necessary to have the photovoltaic disconnecting means grouped with the other disconnecting means. Although photovoltaic modules and arrays may be located some distance away or on the roof, there is no requirement for a disconnect at the source because the source is energized in daylight whether or not the disconnect is opened.
PANEL ACTION: Accept in Principle.
Add the following new text to the proposed text:
"(c) Requirements for Disconnecting Means. Means shall be provided to disconnect all conductors in a building or other structure from the photovoltaic system conductors.
(1) Location. The photovoltaic disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the system conductors.
The photovoltaic system disconnecting means shall not be installed in bathrooms.
(2) Marking. Each photovoltaic system disconnecting means shall be permanently marked to identify it as a photovoltaic system disconnect.
(3)Suitable for Use. Each photovoltaic system disconnecting means shall be suitable for the prevailing conditions. Equipment installed in hazardous (classified) locations shall comply with the requirements of Articles 500 through 517.
(4)Maximum Number of Disconnects. The photovoltaic system disconnecting means shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard.
(5)Grouping. The photovoltaic system disconnecting means shall be grouped with other disconnecting means for the system to comply

with (4). A photovoltaic disconnecting means shall not be required at the photovoltaic module or array location."
PANEL STATEMENT: The added text was modified from Part F of Article 230 to ensure that a means for disconnecting the photovoltaic system will exist at the proper location, with the proper marking and suitability of use, and with the proper maximum number of disconnecting means.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3281)

3- 183 - (690-17(4)): Accept
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise the second paragraph of 690-17(4) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and ~~shall read substantially~~ have with the following words or equivalent:
WARNING - ELECTRIC SHOCK HAZARD - DO NOT TOUCH TERMINALS - TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.
SUBSTANTIATION: The explicit nature of the present wording is causing field problems in the acceptance of appropriate warning signs or markings. The ANSI Z535 series of standards provides the proper procedure in establishing a hazard sign or marking. ANSI Z535.4 provides the information about what should be contained in a hazard sign or label. This includes a message panel that identifies the hazard, indicates how to avoid the hazard and advises the probable consequence of not avoiding the hazard.
The objective of the NEC wording is to generally convey the basic message requirement to user. However, in order to comply with Z535.4, the exact words stated in the NEC may not be appropriate for the contemplated circumstances. Revising the text to allow "or equivalent" would allow a hazard sign to comply with the NEC, but be formated in accordance with Z535.4.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2361)

3- 184 - (690-31(b)): Accept in Principle
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Add USE-2 to the three acceptable cable types in the first sentence.
SUBSTANTIATION: Many photovoltaic module installations operate at temperatures that require a 90°C, wet-rated, sunlight resistant single-conductor cable. USE-2 meets these requirements, is commonly available, and is the most appropriate cable for this application.
PANEL ACTION: Accept in Principle.
Revise text in first sentence to read:
"Types SE, UF, USE, and USE-2..." Remainder of sentence to remain the same.
Revise text in last sentence to read:
"Where exposed to sunlight Type UF, USE, and USE-2 cables identified as sunlight-resistant shall be used."
PANEL STATEMENT: The panel has met the submitter's intent and revised text to add Type USE-2 cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2362)

3- 185 - (690-31(c)): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Change the last two Fahrenheit (°F) temperatures as follows:
Change 141-149 to 141-158.
Change 150-158 to 159-176.
SUBSTANTIATION: Corrects errors in the table
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1107)

3- 186 - (690-31(d)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "with sizes No. 16 and No. 18" to "in sizes 16 and 18 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code. "In" is more descriptive than "with".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2364)

3- 187 - (690-41): Accept
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Replace the existing contents with the following:
"For a photovoltaic power source, one conductor of a two-wire system with a system voltage over 50 volts and the reference (center tap) conductor of a bipolar system shall be solidly grounded or shall use other methods that accomplish equivalent system protection in accordance with Section 250-2(a)."
SUBSTANTIATION: Updates the terminology to be consistent with new definitions and definitions in the 1999 NEC. Moves the exception into the basic requirement. All equipment in the code is required to be listed so that 1999 NEC requirement for listed devices is not needed. The proposal also merges the FPN into the requirement to ensure that the device used is fully defined.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3798)

3- 188 - (690-43): Reject
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
RECOMMENDATION: Add the following:
"Exposed noncurrent carrying metal parts of photovoltaic modules secured to and in electrical contact with a metal rack or structure provided for module support and grounded by one of the means indicated in Section 250.134, shall be considered effectively grounded. Separate bonding jumpers shall not be required at each module. "
SUBSTANTIATION: This proposal clarifies the equipment grounding requirements for photovoltaic modules, panels, and arrays and is entirely consistent with the grounding requirements of other equipment covered by the NEC.
In the absence of clear guidelines, some jurisdictions have been requiring individual bonding jumpers to each module frame even when these frames were effectively grounded according to 250-134 and 250-136.

PANEL ACTION: Reject.
PANEL STATEMENT: There was no technical substantiation submitted with the proposal in his second sentence justifying the deletion of separate bonding jumpers from module to module and module to frame. The overall system must be provided with a equipment grounding conductor connection to facilitate the operation of overcurrent protection devices and to bond the overall system together. Adverse conditions often affect frames and module interconnections.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2365)

3- 189 - (690-45): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Replace the existing paragraph with the following:
"Where not protected by the ground-fault protection equipment required by Section 690-5, the equipment-grounding conductor for PV source and PV output circuits shall be sized for 125 percent of the PV-originated short-circuit currents in that circuit. Where protected by the ground-fault protection equipment required by Section 690-5, the equipment-grounding conductors for PV source and PV output circuits shall be sized in accordance with Section 250-122."
SUBSTANTIATION: When Underwriters Laboratories (UL) recently listed a PV combiner enclosure, they determined that ground faults in PV source and output circuits can result in continuous currents from the PV array flowing through the equipment-grounding conductor even after all overcurrent devices have tripped. This determination indicates that the equipment-grounding conductor for these circuits should be able to carry the currents from the PV sources. These equipment-grounding conductors should be sized at only 125 percent of the short-circuit current (Isc) since the additional 125 percent derating for continuous operation is not required. The equipment-grounding conductor (sized at 125 percent Isc) might be one size smaller than the circuit conductors (sized at 156 percent Isc) in a few systems.
If the system has a Section 690-5 ground-fault protection device installed, then the interruption of the fault current will prevent these PV currents from flowing in the equipment-grounding conductor and the increased size is not necessary. In this case, the requirements of Section 250-122 are appropriate.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter did not provide any technical substantiation for removing the requirement for the equipment grounding conductor to be not smaller than the required size of the circuit conductors where the available photovoltaic power source short-circuit current is less than twice the current rating of the overcurrent device. The second sentence of the substantiation states that this determination indicates that the equipment grounding conductor for these circuits should be able to carry the currents from the PV sources. This information should be provided to the panel to substantiate the proposed change.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #992)

3- 190 - (690-47): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add new text to read as follows:
A grounding electrode conductor in accordance with Section 250-166 for grounded systems or Section 250-169 for ungrounded systems, installed in accordance with Section 250-64, shall be used to connect the grounding electrode system to the solar photovoltaic system.
SUBSTANTIATION: Referencing the requirements for the grounding electrode conductor is appropriate and helpful to code users.
PANEL ACTION: Accept in Principle.
Revise 690-47 to read as follows:
"690-47. Grounding Electrode System
(A) Alternating Current Systems. If installing an ac system, a grounding electrode system shall be provided in accordance with Sections 250-50 through 250-60. The grounding electrode conductor shall be installed in accordance with Section 250-64.
(B) Direct Current Systems. If installing a dc system, a grounding electrode system shall be provided in accordance with Section 250-166 for grounded systems or Section 250-169 for ungrounded systems. The grounding electrode conductor shall be installed in accordance with Section 250-64."
PANEL STATEMENT: The proposed text has been accepted with some editorial rewrite, given a title, and made into separate subsection (B). To cover ac system connections, the existing text from the 1999 NEC Section 690-47 has been incorporated into a new subsection (A).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2363)

3- 191 - (690-51): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Delete this section.
SUBSTANTIATION: These requirements duplicate the requirements established by UL Standard 1703 and are required on the labels of all modules. This section is no longer needed.
PANEL ACTION: Reject.
PANEL STATEMENT: This marking information may be included in UL Standard 1703 but it is also information that is helpful in the enforcement, inspection, and installation of photovoltaic modules. There are other NEC articles that have marking requirements that are also required in their corresponding UL Standards, such as Part E of Article 422 dealing with appliances.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2366)

3- 192 - (690-52): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Delete this section.
SUBSTANTIATION: These requirements duplicate the requirements established by UL Standard 1703 and are required on the labels of all modules. This section is no longer needed.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel statement on Proposal 3-191.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2367)

3- 193 - (690-55 (New)): Accept in Principle
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Add new text to read:
"Photovoltaic power systems employing energy storage shall also be marked with the information in (1) and (2).
(1) Maximum operating voltage including any equalization voltage
(2) Polarity of grounded circuit conductor."
SUBSTANTIATION: These additional markings will facilitate the inspection, maintenance, and operation of the system.
PANEL ACTION: Accept in Principle.
Delete the (1) and (2) in the proposal and make into a complete sentence to read as follows:
"Photovoltaic Power Systems Employing Energy Storage.
Photovoltaic power systems employing energy storage shall also be marked with the maximum operating voltage including any equalization voltage and the polarity of the grounded circuit conductor."

PANEL STATEMENT: The proposed text was revised for clarity and more user friendliness.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BOWER: I affirm the comment that the term "labeled" should be used instead of "marked" and that the Panel Action still leaves a hole for center-tapped systems. I propose the Panel Action language should require labeling of the system grounded conductor with terms such as grounded positive, grounded negative or grounded center-tap.

(Log #2368)

3- 194 - (690-56 (New)): Accept in Principle
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Add new text to read:
"Any structure or building with a photovoltaic power system capable of acting as a Stand-Alone System shall have a permanent plaque or other label placed in a visible location on the exterior of the building or structure with the notice (1) and information (2). For structures with a utility service entrance, the label shall be located adjacent to the service entrance, exterior meter socket, or exterior utility disconnect."
(1) This structure contains a Stand-Alone Electrical Power System
(2) Location of system disconnects (PV, battery, and other energy sources)."
SUBSTANTIATION: Facilitates the rapid shut down of all power to a building in an emergency.
PANEL ACTION: Accept in Principle.
Revise the proposed text to read as follows:
"690-56 Identification of Power Sources
(A) Facilities With Stand Alone Systems. Any structure or building with a photovoltaic power system that is not connected to a utility service source and is a stand alone system, shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location acceptable to the authority having jurisdiction. The plaque or directory shall provide the location of system disconnecting means and that the structure contains a stand alone electrical power system.
(B) Facilities with Utility Services and PV Systems. Buildings or structures with both utility service and a photovoltaic system shall have a permanent plaque or directory providing the location of the service disconnecting means and the photovoltaic system disconnecting means, if not located at the same location."
PANEL STATEMENT: The submitted text was restructured to comply with the 1999 NEC Style Manual to provide titles and separate subsections where dealing with different information.
The panel had a lengthy discussion regarding the location of the required plaque.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2369)

3- 195 - (690-64(b)(5)): Reject
SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum
RECOMMENDATION: Delete this section.
SUBSTANTIATION: With utility-interactive inverters, this section is not needed. Circuit breakers, used to conduct currents from a utility-interactive inverter into a load center, may be subjected to faults on the inverter side of the breaker. While the breaker may carry normal operating current in a reverse direction, any overcurrent tripping in a fault situation is in the normal forward direction.
Other sections of the code (not this one) may require clamping backfed breakers, but this is not necessary since these breakers, if removed while being used, immediately become deenergized or dead due to the deenergizing circuits in the connected inverter.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing section does not state that a backfed breaker is necessary, it only states that the breaker must be identified for such operation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BOWER: I affirm the Panel Action with the comment that the existing code states: "Equipment such as circuit breakers, if backfed, shall be identified for such operation." The requirement for using breakers identified for backfeeding is unclear here. Does it mean simply that a standard circuit breaker be installed with a clamping device or does it mean the breaker must be listed for being backfed and come with its own clamping mechanism? The argument for deleting 690-64(b)(5) is that the use of standard circuit breakers with inverters identified for utility-interactive applications is perfectly safe. While the inverters do supply power from the load side of the breaker during normal operation, the load terminals are not energized when the breaker is removed from the panel. The listed utility-interactive inverters conform to UL1741 and do not supply power in the absence of the proper utility voltage.

(Log #CP306)

3- 195a - (690-71(b)): Accept
Note: The Technical Correlating Committee directs the Panel to correlate the action on this Proposal with the action on Proposal 3-196. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Technical Committee on National Electrical Code P03
RECOMMENDATION: Add headings to read as follows:
"(b) Dwellings.
1. Operating Voltage. Storage batteries for dwellings shall have the cells connected so as to operate at less than 50 volts.
Exception: Where live parts are not accessible during routine battery maintenance, a battery system voltage in accordance with Section 690-7 shall be permitted.
2. Guarding of Live Parts. Live parts of battery systems for dwellings shall be guarded to prevent accidental contact by persons or objects, regardless of voltage or battery type.
FPN: Batteries in solar photovoltaic systems are subject to extensive charge-discharge cycles and typically require frequent maintenance, such as checking electrolyte and cleaning connections."
SUBSTANTIATION: The panel provided headings in (1) and (2) to conform with the 1999 NEC Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BOWER: I affirm the Panel Action with the comment that the "battery system voltage" is not defined in Article 690 and would be more appropriate if just "system voltage" were used.

(Log #3799)

3- 196 - (690-71(b)(1)): Accept
SUBMITTER: Patrick B. Kiernan, Eco Electric, Inc.
RECOMMENDATION: Revise as follows:
"Storage batteries for dwellings shall have the cells connected so as to operate at less than 50 volts nominal."
SUBSTANTIATION: This clarifies the wording to distinguish between the easily confused "system voltage," "rated voltage," "operating voltage," and the nominal 12, 24, and 48 volt ratings. This change will provide for the 48 volt nominal systems that are commonly in use.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:
BOWER: I affirm the Panel Action with the comment that the Panel should have removed the term "nominal". DC devices are rate at maximum ratings. The use of the term nominal could mislead installers into thinking there is a tolerance associated with 50 volts.

(Log #2370)

3- 197 - (690-71(d) (New)): Accept in Principle

Note: The Technical Correlating Committee directs the Panel to revise the FPN to remove the statement of intent or to move the statement into the mandatory code text. This action will be considered by the Panel as a Public Comment.

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add new text to read:

"Flooded, vented, lead-acid batteries with more than 24, 2-volt cells connected in series (nominal 48 volts) shall not use or be installed in conductive cases. Conductive racks used to support the nonconductive cases are permitted where no rack material is located within six inches of the tops of the nonconductive cases.

FPN: This requirement does not apply to any type of valve regulated lead-acid battery (VRLA) or any other types of sealed batteries that may require steel cases for proper operation."

SUBSTANTIATION: Battery cases of flooded, lead-acid batteries made of steel or other conductive materials must be grounded to meet the requirements of this code.

Acid and dirt films on the tops of the cells created during the normal charging and equalizing processes form conductive leakage paths between the circuit conductors and the grounded cases. These leakage paths may lead to higher and higher fault currents that can result in fires and explosions.

Attempts to float or otherwise electrically isolate these conductive cases may result in a shock hazard between the cases and the grounded racks or conductive floor. Paint or other thin insulating films have not proven effective in isolating grounded cases.

Sandia National Laboratories has documented battery fires, explosions, and shocks to qualified service personnel over the last five years on battery systems employing metal cases.

The FPN is added for explanatory reasons. This proposal does not apply to any type of valve regulated lead-acid battery (VRLA) or any other types of sealed batteries that may require steel cases for proper operation.

PANEL ACTION: Accept in Principle.

Delete the "are permitted" in the second sentence of the proposal and replace with "shall be permitted" to read as follows:

"(d) Battery Nonconductive Cases and Conductive Racks. Flooded, vented, lead-acid batteries with more than twenty four (24), 2-volt cells connected in series (48 volts, nominal) shall not use conductive cases or shall not be installed in conductive cases. Conductive racks used to support the nonconductive cases shall be permitted where no rack material is located within 150 mm (6 in.) of the tops of the nonconductive cases.

FPN: This requirement is not intended to apply to any type of valve regulated lead-acid battery (VRLA) or any other types of sealed batteries that may require steel cases for proper operation."

PANEL STATEMENT: The text in the proposal that is underlined was changed to be consistent with the 1999 NEC Style Manual and for clarity. The changes were strictly editorial in nature.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:
BOWER: I affirm with the Panel Action with the comment that current practice does not use the 6 in. spacing and that structural plastics do exist where the spacing may not be an issue with battery manufactures.

(Log #2371)

3- 198 - (690-71(e) (New)): Accept in Principle

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add new text to read:

"Battery circuits, subject to field servicing, where there are more than 24, 2-volt cells connected in series (nominal 48 volts) shall have provisions for qualified persons to disconnect the series-connected strings into segments of 24 cells or less for service. Non-load-break bolted or plug-in disconnects are permitted."

SUBSTANTIATION: Working on high-voltage strings of batteries is inherently hazardous, even for qualified persons. Breaking the strings into not more than 24-cell segments allows the individual cells or batteries to be serviced at voltages of 48 volts (nominal) or less. While it is optional with the servicing person to break the strings, the provisions for such disconnects should be required. Some battery systems are installed with welded inter-cell connections that cannot be disconnected without cutting cables.

The hazard is significantly reduced for batteries operating below 48 volts nominal. No problems have been documented using metal cased batteries at 48 volts nominal in forklift truck applications.

Some high-voltage sealed (VRLA) battery systems are sealed in a container at the factory and are not serviced in the field. They would not be subject to this requirement.

PANEL ACTION: Accept in Principle.

Delete the "are permitted" in the second sentence of the proposal and replace with "shall be permitted" to read as follows:

"(e) Disconnection of Series Battery Circuits. Battery circuits, subject to field servicing, where ~~there are~~ more than twenty four (24), 2-volt cells connected in series (48 volts, nominal), shall have provisions to disconnect the series-connected strings into segments of 24 cells or less for maintenance by qualified persons. Non-load-break bolted or plug-in disconnects shall be permitted."

PANEL STATEMENT: The text in the proposal that is underlined was changed to be consistent with the 1999 NEC Style Manual and for clarity. The changes were strictly editorial in nature.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2372)

3- 199 - (690-71(f) (New)): Accept in Principle

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add new text to read:

"Battery installations where there are more than 24, 2-volt cells connected in series (nominal 48 volts) shall have a switched disconnect, accessible only to qualified persons, that ungrounds the battery electrical system for maintenance. This switch shall not unground the remainder of the PV electrical system. The use of a non-load break rated switch shall be permitted."

SUBSTANTIATION: Battery systems, due to the presence of conductive acid films on batteries, are inherently hazardous to service. By allowing the qualified maintenance person to unground the battery, the hazards may be somewhat reduced even when protective clothing, proper tools, and correct procedures are used. Since it is generally acknowledged that a floated, high-voltage battery is safer for servicing, the requirement is mandatory.

The hazard is significantly reduced for batteries operating below 48 volts nominal and is not required for these lower-voltage systems.

PANEL ACTION: Accept in Principle.

Revise the proposed text as follows:

"(f) Battery Maintenence Disconnecting Means. Battery installations, where there are more than twenty four (24), 2-volt cells connected in series (48 volts, nominal), shall have a disconnecting means, accessible only to qualified persons, that disconnects the grounds in the battery electrical system for maintenance. This disconnecting means shall not disconnect the ground for the remainder of the photovoltaic electrical system. A non-load-break rated switch shall be permitted to be used as the disconnecting means."

PANEL STATEMENT: The text in the proposal that is underlined was changed to be consistent with the 1999 NEC Style Manual and for clarity. The changes were strictly editorial in nature. The "switched disconnect" was changed to "disconnecting means" to cover various means of disconnecting the battery for maintenance.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2373)

3- 200 - (690-71(g) (New)): Accept in Principle

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add new text to read:

"On photovoltaic systems where the battery system consists of more than 24, 2-volt cells connected in series (nominal 48 volts), the battery system shall be permitted to operate with ungrounded conductors provided that conditions (1) through (4) are met:

(1) The photovoltaic array source and output circuits shall be solidly grounded.

(2) The dc and ac load circuits shall be solidly grounded.

(3) All main ungrounded battery input/output circuit conductors shall be provided with switched disconnects and overcurrent protection.

(4) A ground-fault detector and indicator shall be installed to monitor for ground faults in the battery bank."

SUBSTANTIATION: This proposal permits high-voltage (above 48-volts nominal) battery systems to be operated in an ungrounded state if the listed conditions are met. Certain types of power processing equipment (inverters) can be designed for this type of operation. This proposal may be most likely applied on higher voltage (above 200 volts) systems. This ungrounded operation may increase long term reliability and fire safety in the system.

PANEL ACTION: Accept in Principle.

Revise the proposed text to read as follows:

"(g) Battery Systems of More Than 48 Volts. On photovoltaic systems where the battery system consists of more than twenty four (24), 2-volt cells connected in series (more than 48 volts, nominal), the battery system shall be permitted to operate with ungrounded conductors, provided the conditions in (1) through (4) are met:

(1) The photovoltaic array source and output circuits shall comply with 690-41."

Remainder of proposed text unchanged.

PANEL STATEMENT: The text in the proposal that is underlined was changed to be consistent with the 1999 NEC Style Manual and for clarity. The changes were strictly editorial in nature.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:

KREINER: Correction to Panel Action: Provide underlines for the following in accordance with the Panel Statement:

(g) Battery Systems of More than 48 Volts. On photovoltaic systems where the battery system consists of more than twenty four (24), 2-volt cells connected in series (more than 48 volts, nominal), the battery system shall be permitted to operate with ungrounded conductors, provided the conditions in (1) through (4) are met:

Remainder of text unchanged.

(Log #2374)

3- 201 - (690-72(a) (New)): Accept in Principle

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add new text to read:

"A photovoltaic power system employing a diversion charge controller as the sole means of regulating the charging of a battery shall be equipped with a second, independent means to prevent overcharging of the battery."

SUBSTANTIATION: Diversion controllers are connected between the battery and a diversion load. This external circuit will have overcurrent protection. If the controller fails, if the diversion load is sized improperly, or if the overcurrent device opens during a fault or is manually operated, the battery charging process is no longer regulated. In systems using the inverter to divert excess battery current into the utility, grid, the inverter may fail or the utility grid may go down.

An independent or backup charge regulating system is needed to improve the safety on those systems having diversion controllers. See related new proposal 690-72(b).

PANEL ACTION: Accept in Principle.

Revise the existing Code text to read as follows:

"690-72. Charge Control.

(A) General. Equipment shall be provided to control the charging process of the battery. Charge control shall not be required where the design of the photovoltaic source circuit is matched to the voltage rating and charge current requirements of the interconnected battery cells, and the maximum charging current multiplied by 1 hour is less than 3 percent of the rated battery capacity expressed in ampere-hours or as recommended by the battery manufacturer.

All adjusting means for control of the charging process shall be accessible only to qualified persons.

FPN: Certain battery types such as valve-regulated lead acid or nickel cadmium can experience thermal failure when overcharged."

Revise the proposed text to read as follows:

"(B) Diversion Charge Controller.

(1) A photovoltaic power system employing a diversion charge controller as the sole means of regulating the charging of a battery shall be equipped with a second independent means to prevent overcharging of the battery."

PANEL STATEMENT: The text in the proposal that is underlined was changed to be consistent with the 1999 NEC Style Manual and for clarity. The changes were strictly editorial in nature.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

COMMENT ON AFFIRMATIVE:

BOWER: I affirm the Panel Action with the comment that the terms "lead acid" and "nickel cadmium" should be hyphenated.

(Log #2375)

3- 202 - (690-72(b) (New)): Accept in Principle

SUBMITTER: John C. Wiles, Jr., Southwest Tech. Development Inst./Rep. Photovoltaic Power Industry Forum

RECOMMENDATION: Add new text to read:

"Circuits containing a direct-current diversion charge controller and a direct-current diversion load shall comply with (1) and (2).

(1) The current rating of the diversion load shall be rated at least 150 percent of the current of the diversion charge controller.

(2) The conductor ampacity and the rating of the overcurrent device for this circuit shall be at least 150 percent of the maximum current of the diversion charge controller.

FPN: This requirement does not apply to ac or dc circuits using inverters that control the battery charging process by feeding power into the utility lines. Such circuits are used in several modes and must be sized and protected in a normal manner as required elsewhere in Article 690."

SUBSTANTIATION: If the diversion load is undersized or if the overcurrent device in the circuit of a diversion charge controller opens from overloads due to excess diversion currents, the charge control process is lost and the battery may be over charged creating a safety hazard. Requiring the 150 percent rating on the diversion load, the overcurrent device, and the cable ampacity is consistent with other systems that could create hazardous conditions when overload protection is included. See Section 240-3(a). The 150 percent rating provides the necessary short-circuit protection. The FPN is added for explanatory reasons. This requirement does not apply to ac or dc circuits using inverters that control the battery charging process by feeding power into the utility lines. Such circuits are used in several modes and must be sized and protected in a normal manner as required elsewhere in Article 690.

PANEL ACTION: Accept in Principle.

Add as a new (2) under the (b)(1) as revised in Proposal 2-201 and revise the proposed text in this proposal to read as follows:

"(2) Circuits containing a dc diversion charge controller and a dc diversion load shall comply with (a) and (b).

(a) The current rating of the diversion load shall be rated at least 150 percent of the current rating of the diversion charge controller.

(b) The conductor ampacity and the rating of the overcurrent device for this circuit shall be at least 150 percent of the maximum current rating of the diversion charge controller.

(3) ~~FPN~~The requirements in (2) shall not apply to ac or dc circuits using inverters to control the battery charging process by feeding power into the utility ~~lines~~ system. These circuits, used in several modes, shall be sized and protected ~~in a normal manner~~ as required ~~elsewhere~~ in ~~Article~~ 690-8."

PANEL STATEMENT: The text in the proposal that is underlined was changed to be consistent with the 1999 NEC Style Manual and for clarity. The changes were strictly editorial in nature. The proposed

FPN contained mandatory text that is not allowed by Section 3.1.3 of the 1999 NEC Style Manual and was made into a separate subsection.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1108)

3- 203 - (690-74): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 2/0" to "2/0 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2785)

3- 204 - (690 Part I): Reject
SUBMITTER: Ivan DeWitt, Holland, MI
RECOMMENDATION: Change Part "I" to Part "J".
(no other change in heading)
SUBSTANTIATION: The leters I and O have been omitted as identification of headings in the format of other articles of the NEC to eliminate any possible confusion with the numbers one and zero. Article 690 Part I is not consistent with this format and the style manual of the NEC. References: Articles 250, 410, 424, 430 and 620 (1999 Edition).
PANEL ACTION: Reject.
PANEL STATEMENT: Article parts will be identified by roman numeral numbers per 2.1.4 of the 1999 NEC Style Manual.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #2192)

3- 205 - (690-85): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
For the purposes of Part I of this article, the voltages used to determine cable and equipment ratings is ~~shall be defined~~ as follows:~~.~~
Battery Circuits. In battery circuits, the voltage is ~~shall be~~ the highest voltage experienced under charging conditions.
Photovoltaic Circuits. In dc photovoltaic source circuits and photovoltaic output circuits, the voltage is ~~shall be~~ the maximum system voltage.
SUBSTANTIATION: This is a definition not a rule. It should be stated in a declarative sentence and should not use mandatory rule language, such as "shall be". Definitions shall not contain requirements. See the NEC Style Manual 2.2.2 and 3.1.
(I have submitted four other proposals on this same concept.)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12
COMMENT ON AFFIRMATIVE:
BOWER: I affirm the Panel Action with the comment that the word "photovoltaic" should be added to the last sentence so that it reads:
"...the voltage is the maximum photovoltaic system voltage."

(Log #3293)

3- 206 - (691 (New)): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee. The Technical Correlating Committee directs that the second sentence of the proposed Scope be deleted and considered for inclusion in a definition.
The Technical Correlating Committee directs that a new title "Fuel Cell Systems" be used and the Article be renumbered as Article 692.
The Technical Correlating Committee further directs the panel to remove the term "nationally recognized testing laboratory" from 691-6 since this term is specific to OSHA approval and the definition of listing in Article 100 is sufficient to describe the requirements for a laboratory. The Technical Correlating Committee directs that the Panel review the proposed text to eliminate the references to complete Articles in 691-3, 691-10(b), 691-14, and 691-80, in accordance with the NEC Style Manual. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Kenneth Krastins, Plug Power, Inc.
RECOMMENDATION: Add a new Article 691 to read as follows:
A. General.
691-1. Scope. The provisions of this article apply to fuel cell electrical energy systems installed as the primary electrical power source for a building or residential dwelling. This article identifies the requirements for the installation of a building/residential fuel cell system, which may be stand alone or interactive with other electrical power production sources, with or without electrical energy storage such as batteries. Fuel cell systems are typically packaged in enclosures that contain all of the components needed for operation requiring only the connection of the electrical wiring to the distribution panel, a fuel gas source, and, in the case of indoor units, an appropriate ventilation system. The sections contained herein provide the requirements for wiring the fuel cell system to the distribution panel. The fuel cell system itself shall be evaluated and listed for application as a building/residential power source by a nationally recognized test laboratory prior to installation.
FPN: NFPA 853 categorizes fuel cells of 50 kVA or smaller differently than fuel cells sized larger than 50 kVA. Fuel cells with ratings greater than 50 kVA are generally used in structures larger than single-family dwellings. However, single fuel cell systems are capable of being paralleled with other fuel cell systems in order to increase the overall output rating at a site.
691-2. Definitions.
Backfeed. To energize a section of a power network that is supplied from a source other than its normal source.
Charge Controller. Equipment that controls dc voltage or dc current, or both, used to charge a battery.
Fuel Cell. An electrochemical system that continuously consumes a fuel to produce an electrical current. The main chemical reaction used in a fuel cell for producing electrical power is not combustion as defined by other codes. There may, however, be sources of combustion used within the overall fuel cell system such as reformers/fuel processors.
Fuel Cell System. The complete aggregate of equipment used to convert chemical fuel into usable electricity. A fuel cell system typically consists of a reformer, stack, power conditioner, and auxiliary equipment.
Interactive System. A fuel cell system that operates in parallel with and may deliver power to an electrical production and distribution network. For the purpose of this definition, an energy storage subsystem of a fuel cell system, such as a battery, is not another electrical production source.
Maximum System Voltage. The highest nominal fuel cell power conditioner output voltage between any ungrounded conductors present at accessible output terminals.
Output Circuit. The equipment conductors used to connect the fuel cell system to its electrical point of delivery. In the case of sites that have paralleled, multiple units connected together, the term *output circuit*refers also to the equipment used to electrically interconnect the fuel cell systems.
Point Of Common Coupling. The point at which the power network and the customer interface occurs. Typically, this is the dwelling or customer side of the power network meter.
Power Conditioner. The subsystem that converts the direct current from the fuel cell stack subsystem into alternating current of the proper voltage, frequency and phase angle compatible with the connecting electric power system or the power demand of a dedicated

electrical load. It may also incorporate other power conversion functions including charging and discharging of batteries and supply of power to auxiliary systems within the fuel cell system.

Reformer. The subsystem that converts the gas supplied to the fuel cell into a hydrogen-rich mixture to be used by the fuel cell stack for producing electrical power.

Stack. The subsystem consisting of a series of plates placed side by side that electrochemically converts hydrogen to electricity. The individual voltages across the plates add to form the overall voltage across the fuel cell stack.

691-3. Other Articles. Wherever the requirements of other articles of this *Code* and Article 691 differ, the requirements of Article 691 shall apply.

691-4. Installation.

(a) Fuel Cell System. A fuel cell system shall be permitted to supply a building or other structure in addition to any service(s) of another electricity supply system(s).

(b) Grounded Conductor. Bonding shall be in accordance with Article 250-142.

(c) Equipment. The fuel cell system shall be identified and listed as a residential/building source for generating on site power.

(d) Directory. A permanent plaque or directory, denoting all electrical power sources on or in the premises, shall be installed at each service equipment location.

B. Circuit Requirements

691-7. Maximum Voltage.

(a) Circuits Over 150 Volts To Ground. In one and two family dwellings, live parts in fuel cell systems and circuits over 150 volts to ground shall be contained within the fuel cell enclosure and shall not be accessible to other than qualified persons while energized.

FPN: See Section 110-27 for guarding of live parts and Section 210-6 for voltage to ground and between conductors.

(b) Circuits of 120 Volts Nominal To Ground. In one and two-family dwellings, fuel cell output circuits 120 volts nominal to ground shall be permitted to supply branch circuits that supply lampholders, fixtures or receptacles.

691-8. Circuit Sizing and Current.

(a) Maximum Circuit Current. The maximum circuit current shall be the rated short circuit current indicated on the fuel cell nameplate.

(b) Ampacity And Overcurrent Device Ratings. Fuel cell system currents shall be considered continuous. The circuit conductors and overcurrent devices shall be sized to carry not less than 125 percent of the maximum circuit current specified in (a). The rating or setting of overcurrent devices shall be permitted in accordance with Section 240-3 (b) and (c). Additional circuit overcurrent devices shall not be required if the fuel cell power conditioner is provided with overcurrent protection that is sufficient to protect the circuit conductors that supply the load. Equipment and conductors connected to more than one electrical source shall have sufficient protection from all sources.

Exception: Service conductors covered by Section 230-31 and equipment covered by Article 230-42.

691-9. Overcurrent Protection.

(a) Circuits and Equipment. The fuel cell power conditioner output, or output of the fuel cell stack where a power conditioner is not used, shall be protected in accordance with the requirements of Article 240.

(b) Fuel Cell Output Circuits. Branch-circuit or supplementary-type overcurrent devices shall be permitted to provide overcurrent protection in output circuits. The overcurrent devices shall be accessible, but shall not be required to be readily accessible.

691-10. Stand-Alone Systems. The premises wiring system shall meet the requirements of this *Code* except as modified by (a), (b), and (c).

(a) Power Conditioner Output. The ac inverter output from a stand-alone system shall be permitted to supply ac power to the building or structure disconnecting means at current levels below the rating of that disconnecting means.

(b) Sizing and Protection. The circuit conductors between the inverter output and the building or structure disconnecting means shall be sized based on the output rating of the inverter. These conductors shall be protected from overcurrents in accordance with Article 240. The overcurrent protection shall be located at the output of the inverter.

(c) Single 120-Volt Supply. The inverter output of a stand alone fuel cell system shall be permitted to supply 120 volts to single-phase, 3-wire 120/240-volt service equipment or distribution panels where there are no 240-volt outlets and where there are no multiwire branch circuits. In all installations, the rating of the overcurrent device connected to the output of the inverter shall be less that the rating of the neutral bus in the service equipment. This equipment shall be marked

WARNING – SINGLE 120-VOLT SUPPLY –
DO NOT CONNECT MULTIWIRE BRANCH
CIRCUITS!

C. Disconnecting Means

691-13. All Conductors. Means shall be provided to disconnect all current-carrying conductors of a fuel cell system power source from all other conductors in a building or other structure. Where a circuit grounding connection is not designed to be automatically interrupted as part of the ground-fault protection system required by Section 691-5, a switch or circuit breaker used as a disconnecting means shall not have a pole in the grounded conductor. The grounded conductor may have a bolted or terminal disconnecting means to allow maintenance or troubleshooting by qualified personnel.

691-14. Additional Provisions. The provisions of Article 230, Part F shall apply to the fuel cell system power source disconnecting means. The disconnecting means shall not be required to be suitable as service equipment and shall be rated in accordance with Section 691-17.

691-17. Switch or Circuit Breaker. The disconnecting means for ungrounded conductors shall consist of a manually operable switch(es) or circuit breaker(s)

(1) Located where readily accessible,
(2) Externally operable without exposing the operator to contact with live parts,
(3) Plainly indicating whether in the open or closed position, and
(4) Shall have an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment.

Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and shall read substantially:

WARNING – ELECTRIC SHOCK HAZARD –
DO NOT TOUCH TERMINALS –
TERMINALS ON BOTH THE LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION.

Exception No. 1: A connector shall be permitted to be used as an ac disconnecting means provided that it complies with the requirements of Section 691-33 and is listed and identified for the use.

D. Wiring Methods

691-31. Methods Permitted.

(a) Wiring Systems. All raceway and cable wiring methods included in Chapter 3 of this *Code* and other wiring systems and fittings specifically intended and identified for use on fuel cell systems shall be permitted. Where wiring devices with integral enclosures are used, sufficient length of cable shall be provided to facilitate replacement.

(b) Single Conductor Cable. ***Types SE, UF, and USE single-conductor cable shall be permitted in fuel cell power systems where installed in the same manner as Type UF multiconductor cable in accordance with Article 339.***

691-33. Connectors. The connectors permitted by Article 691 shall comply with (a) through (e).

(a) Configuration. The connectors shall be polarized and shall have a configuration that is noninterchangeable with receptacles in other electrical systems on the premises.

(b) Guarding. The connectors shall be constructed and installed so as to guard against inadvertent contact with live parts by persons.

(c) Type. The connectors shall be of the latching or locking type.

(d) Grounding Member. The grounding member shall be the first to make and the last to break contact with the mating connector.

(e) Interruption of Circuit. The connectors shall be capable of interrupting the circuit current without hazard to the operator.

E. Grounding

691-41. System Grounding. For a fuel cell system, one conductor of a 2-wire system rated over 50 volts and a neutral conductor of a 3-wire system shall be solidly grounded.

Exception: Other methods that accomplish equivalent system protection and that use equipment listed and identified for the use shall be permitted.

FPN: See Section 250-2 (a)

691-45. Size of Equipment Grounding Conductor. The equipment grounding conductor shall not be smaller than the required size of the circuit conductors in systems where the available fuel cell system power source short-circuit current is less than twice the current rating of the overcurrent device. In other systems, the equipment grounding conductor shall be sized in accordance with Section 250-122.

691-47. Grounding Electrode System. A grounding electrode system shall be provided in accordance with Sections 250-50 through 250-60.

F. Marking

691-53. Fuel Cell Power Sources. A marking, specifying the fuel cell power source rating as follows shall be provided by the installer at the site at an accessible location at the disconnecting means for the fuel cell power source.

(1) Operating Voltage
(2) Output Power Rating
(3) Short Circuit Current

691-54. Fuel Shut-Off. At the location of the primary disconnecting means of the building or circuits supplied, the location of the manual fuel shut-off valve shall be marked.

691-56. Stored Energy. At the location of the primary disconnecting means of the building or circuits supplied, it shall be marked that the fuel cell unit stores electrical energy, if batteries or other energy storage devices are used in the power conditioner section of the fuel cell.

G. Connection to Other Circuits

691-59 Hybrid Systems Equipment. For power network interactive fuel cell systems installed in non-interactive systems, it shall be permitted to maintain isolation between the electrical production and distribution network and the fuel cell system by means of an automatic bus transfer switch. This switch may be located externally from or internal to the fuel cell system enclosure. When the utility service conductors of the dwelling are connected to the transfer switch, the switch shall comply with Article 230, Part E.

691-60 Identified Interactive Equipment. Only fuel cell systems listed and identified as interactive shall be permitted in interactive systems. When connected in an interactive system, the fuel cell system shall be operated in accordance with Article 705.

691-61 Output Characteristics. The output of a fuel cell system operating in parallel with an electric supply system shall be compatible with the voltage, wave shape, and frequency of the system to which it is connected.

FPN: The term compatible does not necessarily mean matching the primary source wave shape.

691-62. Loss of Interactive System Power. The fuel cell system shall be provided with a means of detecting when the electrical production and distribution network has become de-energized and shall not backfeed the electrical production and distribution network side of the point of common coupling under this condition. The fuel cell system shall remain in that state until the electrical production and distribution network voltage has been restored.

A normally interactive fuel cell system shall be permitted to operate as a stand-alone system to supply loads that have been disconnected from electrical production and distribution network sources.

691-63. Ampacity of Neutral Conductor. If a single-phase, 2-wire fuel cell output is connected to the neutral and one ungrounded conductor (only) of a 3-wire system or of a 3-phase, 4-wire, wye-connected system, the maximum load connected between the neutral and any one ungrounded conductor plus the fuel cell system output rating shall not exceed the ampacity of the neutral conductor.

691-64. Unbalanced Interconnections.

(a) Single Phase. Single-phase inverters in interactive fuel cell systems shall not be connected to 3-phase power system unless the interconnected system is designed so that significant unbalanced voltages cannot result.

(b) Three Phase. Three-phase inverters in interactive fuel cell systems shall have all phases automatically de-energized upon loss of, or unbalanced, voltage in one or more phases unless the interconnected system is designed so that significant unbalanced voltages will not result.

691-65. Point Of Connection. The output of a fuel cell system power source shall be connected as specified in (a) or (b).

(a) Supply Side. A fuel cell system power source shall be permitted to be connected to the supply side of the service disconnecting means as permitted in Section 230-82(5).

(b) Load Side. A fuel cell system power source shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises provided that all of the following conditions are met.

(1) Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.

(2) The sum of the ampere ratings of overcurrent devices in circuits supplying power to a busbar or conductor not exceed the rating of the busbar or conductor.

Exception: For a dwelling unit, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.

(3) The interconnection point shall be on the line side of all ground-fault protection equipment.

Exception: Equipment with power supplied from a single point of connection.

(4) Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.

Exception: Equipment with power supplied from a single point of connection.

(5) Equipment such as circuit breakers, if backfed, shall be identified for such operation.

FPN: Backfeeding certain devices such as ground fault circuit interrupter breakers or outlets has the potential to damage them.

I. Systems Over 600 Volts

691-80. General. Fuel cell systems with a maximum system voltage over 600 volts dc shall comply with Articles 490, 685, 705, and other requirements applicable to installations rated over 600 volts.

691-81. Interactive Systems. For single and multiple systems, the fuel cell(s) shall not backfeed power to the electric production and distribution network side of the point of common coupling upon a loss of electric production and distribution network power.

691-85. Definitions. For the purposes of Part I of the article, the voltages used to determine cable and equipment ratings shall be defined as follows.

Battery Circuits. **In battery circuits, the voltage shall be the highest voltage experienced under charging conditions.**

Fuel Cell Circuits. In dc fuel cell outputs and fuel cell system output circuits, the voltage shall be the maximum system voltage.

SUBSTANTIATION: An important goal of building codes is to permit to the fullest extent possible, the use of modern methods, devices and technological improvements while protecting the health, safety, and welfare of the end user and general public. While new technology may offer many worthwhile benefits, appropriate regulations are needed to allow safe adoption of the technology and prevent misapplication. The fuel cell represents just such an emerging technology. Fuel cells provide a means, via an electrochemical process, of converting a fuel gas (such as natural gas, propane, etc.) into electrical energy that may then be used to power a building or residential dwelling. Fuel cells are virtually pollution free, very quiet when compared to other means of electric power generation, and can operate at high efficiency levels using very abundant and cheap fuels such as natural gas and LP gas.

There is growing interest in small, clean and quiet independent power generating units. The installation of fuel cell electrical generating systems used at residential and light commercial establishments is imminent. Recent advances in fuel cell technologies and more economical means of production will foster widespread acceptance of small distributed electrical generating units (under 50 kW) for single family home use and medium size units (51 kW to 250 kW) for multifamily units and small commercial buildings.

The interest in other clean forms of distributed generation is demonstrated by the adoption of the NEC Article 690, Solar Photovoltaic Systems. The direct interpretation of this article and its application deals specifically with solar photovoltaic electrical generating systems. It has been suggested that this article can also adequately cover other forms of distributed generation including fuel cell systems. However, since much of the language in Article 690 is specific to photovoltaic systems and rather complex to accommodate the interconnection requirements of the many sub-systems in photovoltaic systems, application of this article to fuel cells will be cumbersome.

Much of the information in Article 690 could apply to small and medium size electrical generating systems in general. Likewise, Article 705, Interconnected Electrical Power Production Sources, and Article 490, Equipment Over 600 Volts, Nominal, apply mainly to the large utility grid parallel independent electrical generating units. For example, Article 705-12, (b), (1) stipulates, "The aggregate of non-

utility sources of electricity has a capacity in excess of 100k W, or the service is above 1000 volts." Leaving the interpretation of Article 690 and other articles up to the local inspector to determine the requirements for fuel cell systems will be problematic and could hinder the use of this beneficial technology. While the combination of these existing articles and others may adequately address fuel cells, it is clearly advantageous to users of the National Electrical Code, to have an article which specifically articulates the electrical installation requirements of fuel cell systems.

This being stated, Article 690, Solar Photovoltaic Systems, does offer a good basis for the creation of a Fuel Cell Systems article. A description of and substantiation for the individual topics to be covered in the proposed article follows. Where appropriate, comparisons are made within the following detailed substantiation between this proposed fuel cell article and the extant Photovoltaic Article 690. Sections of the Photovoltaic article that do not appear at all in the proposed article are also discussed and distinguished in bold, italicized text.

691-1 Scope - This section provides the scope of the document. It identifies that the article pertains to fuel cell systems for residential and building applications. It identifies the fuel cell as a source of on-site, electrical power generation distinguishing it from fuel cell systems used in non-stationary or other applications. It also indicates that the proposed NEC article covers only the electrical installation but none of the gas or venting interfaces. It also indicates that the fuel cell system is a "black box" that needs to be evaluated by an independent, nationally recognized test laboratory for use in a building or residential dwelling prior to installation.

691-2 Definitions – Those words for which definitions already exist in the Photovoltaic Article 690; the definitions were taken from there. The source of the definition of "backfeed" comes from both The IEEE Standard Dictionary of Electrical and Electronics Terms (IEEE Std. 100-1996) and the IEEE Standard Definitions for Power Switchgear (IEEE Std. C37-100-1992). The definition of the "point of common coupling" finds its roots in both the proposed draft to the IEEE SCC 21 national interconnection standard and the proposed New York State Standard Interconnection Requirements (SIR). The remainder of the definitions come from our own experience as fuel cell manufacturers as modified by the suggestions of others who reviewed the article.

691-3 Other Articles – This statement is made, similar to the one in Article 690, to identify that the idiosyncrasies of fuel cell installations may result in inconsistencies between this article and the remainder of the Code. The statement provides a clear statement to inspectors of fuel cell installations that the proposed Article 691 is appropriate for evaluating a fuel cell installation and that it takes precedence over the remainder of the Code for a fuel cell evaluation.

691-4 Installation – Since the fuel cells systems covered by this article are intended to provide a primary source of on-site electrical power generation, the statement is made permitting them to do so and requiring that fuel cells be listed for such applications. The installation section does not include requirements for ground-fault protection as are included in the Photovoltaic article 690 due to the integrated, packaged configuration of the fuel cell system. The fuel cell system ground fault detection and protection requirements will be covered by the product evaluation of the fuel cell.

(691-5) *Ground-Fault Protection - There is no corresponding section needed on ground fault protection as there is in section 690-5 of the Photovoltaic article. The configuration of the fuel cell is a single, integrated enclosure that has already been evaluated and listed by an NRTL as a power source for a building or dwelling application. This obviates the need for an inspector working to the NEC to have to evaluate the product itself for ground-fault protection.*

(691-6) *Alternating-Current Modules - There is no corresponding section needed on AC modules as there is in section 690-6. The fuel cell system is contained within an enclosure that has already been evaluated by a third-party listing agency precluding the need for an inspector evaluating the installation to have to go into the fuel cell enclosure. It is not of modular construction as is a photovoltaic system.*

691-7 Maximum Voltage - A fuel cell system is a constant voltage, load following source of on-site power production. As such, the requirements for voltage correction factors for crystalline and multi-crystalline silicon modules contained in the fuel cell photovoltaic article are eliminated and not included in the proposed fuel cell article.

691-8 Circuit Sizing and Current – Due to the non-modular nature of fuel cell systems, the calculation of maximum current is unnecessary and can simply be read off of the fuel cell manufacturer's nameplate. Conductors and overcurrent devices are sized to carry 125 percent of the fuel cell system output rating to ensure that they are sufficiently large enough to carry the current output of the fuel cell system demanded by the load and to avoid unnecessary nuisance tripping.

691-9 Overcurrent Protection – The proposed fuel cell article points to the standard article for overcurrent protection (Article 240) for cell systems that are either not integrated in a single, already listed, enclosure, or for systems that are paralleled with other fuel cell systems to achieve an increased output level. Overcurrent protection for fuel cells systems integrated into a single enclosure will already be evaluated to product standards by an NRTL. Normally it is undesirable for one article of the NEC to reference an entire other article of the NEC rather than identifying specific sections of the referenced article. However, given the statement made in 691-3, it makes sense to identify similarities to the other sections of the codes along with the differences.

691-10 Stand-Alone Systems – Similar to the photovoltaic article, the proposed article indicates that fuel cell systems are not required to provide the full service-entrance rating of 100 or 200 amperes. The bulk of this sections follows along the lines of the corresponding section of the Photovoltaic Article 690.

691-13 All Conductors – This section provides a requirement for the capability to isolate the fuel cell system from the rest of the building/dwelling wiring for servicing and other purposes.

691-14 Additional Provisions – This wording is similar to the existing text of section 690-14 of the Code, modified for a fuel cell system.

(691-15) *Disconnection of Photovoltaic Equipment - There is no section on the disconnection of fuel cell equipment as there is for the photovoltaic equipment in section 690-15. Since the fuel cell system is a fully integrated system such wording is unnecessary.*

(691-16) *Fuses - There is no section on fuses within a fuel cell system as there is in section 690-16 of the photovoltaic article. Appropriate/sufficient fusing would be addressed by the NRTL evaluating the complete fuel cell system to the appropriate product standards.*

691-17 Switch or Circuit Breaker – This section is essentially lifted from section 690-17 of the existing Code and modified only to delete the provisions for dc circuitry. While a fuel cell stack generates dc power, that power is contained within the fuel cell enclosure, inaccessible to the user, and is inverted by the power conditioning prior to reaching the output terminals of the fuel cell system.

(691-18) *Installation and Service of an Array - There is no section on the installation of a service array as there is in section 690-18 of the Photovoltaic article as this does not apply to a fuel cell system.*

691-31 Methods Permitted – The permissible wiring follows along the lines of section 690-31 of the existing Code modified for use with a fuel cell system.

(691-32) *Component Interconnections - There is no section included on component interconnections corresponding to section 690-32, as this does not pertain to fuel cell systems.*

691-33 Connectors - This section is taken directly from the existing section 690-33 of the Code.

(691-33) *Access to Boxes - There is no section included on access to boxes corresponding to section 690-34, as this does not pertain to fuel cell systems.*

691-41 System Grounding – This section is taken directly from the existing section 690-41 of the Code.

(691-42) *Point of System Grounding Connection - There is no section needed on the point of system grounding connection corresponding to section 690-42 as this would already be verified during the listing to a product standard of an integrated, enclosed fuel cell system.*

(691-43) *Equipment Grounding – There is no section needed on the equipment grounding corresponding to section 690-43 as this would already be verified during the listing to a product standard of an integrated, enclosed fuel cell system.*

691-45 Size of Equipment Grounding Conductor – This section is taken directly from the existing section 690-45 of the Code.

691-47 Grounding Electrode System – This section is taken directly from the existing section 690-47 of the Code.

691-53 Fuel Cell Power Sources – The nature of fuel cell systems and the fact that they are provided in single, listed enclosures eliminates the need to identify and label all of the parameters identified in section 690-51, 690-52, and 690-53.

691-54 Fuel Shut-Off - The fuel cell system uses fuel gas as a source of energy. The location of the fuel shut-off valve identifies a means for shutting down the fuel cell gas supply, which will cause the fuel cell system to cease generating electrical energy. Residual energy, capable of being delivered externally, may still reside within the batteries of the fuel cell even after shutting down the fuel cell gas supply. This is addressed in the following proposed section 691-56.

691-56 Stored Energy – Section 691-54 identifies the location of the fuel gas supply shut-off valve. However, shutting down the fuel gas supply will not necessarily prevent a fuel cell system from continuing to deliver power using the energy stored within its batteries. Section 691-56 is included to ensure that this is recognized by anyone attempting to shutdown the fuel cell system.

691-59 Hybrid Systems Equipment – This section identifies an automatic bus transfer switch as a permissible means for maintaining isolation between the fuel cell system and the utility grid. A concern amongst the utilities with respect to distributed generation has to do with questions regarding the effectiveness of non-islanding inverters in grid-parallel systems. Non-islanding inverters prevent the energization of the utility power system by the fuel cell system upon a loss of utility grid power. By employing an automatic bus transfer switch, the fuel cell system can be installed in a non-paralleled, grid backup configuration precluding any issues concerning non-islanding inverters. Section 691-59 permits this configuration.

691-60 Identified Interactive Equipment – This section identifies that only fuel cell systems listed for parallel operation with utility grids are permitted to be connected in such a configuration.

691-61 Output Characteristics – This section is taken directly from the existing section 705-14 of the Code.

691-62 Loss of Interactive System Power – This section specifically spells out the non-islanding requirement for fuel cell systems intended to be operated in a grid-parallel configuration. It also states that fuel cell systems capable of grid-parallel operation need not necessarily be installed in a grid-parallel configuration and may instead be installed in a grid-independent configuration.

691-63 Ampacity of Neutral Conductor - This section is taken directly from the existing section 690-62 of the Code.

691-64 Unbalanced Interconnections – This section is taken directly from the existing section 690-63 of the Code.

691-65 Point Of Connection – This is essentially taken from the existing section 690-64 of the Code but modified for the configuration of a single, enclosed fuel cell system.

691-71 Installation – Fuel cell sections corresponding to sections 690-71, 690-72, and 690-74 of the photovoltaic have been omitted as the battery and battery charger will be contained within the fuel cell enclosure and be therefore covered by the product evaluation.

(691-72) *Installation & Charge Control of Batteries – Batteries will be contained within the fuel cell enclosure and will have already been evaluated along with the listed fuel cell system. They are therefore not included in the proposed fuel cell article.*

691-80 General – Sections 691-80, 691-81, and 691-85 are drawn from existing sections 690-80 and 690-85 of the Code.

Additional Changes – Revised wording is recommended for section 230-82 (5), the exception to section 705-3, and section 705-30 to include language to cover fuel cell systems, similar to what is currently included for solar photovoltaic systems.

Members of Plug Power, Inc. and DTE Energy Technologies drafted the original version of the proposed fuel cell article. The proposed article began to be referred to as 691 because of its similarity and relationship to Article 690. It is recognized that the number ultimately assigned to the article may be different from 691.

The article was then circulated, reviewed, and revised internally at Plug Power. Subsequently, an e-mail notification was forwarded on September 13, 1999 to the members of three different groups advising them of the existence of the proposed article and inviting them to request a copy for review and comment. The three different groups notified were

- The members of the IEEE Standards Coordinating Committee (SCC) 21 currently involved in the development of a national standard (P1547) to cover interconnection of distributed resources with electrical power systems
- The members of the technical working group involved in the development of Standard Interconnection Requirements (SIR) for New York State which have since been submitted to the NYS Public Service Commission
- The Codes & Standards Working Group of the US Fuel Cell Council

All totaled, these groups include over 200 individuals. Presentations concerning the proposed article were given by Plug Power at both the September 27, 1999 meeting of the IEEE-SCC21 committee in Arlington, Virginia and the October 8, 1999 Power Quality Workshop (Interconnect-3) sponsored by the US Fuel Cell Council in Phoenix, Arizona. Those individuals who requested a copy of the draft article as a result of the e-mail notification or the presentations were sent one for review. After comments were received, they were negotiated and incorporated in the proposed article currently being submitted. Substantial changes have been made to the proposed article since its original inception, but the input generously provided by the individuals of the groups listed above has served to help develop a much better article as a result.

PANEL ACTION: Accept in Principle.

A. General

691-3. Scope. This article identifies the requirements for the installation of fuel cell power systems, which may be stand alone or interactive with other electrical power production sources, and may be with or without electrical energy storage such as batteries. Fuel cell systems are ~~typically~~ packaged in enclosures that contain all of the components needed for operation requiring only the connection of the electrical wiring to the distribution panel, a fuel gas source, and, in the case of indoor units, an appropriate ventilation system. ~~The fuel cell system itself shall be evaluated and listed for its intended application by a nationally recognized test laboratory prior to installation.~~

~~FPN: NFPA 853 categorizes fuel cells of 50 kVA or smaller differently than fuel cells sized larger than 50 kVA. Fuel cells with ratings greater than 50 kVA are generally used in structures larger than single family dwellings. However, single fuel cell systems are capable of being paralleled with other fuel cell systems in order to increase the overall output rating at a site.~~

691-4. Definitions.

~~**Charge Controller.** Equipment that controls dc voltage or dc current, or both, used to charge a battery.~~

Fuel Cell. An electrochemical system that ~~continuously~~ consumes ~~a~~to fuel to produce an electrical current. The main chemical reaction used in a fuel cell for producing electrical power is not combustion ~~as defined by other codes~~. There may, however, be sources of combustion used within the overall fuel cell system such as reformers/fuel processors.

Fuel Cell System. The complete aggregate of equipment used to convert chemical fuel into usable electricity. A fuel cell system

typically consists of a reformer, stack, power ~~conditioner~~inverter, and auxiliary equipment.

Interactive System. A fuel cell system that operates in parallel with and may deliver power to an electrical production and distribution network. For the purpose of this definition, an energy storage subsystem of a fuel cell system, such as a battery, is not another electrical production source.

Maximum System Voltage. The highest ~~nominal~~ fuel cell ~~power~~ inverter output voltage between any ungrounded conductors present at accessible output terminals.

Output Circuit. The equipment conductors used to connect the fuel cell system to its electrical point of delivery. In the case of sites that have paralleled~~,~~ multiple units connected together, the term *output circuit*also refers ~~also~~ to the equipment used to electrically interconnect the fuel cell system(s).

Point Of Common Coupling. The point at which the power production and distribution network and the customer interface occurs in an interactive system. Typically, this is the load side of the power network meter.

~~**Power Conditioner.** The subsystem that converts the direct current from the fuel cell stack subsystem into alternating current of the proper voltage, frequency and phase angle compatible with the connecting electric power system or the power demand of a dedicated electrical load. It may also incorporate other power conversion functions including charging and discharging of batteries and supply of power to auxiliary systems within the fuel cell system.~~

~~**Reformer.** The subsystem that converts the gas supplied to the fuel cell into a hydrogen-rich mixture to be used by the fuel cell stack for producing electrical power.~~

~~**Stack.** The subsystem consisting of a series of plates placed side by side that electrochemically converts hydrogen to electricity. The individual voltages across the plates add to form the overall voltage across the fuel cell stack.~~

Stand-Alone System. A fuel cell system that supplies power independently of an electrical production and distribution network.

691-5. Other Articles. Wherever the requirements of other articles of this *Code*and Article 691 differ, the requirements of Article 691 shall apply.

691-6. Installation.

(a) Fuel Cell System. A fuel cell system shall be permitted to supply a building or other structure in addition to any service(s) of another electricity supply system(s).

~~**(b) Equipment.** The fuel cell system shall be identified and listed for the intended use.~~.

(b) Identification. A permanent plaque or directory, denoting all electrical power sources on or in the premises, shall be installed at each service equipment location.

691-6. Listing Requirement. The fuel cell system shall be evaluated and listed for its intended application by a nationally recognized testing laboratory prior to installation.

B. Circuit Requirements

~~**691-7. Maximum Voltage.**~~

~~**(a) Circuits Over 150 Volts To Ground.** In one and two family dwellings, live parts in fuel cell systems and circuits over 150 volts to ground shall be contained within the fuel cell enclosure and shall not be accessible to other than qualified persons while energized.~~

~~FPN: See Section 110-27 for guarding of live parts and Section 210-6 for voltage to ground and between conductors.~~

~~**(b) Circuits of 120 Volts Nominal To Ground.** In one and two-family dwellings, fuel cell output circuits 120 volts nominal to ground shall be permitted to supply branch circuits that supply lampholders, fixtures or receptacles.~~

691-8. Circuit Sizing and Current.

(a) ~~Maximum~~ Nameplate Rated Circuit Current. The ~~maximum~~ nameplate(s) rated circuit current shall be the rated~~ short circuit~~ current indicated on the fuel cell nameplate(s).

(b) Conductor Ampacity And Overcurrent Device Ratings. The ampacity of the feeder circuit conductors from the fuel cell system(s) to the premises wiring system shall not be less than the greater of (1) nameplate(s) rated circuit current, or (2) the rating of the fuel cell system(s) overcurrent protective device(s).

~~Fuel cell system currents shall be considered continuous.~~

(c)Ampacity of Grounded or Neutral Conductor. If ~~an~~ interactive single-phase, 2-wire fuel cell output(s) is connected to the grounded or neutral conductor and a single ungrounded conductor ~~(only)~~ of a 3-wire system or of a 3-phase, 4-wire, wye-connected system, the maximum unbalanced neutral load current ~~load connected between the grounded or neutral conductor and any one ungrounded conductor~~ plus the fuel cell system(s) output rating shall not exceed the ampacity of the grounded or neutral conductor.

691-11. Overcurrent Protection.

(a) Circuits and Equipment. If the fuel cell system is provided with overcurrent protection sufficient to protect the circuit conductors that supply the load, additional circuit overcurrent devices shall not be required. Equipment and conductors connected to more than one electrical source shall be protected.

(b) Accessibility. Overcurrent devices shall be readily accessible.

691-12. Stand-Alone Systems. The premises wiring system shall meet the requirements of this *Code*except as modified by (a), (b), and (c).

(a) ~~Power Conditioner~~ Fuel Cell System Output. The ~~ac inverter~~ fuel cell system output from a stand-alone system shall be permitted to supply ac power to the building or structure disconnecting means at current levels below the rating of that disconnecting means.

(b) Sizing and Protection. The circuit conductors between the ~~inverter~~ fuel cell system(s) output and the building or structure disconnecting means shall be sized based on the output rating of the ~~inverter~~ fuel cell system(s). These conductors shall be protected from overcurrents in accordance with Article 240. The overcurrent protection shall be located at the output of the ~~inverter~~ fuel cell system(s).

(c) Single 120-Volt Nominal Supply. The inverter output of a stand alone fuel cell system shall be permitted to supply 120 volts, nominal, to single-phase, 3-wire 120/240-volt service equipment or distribution panels where there are no 240-volt ~~outlets~~loads and where there are no multiwire branch circuits. In all installations, the rating of the overcurrent device connected to the output of the ~~inverter~~ fuel cell system(s) shall be less tha~~t~~n the rating of the ~~neutral bus in the~~ service equipment. This equipment shall be marked

WARNING – SINGLE 120-VOLT SUPPLY –
DO NOT CONNECT MULTIWIRE BRANCH
CIRCUITS!

C. Disconnecting Means

691-13. All Conductors. Means shall be provided to disconnect all current-carrying conductors of a fuel cell system power source from all other conductors in a building or other structure.

~~**691-13. All Conductors.** Means shall be provided to disconnect all current carrying conductors of a fuel cell system power source from all other conductors in a building or other structure. Where a circuit grounding connection is not designed to be automatically interrupted as part of the ground-fault protection system required by Section 691-5, a switch or circuit breaker used as a disconnecting means shall not have a pole in the grounded conductor. The grounded conductor may have a bolted or terminal disconnecting means to allow maintenance or troubleshooting by qualified personnel.~~

691-14. ~~Additional~~ Provisions. The provisions of Article 215 or Article 225, Part B, as applicable, shall apply to the fuel cell system power source disconnecting means. The disconnecting means shall not be required to be suitable as service equipment and shall be rated in accordance with Section 691-17.

691-17. Switch or Circuit Breaker. The disconnecting means for ungrounded conductors shall consist of readily accessible, manually operable switch(es) or circuit breaker(s).

~~**691-17. Switch or Circuit Breaker.** The disconnecting means for ungrounded conductors shall consist of a manually operable switch(es) or circuit breaker(s)~~

~~(5) Located where readily accessible,~~

~~(6) Externally operable without exposing the operator to contact with live parts,~~

~~(7) Plainly indicating whether in the open or closed position, and~~

~~(8) Shall have an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment.~~

Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and shall ~~read substantially~~have the following words or equivalent:

~~WARNING~~DANGER – ELECTRIC SHOCK HAZARD –
DO NOT TOUCH TERMINALS –
TERMINALS ON BOTH THE LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION.

Exception No. 1: A connector shall be permitted to be used as an ac disconnecting means provided that it complies with the requirements of Section 691-33 and is listed and identified for the use.

D. Wiring Methods

691-32. Methods Permitte.WIRING SYSTEMS.

. All raceway and cable wiring methods included in Chapter 3 of this *Code* and other wiring systems and fittings specifically intended and identified for use on with fuel cell systems shall be permitted. Where wiring devices with integral enclosures are used, sufficient length of cable shall be provided to facilitate replacement.

*(b) Single Conductor Cabl**Types SE, UF, and USE single-conductor cable shall be permitted in fuel cell power systems where installed in the same manner as Type UF multiconductor cable in accordance with Article 339.***

691-33. Connectors. The connectors permitted by Article 691 shall comply with (a) through (e).

(a) Configuration. The connectors shall be polarized and shall have a configuration that is noninterchangeable with receptacles in other electrical systems on the premises.

(b) Guarding. The connectors shall be constructed and installed so as to guard against inadvertent contact with live parts by persons.

(c) Type. The connectors shall be of the latching or locking type.

(d) Grounding Member. The grounding member shall be the first to make and the last to break contact with the mating connector.

(e) Interruption of Circuit. The connectors shall be capable of interrupting the circuit current without hazard to the operator.

E. Grounding

691-41. System Grounding. For a fuel cell system output circuit, one conductor of a 2-wire system rated over 50 volts and a neutral conductor of a 3-wire system shall be solidly grounded by either (A) or (B).

(A) Stand-Alone Systems

Grounding and bonding shall be in accordance with Section 250-30.

(B) Other than Stand-Alone Systems

(1) For two wire systems, one conductor shall be terminated at the grounded circuit conductor terminal of the premises wiring system.

(2) For three wire systems, the neutral conductor shall be terminated at the grounded circuit conductor terminal of the premises wiring system.

Exception: Other methods that accomplish equivalent system protection and that use equipment listed and identified for the use shall be permitted.

FPN: See Section 250-2 (a)

691-44. Equipment Grounding Conductor. A separate equipment grounding conductor shall be installed.

691-45. Size of Equipment Grounding Conductor. The equipment grounding conductor shall not be smaller than the required size of the circuit conductors in systems where the available fuel cell system power source short circuit current is less than twice the current rating of the overcurrent device. In other systems, the equipment grounding conductor shall be sized in accordance with Section 250-122 for ac systems and Section 250-166 for dc systems.

691-47. Grounding Electrode System. A grounding electrode system shall be provided in accordance with Sections 250-50 through 250-60.

Any supplementary equipment grounding electrode(s) required by the manufacturer shall be bonded connected to the provided equipment grounding conductor specified in 250-118.

F. Marking

691-53. Fuel Cell Power Sources. A marking, specifying the fuel cell system, power source rating as follows output voltage, output power rating, and short circuit continuous output current rating as follows shall be provided provided by the installer at the site at an accessible location at the disconnecting means for the fuel cell power source at an accessible location on the site.

(1) Operating Output Voltage

(2) Output Power Rating

(3) Short Circuit Current

691-54. Fuel Shut-Off. The location of the manual fuel shut-off valve shall be marked at the location of the primary disconnecting means of the building or circuits supplied, of the manual fuel shut-off valve shall be marked.

691-56. Stored Energy. A fuel cell system that stores electrical energy shall require the following warning sign, or similar equivalent, at the location of the service disconnecting means of the premises: WARNING – Fuel Cell Power System contains electrical energy storage devices.

.. At the location of the primary disconnecting means of the building oncircuits supplied, it shall be marked that the fuel cell unit stores electrical energy, if batteries or other energy storage devices are used in the power conditioner section of the fuel cell.

G. Connection to Other Circuits

691-59 Transfer Switch. A transfer switch shall be required in non-grid-interactive systems that use utility grid backup. The transfer switch maintains isolation between the electrical production and distribution network and the fuel cell system.. The transfer switch may be located externally or internally to the fuel cell system unit.. When the utility service conductors of the dwelling structure are connected to the transfer switch, the switch shall comply with Article 230, Part E.

691-62 Identified Interactive Equipment. Only fuel cell systems listed and identified as interactive shall be permitted in interactive systems. When connected in an interactive system, the fuel cell system shall be operated in accordance with Article 705.

691-63 Output Characteristics. The output of a fuel cell system operating in parallel with an electric supply system shall be compatible with the voltage, wave shape, and frequency of the system to which it is connected.

FPN: The term compatible does not necessarily mean matching the primary source wave shape.

691-62. Loss of Interactive System Power. The fuel cell system shall be provided with a means of detecting when the electrical production and distribution network has become de-energized and shall not feed the electrical production and distribution network side of the point of common coupling. under this condition.during this condition. The fuel cell system shall remain in that state until the electrical production and distribution network voltage has been restored.

A normally interactive fuel cell system shall be permitted to operate as a stand-alone system to supply loads that have been disconnected from electrical production and distribution network sources.

691-64. Unbalanced Interconnections.

(a) Single Phase. Single-phase inverters in interactive fuel cell systems shall not be connected to a 3-phase power system unless the interconnectedinteractive system is designed so that significant unbalanced voltages cannot result.

(b) Three Phase. Three-phase inverters in interactive fuel cell systems shall have all phases automatically de-energized upon loss of voltage, or unbalanced of, voltage in one or more phases unless the interconnectedinteractive system is designed so that significant unbalanced voltages will not result.

691-65. Point Of Connection. The output of a fuel cell system power source shall be connected as specified in (a) or (b).

(a) Supply Side. A fuel cell system power source shall be permitted to be connected to the supply side of the service disconnecting means as permitted in Section 230-82(5).

(b) Load Side. A fuel cell system power source shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises provided that all of the following conditions are met.

(1) Each source interconnection shall be made at a dedicated circuit breaker or fusible disconnecting means.

(2) The sum of the ampere ratings of overcurrent devices in circuits supplying power to a busbar or conductor shall not exceed the rating of the busbar or conductor.

Exception: For a dwelling unit, the sum of the ampere ratings of the overcurrent devices shall not exceed 120 percent of the rating of the busbar or conductor.

(3) The interconnection point shall be on the line side of all ground-fault protection equipment.

Exception: Equipment with power supplied from a single point of connection.

(4) Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor shall be marked to indicate the presence of all sources.

Exception: Equipment with power supplied from a single point of connection.

(5) Equipment such as circuit breakers, if backfed, shall be identified for such operation.

(6) The circuit breaker on the dedicated output of a utility-interactive inverter shall be positioned in the distribution equipment at the opposite (load) end from the input feeder connection or main circuit location. A permanent warning label shall be applied to the

distribution equipment with the following, ~~or similar language~~ or equivalent:
WARNING. Fuel Cell Power System Output. Do not ~~move~~relocate this circuit breaker. ~~from this position~~ .
I. ~~Systems~~ Outputs Over 600 Volts
691-80. General. Fuel cell systems with a maximum ~~system~~ output voltage over 600 volts ~~dc~~ ac shall comply with Article~~s~~ 490 ~~, 685, 705, and other~~ and the requirements of other articles applicable to such installations. ~~rated over 600 volts~~.
~~**691-81. Interactive Systems.** For single and multiple systems, the fuel cell(s) shall not backfeed power to the electric production and distribution network side of the point of common coupling upon a loss of electric production and distribution network power.~~
~~**691-85. Definitions.** For the purposes of Part I of the article, the voltages used to determine cable and equipment ratings shall be defined as follows.~~
~~Battery Circuits. **In battery circuits, the voltage shall be the highest voltage experienced under charging conditions.**~~
~~**Fuel Cell Circuits.** In dc fuel cell outputs and fuel cell system output circuits, the voltage shall be the maximum system voltage.~~
PANEL STATEMENT: The panel reviewed the proposal and determined the overall effort was very commendable. The proposed text was revised for clarity, to comply with the 1999 NEC Style Manual and to remove any inconsistencies. A reworked proposal was produced that focused on the complete listed system concept and associated wiring for the fuel cell installation. The panel reviewed and revised this proposal. This new revised document meets the approval of the submitter. Due to the similarities in technology between fuel cell systems and photovoltaic systems (690) Panel 3 should retain jurisdiction of proposed new Article 691. The panel recognizes that the TCC has the final jurisdiction over the numbering and assignment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 695 — FIRE PUMPS

(Log #CP1505)

15- 77a - (695): Accept
SUBMITTER: CMP 15
RECOMMENDATION: After 695-3(a)(2) add:
[NFPA 20 - 1999, 6-2.1, 6-2.2, and 6-2.4.4]
After 695-3(b)(3) add:
[NFPA 20 - 1999, 6-2.3, 6-2.4.1, 6-2.4.3, and 6-6.1.]
After 695-4(b)(5)(d) add:
[NFPA 20 - 1999, 6-3.2.2.1, 6-3.2.2.2, and 6-3.2.2.3.]
After 695-7 add:
[NFPA 20 - 1999, 6-4]
After 695-10 add:
[NFPA 20 - 1999, 6-5.1.1, 7-1.2.1, and 9-1.1.1.]
After 695-14(a) add:
[NFPA 20 - 1999, 7-5.2.5]
After 695-14(b) add:
[NFPA 20 - 1999, 7-4.5.6]
After 695-14(c) add:
[NFPA 20 - 1999, 7-8.1.3]
After 695-14(d) add:
[NFPA 20 - 1999, 9-3.5.1]
SUBSTANTIATION: The references have been added in accordance with the requirement of the NFPA National Electrical Code Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1175)

15- 78 - (695-2-Fault Tolerant External Control Conductors): Accept in Principle in Part
SUBMITTER: Richard Schneider, Joslyn Clark Controls, Inc.
RECOMMENDATION: Add a definition to read:
Fault Tolerant External Control Conductors. Those control conductors entering/leaving the fire pump controller enclosure, whose effect on the controller operation upon breakage, disconnection, shorting of wires or loss of power to those circuits, comply with 695-14(a).
SUBSTANTIATION: The term "Fault tolerant", as it pertains to control conductors used in fire pump controllers, is not now defined. This definition is in general concurrence with that contained in the IEEE Standard Dictionary of Electrical and Electronic Terms, 5th edition (IEEE Standard 1000-1992).
PANEL ACTION: Accept in Principle in Part.
Delete existing 695-2.
Add new 695-2 to read as follows:
695-2 Definitions
Fault Tolerant External Control Conductors. Those control conductors entering and/or leaving the fire pump controller enclosure which if broken, disconnected, or shorted will not prevent the controller from starting the fire pump and may cause the controller to start the pump under these conditions.
PANEL STATEMENT: This satisfies the NEC Style Manual and intent of the submitter and makes the definition independent of any section of the article. The reference to 695-14(a) was rejected so that the definition does not contain requirements. Existing 695-2 is not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #337)

15- 79 - (695-2-On-Site Power Production Facility (New) and On-Site Standby Generator (New)): Accept in Principle in Part
SUBMITTER: Richard Schneider, Joslyn Clark Controls, Inc.
RECOMMENDATION: Add the following definitions to 695-2:
On-Site Power Production Facility. An On-Site Power Production Facility (ref. 695-3(a)(2) is intended to serve as the normal supply of electric power for the site and is expected to be normally, constantly energized.
On-Site Standby Generator. An On-Site Standby Generator (ref. 695-3(b)) is a facility producing electric power on-site intended to serve as the alternate supply of electric power. It differs from On-Site Power Production Facility in that it is not expected to be normally, constantly energized.
SUBSTANTIATION: Section 695-3(a)(2) is being interpreted to mean that a standby generator is an acceptable power source for the normal supply to the fire pump motor.
PANEL ACTION: Accept in Principle in Part.
Add the following definitions to 695-2:
On-Site Power Production Facility. An On-Site Power Production Facility is the normal supply of electric power for the site and is expected to be constantly producing power.
On-Site Standby Generator. An On-Site Standby Generator is a facility producing electric power on-site, as the alternate supply of electric power. It differs from an On-Site Power Production Facility in that it is not constantly producing power.
PANEL STATEMENT: This satisfies the NEC Style Manual and intent of the submitter and makes the definition independent of any section of the article.
The part rejected is the two references to 695-3 which would introduce requirements into definitions.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2346)

15- 80 - (695-3(a)(1)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add the following underlined text.
(1) Electric Utility Service Connection. A fire pump shall be permitted to be supplied by a separate service, or by a tap located <u>electrically</u> ahead of and not within the same cabinet, enclosure, or vertical switchboard section as the service disconnecting means. The connection shall be located and arranged so as to minimize the possibility of damage by fire from within the premises and from exposing hazards. A tap ahead of the service disconnecting means shall comply with Section 230-82(4). The service equipment shall

comply with the labeling requirements in Section 230-2 and the location requirements in Section 230-72(b).
SUBSTANTIATION: This proposal is an attempt to show that the intent of the article was to have electrical separation, not physical separation. The installation of a tap or disconnect in the service equipment is permitted provided it is in a separate vertical section and /or meets the requirements of NEC 695-4(b)(2). The intent can be demonstrated by the following excerpt from NFPA 20 1996 Edition, Standard for the Installation of Centrifugal Fire Pumps.
"A-6-3.2.2 Where the alternate power is from an on-site generator, the alternate service equipment need not be located in the fire pump room.
The Committee considered the potential arrangement of providing fire pump power from the secondary side of the transformer, which supplies other electrical loads of the facility. The Committee recognizes that it is possible to supply the fire pump power ahead of other plant loads and to protect the fire pump power circuit by proper electrical coordination. However, the Committee is concerned that, while responding to an emergency, fire fighters may seek to disconnect electrical power to the facility by opening the transformer primary disconnect, which in this case would isolate power to the fire pump as well. In addition, the Committee is concerned that the designed electrical coordination may be compromised by ongoing additional electrical loads to the facility power distribution system. Therefore, if electrical service is supplied to the facility at voltage higher than utilization voltage, the Committee feels that a separate transformer to provide power to the fire pump is appropriate."
As can be seen, the committee was rightfully concerned about the possible inadvertent disconnection of the fire pump supply. Although they were concerned, they did not mandate a separate transformer, service, or even a disconnect located physically remote from the service, in fact, they recognized that any of these would be permitted, especially if a second source of supply (such as a stand-by generator) was provided.
While locating the disconnect, transformer or other source of supply remote from the service should provide a superior design, it is not required. As has been pointed out numerous times, the NEC is not a design manual, it is a minimum standard for safety.
Additional support for the above statements can be found in the two following excerpts from NFPA 20 1996 edition.
"A-6-3 Where risks involved are large and interruption of fire pump service would seriously affect protection, at least two separate circuits from the power plant(s) to the pump room should be provided. The circuits should be run by separate routes or in such a manner that failure of more than one at the same time would be only a remote possibility.
A completely underground circuit from generating station to the pump room is strongly recommended and should be obtained where practicable. Where such construction is not available, an overhead circuit may be allowed, but that part of the circuit adjacent to the plant served by the fire pump or to exposing plants should be run with special reference to damage in case of fire. Where the pump room is part of, or in close proximity to, the plant that the pump is designed to protect, the wires should be underground for some distance from the pump room."
"A-6-3.1.1 Under premise fire conditions, service and feeder connections are susceptible to failure from collapsing structural and other members within the premise as well as failure from fire. Under fire conditions generated by overcurrent within these service and feeder conductors, the characteristics of 6-3.1.1 minimize the possibility of fire spread.
Typical methods of routing power from the source to the motor are shown in Figure A-6-3.2.2. Other configurations may also be acceptable."
In both of these excerpts, the panel for NFPA 20 does not mandate a specific design, rather they state what should be provided.
Finally, it should be noted that the current edition of the NEC would require a more stringent installation for a fire pump when supplied from a normal source and a stand-by source than is required for an emergency system. This seems to be overly restrictive when you take into consideration that a fire pumps primary duty is to provide protection to a building, while an emergency system (NEC 700) primary function is to assure the safety of the occupants of a facility. At the worst case, the system should not be required to be held to a higher standard than an emergency system (except for the conductors).
PANEL ACTION: Reject.
PANEL STATEMENT: The current code language clearly states the intent. The proposed change does not add anything.
The panel does not agree with the submitter's statement that physical separation is not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3913)

15- 81 - (695-3(a)(2), FPN (New)): Reject
SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.
RECOMMENDATION: Add Fine Print Note:
FPN: This power production facility should always be in operation, 24 hours a day, 7 days per week, and of a reliability that is sufficient for the Authority Having Jurisdiction.
SUBSTANTIATION: To help differentiate this power source from an alternate emergency source, when used.
PANEL ACTION: Reject.
PANEL STATEMENT: A definition is clearer than a FPN. Refer to panel action on Proposal 15-79.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1180)

15- 82 - (695-3(b)): Reject
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Revise as follows:
"...in combination with an on-site ~~standby~~ emergency generator complying with...".
SUBSTANTIATION: NFPA 20 Section 6-6.3 requires a Level 1, Type 10 system in accordance with NFPA 110. In NEC terminology, that would be an emergency system to have 10 second power restoration and equipment specification level for life-safety loads.
PANEL ACTION: Reject.
PANEL STATEMENT: NFPA 20 defines the generator as a stand-by generator and purposely refrains from defining it as an emergency generator; it requires the stand-by generator to have the operating characteristics of a Level 1, Class 10 system in accordance with NFPA 110. The NEC does not classify or categorize a Level 1, Class 10 system as an emergency system.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3914)

15- 83 - (695-3(b), FPN (New)): Reject
SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.
RECOMMENDATION: Add Fine Print Note:
FPN: An "on-site generator," when used, is a "standby" generator which may also be known as an emergency generator, or as an alternate source generator, or other designation, such as peak shaving or co-generation unit, when acceptable to the Authority Having Jurisdiction.
SUBSTANTIATION: To help differentiate this power source from an on-site power plant and to suggest the types of alternate sources which may be used.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed FPN does not clarify the term "on-site generator" and tends to confuse it with "standby" and "emergency." The submitters intent has been met by panel action on 15-79.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1177)

15- 84 - (695-3(b)(1)): Reject
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Add text to read:
"Generator capacity sufficient to carry locked-rotor current of the fire pump indefinitely shall not be required."
SUBSTANTIATION: Sizing the generator set to carry locked rotor current of the fire pump motor continuously is sometimes inferred from the sizing requirement for overcurrent protective devices at locked rotor indefinitely. A definitive code language statement is needed to prevent this inference. Depending on the percentage of fire pump load to the total generator load, generator sets sized to carry locked rotor current continuously may be oversized by as much as 300 percent of the capacity required to start and run the fire pump motor. The problem with oversized engine-generators is not just unnecessarily high equipment and installation cost; there are also significant operating problems. The problems with lightly-loaded diesel engines are wet-stacking, carboning, fuel dilution of lube oil, and water contamination of lube oil. If engines have these problems, the emergency source of power is not as reliable.
PANEL ACTION: Reject.
PANEL STATEMENT: This is extract performance-based material (NFPA 20, 6-2.3.1 and 6-2.4.1), NOT an installation requirement. It is impractical to expect the generator to deliver locked rotor amperes (LRA) indefinitely. In those cases where reduced voltage starting is used, the motor starting current is considerably less than motor LRA. The real issue is the starting and running of the motor as in the present text of 695-3(b)(1). LRA is a concern of protective devices, not the power supply. The present requirement addresses the need as a performance issue; the proposal offers a design criteria.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3099)

15- 85 - (695-3(b)(1)): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Section 695-3(b)(1) — Add a new last sentence:
"The requirements of 430-113 shall not apply."
SUBSTANTIATION: Section 695-3(b) is under the purview of NFPA 20, which specifically does not require a disconnecting means under the conditions described.
Note: This is a companion proposal to the proposal on Section 430-113.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2347)

15- 86 - (695-3(c) (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add new text to read as follows:
General Requirements. Power shall be made available to the fire pump in a time not to exceed 10 seconds. When the source of power is from a generator set, the fuel supply capacity shall be sufficient to provide 8 hours of fire pump operation at 100 percent of the rated pump capacity in addition to the supply required for other demands.
SUBSTANTIATION: NEC 695 and NFPA 20 do not currently require a minimum standard for the time required for power to be made available for starting a fire pump. NFPA 20 6-6.3 requires a type 10 generator. NFPA 110 defines a type 10 as one that will have power available to the load terminals of a transfer switch in not more than 10 seconds.
NFPA 20 6-6.3 does require a minimum fuel supply of 8 hours of pump operation. This requirement should also be stated in the NEC.
PANEL ACTION: Reject.
PANEL STATEMENT: This is extract performance-based material (NFPA-20, 6-2, 6-2.1, 6-2.2, 6-2.3), NOT an NEC installation requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1179)

15- 87 - (695-4(b) and Exception (New)): Accept in Principle
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Delete the sentence in 695-4(b):
~~"For on-site generators installed under the provisions of Section 695-3(b)(1), the overcurrent devices shall not be required."~~
Add an Exception to 695-4(b)(1) as follows:
Exception: Overcurrent protective devices between an on-site emergency generator and a fire pump controller shall be selected and sized according to 430-62 to provide short-circuit protection only.
SUBSTANTIATION: There is confusion about selecting and sizing an overcurrent device to feed a fire pump from an emergency generator system, because the language of 695-4(b) is not clear. The requirement for overcurrent protective device selection in 695-4(b)(1) is sometimes applied to on-site emergency generator systems, because there is no exception following that section.
PANEL ACTION: Accept in Principle.
Replace "emergency" with "standby" and replace the proposed deleted sentence with the modified exception as a positive statement in the second paragraph of 695-4(b) to read:
For systems installed under the provisions of Section 695-3(b)(2) only, such additional disconnecting means and associated overcurrent protective device(s) shall be permitted as required to comply with other provisions of this Code. Overcurrent protective devices between an on-site standby generator and a fire pump controller shall be selected and sized according to 430-62 to provide short-circuit protection only. All disconnecting devices and overcurrent protective devices that are unique to the fire pump loads shall comply with the following:
PANEL STATEMENT: See panel action on 15-82 regarding the issue of standby versus emergency generators for fire pumps. The statement is a requirement, not an exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1816)

15- 88 - (695-4(b)(1)): Accept
SUBMITTER: James L. Boyer, Firetrol, Inc.
RECOMMENDATION: Add a new sentence to the end of existing 695-4(b)(1) to read:
"An instantaneous trip circuit breaker shall be permitted to be used as the disconnecting means and overcurrent protection and shall be permitted to be set to a maximum of twenty times motor full load current."
SUBSTANTIATION: Typically, instantaneous trip circuit breakers are permitted only where coordinated with motor overload protection. However, overload protection is not permitted for the fire pump controller / motor. Listed combination switch / fuse units with the switch rated at 125% at motor FLA and the fuses rated to carry motor LRA indefinitely are not available (for larger motors with higher FLA); a thermal-magnetic breaker would have to be sized for continuous motor locked-rotor current. The use of an instantaneous trip circuit breaker will provide short-circuit protection without interfering with the operation of the fire pump motor under (permissible) overload conditions; it provides both disconnecting means and short-circuit protection.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BOYER: This is extracted material which can be revised only by the NFPA 20 committee.

(Log #3915)

15- 89 - (695-4(b)(1), FPN No. 1 and 2 (New)): Reject
SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.
RECOMMENDATION: Add two Fine Print Notes:
FPN No. 1: This requirement applies to devices, when used, upstream (ahead of) of the fire pump controller. It does not apply to the conductors connecting a circuit breaker supplied by an on-site standby (alternate, emergency) generator to the alternate (emergency) side input of a fire pump transfer switch, or a transfer switch fire pump controller combination.
FPN No. 2: Since the minimum wire size required is 125 percent of the fire pump motor full load current, plus other pump room loads, and since a protective device will usually be sized to at least 600 percent of the fire pump motor full load current (for typical design "B" squirrel cage induction motors), special lugs for the smaller (125 percent) wiring may be required to comply with the device's listed lug rating limitation(s).
SUBSTANTIATION: FPN No. 1: To help clarify the endless confusion about where and when this requirement applies.
FPN No. 2: To help reduce the endless confusion regarding fire pump controller versus incoming cable size requirements; and, to attempt to indicate the wire versus lug size coordination required. There is constant misunderstanding regarding (normal side) incoming cable size versus controller lug size versus protective device lug size.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing wording is adequate; the proposed FPNs contain only information already provided. This is Handbook material.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3929)

15- 90 - (695-4(b)(2)): Reject
SUBMITTER: Charles J. Palmieri, Palmieri Assoc.
RECOMMENDATION: Revise text as follows:
(2) Disconnecting Means. The disconnecting means shall be
a. Identified as suitable for use as service equipment,
b. Lockable in the closed position, and
c. Located sufficiently remote from other building or other fire pump source disconnecting means that inadvertent ~~contemporaneous~~ simultaneous operation would be unlikely.
Strike the word contemporaneous and replace with the word simultaneous as indicated.
SUBSTANTIATION: The Code has had marching orders to improve its readability. The term contemporaneous displays only one hit in the 1999 NEC. The word simultaneous appears 15 times and is just as effective.
PANEL ACTION: Reject.
PANEL STATEMENT: "Contemporaneous," meaning occurring within the same time, while "simultaneous" means occurring at the same time (instant).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HIRSCHLER: The word "contemporaneous" is defined in Webster as "existing or occurring during the same time (as during a year, decade, or longer span of time)". I am sure the panel does not want to imply that the separation should be such that activation of the disconnecting means within the same decade should be discouraged. If the panel refuses to accept the word "simultaneous", the correct terminology should be "in rapid succession".

(Log #487)

15- 91 - (695-4(b)(3), 695-6(b), 695-12(d)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 695-4(b)(3) - change "1 in. (25.4 mm)" to "25 mm (1 in.)"
695-6(b) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
695-12(d) - change "12 in. (305 mm)" to "300 mm (12 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2555)

15- 92 - (695-5(b)): Reject
SUBMITTER: Joseph C. Warren, Joseph C. Warren Electrical Consulting Services
RECOMMENDATION: Revise as follows:
(b) Overcurrent Protection. The primary overcurrent protective device(s) shall be selected or set to carry idenfinitely the sum of the locked-rotor current of the fire pump motor(s) and the pressure maintenance pump motor(s) and the full-load current of the associated fire pump accessory equipment when connected to this power supply. Secondary overcurrent protection shall not be permitted. When selecting primary overcurrent protection, it shall also be permitted to be selected or set up to 600 percent of the rated full-load current of the transformer.
SUBSTANTIATION: In the 1996 edition of the NEC, 600 percent was permitted for this calculation, in addition to locked rotor method and fire pump accessory equipment. This made the method of calculation easier to do and gave the designer this option instead of lengthy calculations. It was also easier for inspectors to make sure this calculation fell in line with Article 695 rules. This method of using 600 percent also gives higher overcurrent protection for the fire pump and accessory equipment which is best since the fire pump should run indefinitely until failure for the protection of human life and property.
PANEL ACTION: Reject.
PANEL STATEMENT: This matter is covered in 450-3(a) for supervised transformers with an impedance not greater than 6%. Using 600% of full load current of the transformer is not the same as the existing requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3916)

15- 93 - (695-6, Exception (New)): Reject
SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.
RECOMMENDATION: Add an exception to the main paragraph to read:
Exception: The requirements of (a) and (b) below do not apply to the conductors connecting a circuit breaker supplied by an on-site standby (alternate, emergency) generator to the alternate (emergency) side input of a fire pump transfer switch, or a transfer switch fire pump controller combination.
SUBSTANTIATION: To help clarify the ongoing field confusion about the normal versus emergency side wiring requirements on so-called dual source (transfer switch) installations. There is constant confusion by engineers (electrical and mechanical or fire protection), contractors, inspectors, and installers on this subject.
PANEL ACTION: Reject.
PANEL STATEMENT: 695-6(a) applies only to service conductors and only a utility can provide service; 695-6(b) is intended to apply to feeder conductors from a generator. The proponent invokes the word "emergency."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2994)

15- 94 - (695-6(b)): Accept in Principle in Part

SUBMITTER: James Conrad, Rockbestors-Surprenant Cable Corp.

RECOMMENDATION: Revise Section 695-6(b) to read as follows:

Fire pump supply conductors on the load side of the final disconnecting means and overcurrent device(s) permitted by Section 695-4(b) shall be kept entirely independent of all other wiring. They shall only supply loads that are directly associated with the fire pump system, and they shall be protected to resist potential damage by fire, structural failure, or operational accident. They shall be permitted to be routed through a building(s) using one of the following conditions:

(1) Be encased in a minimum 2 in. (50.8 mm) of concrete

(2) Be within an enclosed construction dedicated to the fire pump circuit(s) and having a minimum of a 1-hour fire resistive rating

(3) Be a listed electrical circuit protection system with a minimum 1-hour fire rating

(4) Be a cable listed to maintain circuit integrity for a minimum of 1 hour when installed in accordance with the listing requirements

Exception: The supply conductors located in the electrical equipment room where they originate and in the fire pump room shall not be required to have the minimum 1-hour fire separation or fire resistance rating, unless otherwise required by Section 700-9(d) of this Code.

SUBSTANTIATION: This proposal does not delete nor add any methods that are currently contained in the 1999 NEC. It identifies and separates fire resistive cables from the electrical circuit protective systems. This would then be consistent with the terminology and the classifications as they appear in the Building Material Directory.

PANEL ACTION: Accept in Principle in Part.

Accept the proposal, except reword (3) as shown and reject (4):

"(3) Be a listed cable or listed electrical circuit protection system with a minimum of 1-hour fire rating."

PANEL STATEMENT: No listing presently exists for item 4; combining it into item 3 permits, without requiring, such a cable.

Editorially revise item 1) to satisfy the Manual of Style with regard to metric units appearing first.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HIRSCHLER: This is premature. UL does not yet list cables to have a minimum 1 hour rating. This is expected to happen in the future, and the NEC should only be changed after such a listing becomes available from UL, or another listing organization. At the time of proposals to the NEC 1999 cycle, it was expected that the UL listing of cables would be imminent, but it has still not occurred.

(Log #4142)

15- 95 - (695-6(b)): Reject

SUBMITTER: L. James Milne, BICCGeneral

RECOMMENDATION: Delete text as follows:

Fire pump supply conductors on the load side of the final disconnecting means and overcurrent device(s) permitted by Section 695-4(b) shall be kept entirely independent of all other wiring. They shall only supply loads that are directly associated with the fire pump system, and they shall be protected to resist potential damage by fire, structural failure, or operational accident. They shall be permitted to be routed through a building(s) encased in 2 in. (50.8 mm) of concrete ~~or within enclosed construction dedicated to the fire pump circuit(s) and having a minimum of a 1-hour fire resistance rating,~~ or they shall be permitted to be within listed electrical circuit protective systems with a minimum of 1-hour fire resistance. The installation shall comply with any restrictions provided in the listing of the electrical circuit protective system used.

SUBSTANTIATION: This proposal recommends deletion of the "enclosed construction" option that first appeared in the 1999 NEC. Although fire protection of fire pump feeders has been a code mandate for many years, the 1999 NEC substantially weakened this requirement. Prior to this fire protection of fire pump feeders had to be achieved using "listed electrical circuit protective systems with a minimum of 1-hour fire resistance" or "enclosed within not less than two inches of concrete." The 1999 NEC allows "a fire-rated assembly having a minimum fire rating of 1 hour" to be used. The most common of these fire rated assemblies would be gypsum board enclosures. This additional method of compliance is concerning for the following reasons:

• Lack of Third Party Testing. Gypsum enclosures do not have a UL listing for electrical circuit protection but is used to achieve fire separation. The 1999 National Electrical Code Handbook warns: "It is important to understand the difference between a 1-hour fire rating of an electrical cable and a 1-hour fire resistance rating of a structural member, such as a wall. Simply stated, at the end of a 1-hour fire rating test on an electrical cable, the circuit and its insulation must be intact and electrically functioning. (No short circuits, grounds, or opens are permitted.) However, a wall subjected to a 1-hour fire resistance test must only prevent a fire from passing through or past the wall, without regard to damage to the wall. All fire ratings and fire-resistance ratings are based on the assumption that the structural supports for the assembly are not impaired by the effects of fire." The Underwriters Laboratories Fire Resistance Directory contains a similar warning: "All ratings are based on the assumption that the stability of structural members supporting the assembly are not impaired by the effects of fire. The extent of damage of the test assembly at the rating time is not a criteria for the rating." By requiring emergency feeders to be a listed electrical circuit protective system, there is assurance that the method used has been subjected to testing that confirms survival of this critical wiring during a fire emergency. By allowing gypsum board enclosures, compliance moves from distinct, tested methods to vague options subject to a wide spectrum of interpretation. Something as important as this demands specific means of compliance and backing by appropriate tests related directly to the protection of electrical wiring.

• Difficult to Inspect. The enclosure is constructed in the field often under less than ideal conditions. In many cases the enclosure is constructed by the general contractor (not the electrical contractor) who may not fully appreciate the role of the enclosure, viewing it as "putting up a little more sheet rock," an inexpensive and ineffective solution. The quality of the enclosure can be very difficult to inspect in the limited access areas so common in retrofit installations.

• Compliance Conflicts. When gypsum enclosures are used it is very difficult to comply with Section 346-11 Bends—Number in One run while meeting the requirements of Section 370-29 Conduit Bodies, Junction, Pull, and Outlet Boxes to be Accessible. In a conduit run, there can be no more than the equivalent of four quarter bends (360° total) between pull points, e.g., conduit bodies and boxes. If the installation mandates pull boxes, the pull boxes can't be inside the gypsum enclosure and still be "rendered accessible without removing any part of the building..." as stated in 370-29.

• System Easily Compromised. Even if properly constructed, the fire resistance of a typical gypsum enclosure can easily be compromised after the installation--and often is. The submitted photographs show how an additional conduit was run through the gypsum enclosure (the shortest routing), completely negating any fire rating it may have had. In most cases this goes unnoticed, resulting in a severely compromised emergency system.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The option of one hour fire-resistant construction rating needs to remain. What happens after the original installation is not part of the NEC. Any wiring methods or protection can be compromised after the original installation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 17

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

SOBEL: I agree with the submitter's substantiation.

(Log #CP1508)

15- 95a - (695-6(c)): Accept

SUBMITTER: CMP 15

RECOMMENDATION: Revise 695-6(c) to read as follows:

(c) Conductor Size

(1) Fire Pump Motors and Other Equipment. Conductors supplying a fire pump motor(s), pressure maintenance pumps, and associated fire pump accessory equipment shall have a rating not less than 125 percent of the sum of the fire pump motor(s) and pressure

maintenance motor(s) full-load current(s), and 100 percent of the associated fire pump accessory equipment.

(2) Fire Pump Motors Only. Conductors supplying only a fire pump motor(s) shall have a rating not less than 125 percent of the fire pump motor(s) full-load current(s).

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3921)

15- 96 - (695-6(c) (New)): Reject
SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.
RECOMMENDATION: Add a new subparagraph to read:

(c) Emergency Side Conductors. The conductors supplying power to the alternate side of a fire pump transfer switch or a combination transfer switch fire pump controller unit shall meet the requirements of a motor branch circuit, including protection thereof, per Section 230.

Exception No. 1: If these alternate side conductors are installed to meet either service entrance requirements of (a) above or the normal side circuit conductors of (b) above, they shall be considered as meeting this requirement.

Exception No. 2: When such circuits are supplied by a gen set whose only load is one fire pump, this requirement may be met by the generator circuit breaker when the combination of this breaker and the maximum output from the generator provide adequate protection for these conductors.

SUBSTANTIATION: This is to help clarify the need for suitable protection for the alternate side conductors. There is rampant confusion on this issue. In the case of either large or multi pump generators or live emergency buses, these conductors are seldom protected. This poses a risk both to the fire protection integrity and also creates a fire hazard as well as a risk to any other emergency loads which are supplied by a larger generator.

Note: It is the intent of the submitter that this text coordinate with or be revised to merge with proposed text on this subject submitted by either NEMA Subcommittee SC-10 or by the NFPA 20 Electrical Task Group.

PANEL ACTION: Reject.
PANEL STATEMENT: The new subparagraph and exceptions are vague and confusing [Which part(s) of Article (not Section) 230? Motor branch circuits are in Article 430.] See panel action on 15-97. The requirements of Article 700 for emergency systems are not always applicable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3098)

15- 97 - (695-6(d), Exception (New)): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add an exception to 695-6(d), Overload Protection, as follows:

"Exception: For on-site standby generator(s) which produce continuous currents in excess of 225 percent of the FLA of the fire pump motor, the conductors between the on-site generator(s) and the combination fire pump transfer switch controller or separately mounted transfer switch shall be installed in accordance with Section 695-6(b) or protected in accordance with Section 430-52.

The protection provided shall be in accordance with the short-circuit current rating of the combination fire pump transfer switch controller or separately mounted transfer switch."

SUBSTANTIATION: At present neither NFPA 70 nor NFPA 20 require overcurrent protection in the conductors from the alternate source when that power source is an on-site generator. This is particularly a problem in installations where the generator capacity far exceeds the fire pump motor FLA. In these cases, the conductors are at risk and present a hazard to the premises. Two-hundred twenty-five percent of the FLA of the fire pump motor will permit a running motor subjected to single-phasing to continue to run.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2981)

15- 98 - (695-6(e)): Reject
Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:

(e) Pump Wiring. All wiring from the controllers to the pump motors shall be in rigid metal conduit, intermediate metal conduit, liquidtight flexible metal conduit, Schedule 80 Rigid Nonmetallic Conduit, or liquidtight flexible nonmetallic conduit Type LFNC-B, or Type MI cable.

SUBSTANTIATION: This proposal adds Schedule 80 Rigid Nonmetallic Conduit as an approved raceway for power circuits.

The UL Fact Finding Report on Schedule 80 Rigid PVC Conduit, 97NK31953, dated October 17, 1997, was first introduced to Panel 15 at the ROC for the 1999 NEC. It should be noted that all product exceeded the product standard's physical requirements. It should also be noted that Rigid Metal (aluminum) Conduit was selected for the comparison for its superior physical properties compared to the other approved pump wiring methods such as intermediate metal conduit, liquidtight flexible metal conduit or Type MI cable. 2-in. Schedule 80 Rigid PVC Conduit is used compared to the 1 1/2-in. Rigid Metal (aluminum) Conduit since a grounding conductor would be required in the Schedule 80 Rigid PVC Conduit increasing its wirefill.

The UL Fact Finding Report compares Schedule 80 Rigid PVC Conduit to Rigid Metal (aluminum) Conduit. Three types of tests were performed on these products, Impact, Crush, and Flammability. It should be noted that the test values for both Impact and Crush were increased from the product standards so that an electrical short would occur.

In both impact and crush testing Schedule 80 Rigid PVC Conduit satisfactorily protected the conductors in the conduit compatible, if not better than, to Rigid Metal (aluminum) Conduit. In the Flammability test, the integrity of the circuit remained with the Schedule 80 Rigid PVC Conduit as long as it would with the Rigid Metal (aluminum) Conduit.

The UL Fact Finding Report does provide sufficient technical substantiation that Schedule 80 Rigid PVC Conduit will resist physical damage equally to those wiring methods currently listed.

Note: Supporting material available for review at NFPA Headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: The tests performed do not show schedule 80 RNMC to be equal or superior to GRC. The test on shorts clearly shows more shorts for the RNMC. The impact tests do not show Schedule 80 PVC to be equal to GRC. The test should also use trade size to trade size for an accurate comparison. By using the worst case scenario for the crush test, Schedule 80 PVC does not equal GRC. In the flame test, the conduits were about equal. The larger sizes of conduit used, clearly shows that PVC does not equal GRC.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 14
NEGATIVE: 4
EXPLANATION OF NEGATIVE:
AMOS: I'm voting against the Panel Action to reject this proposal. The UL fact-finding report submitted with the proposal provides the entire technical substantiation necessary to support the acceptance of schedule 80 rigid nonmetallic conduit.

There is obvious reason, such as the added use of a grounding wire for the difference in trade sizes and there was no evidence that the comparison was an attempt to compare apples to oranges. The fact-finding report substantiated that the comparative qualities of RMC and RNMC regarding the impact test, crush test and flammability test. Liquidtight flexible nonmetallic conduit is presently allowed in this section of the code and has a proven track record of safety. There is

no reason to continue suppressing the use of proven product, simply because it's new.

GLENN: I am voting against the panel action to reject this proposal. The submitter provided adequate documentation in the form of a UL fact-finding report that supports the acceptance of schedule 80 rigid nonmetallic conduit to be installed from the controllers to the pump motors.

During the last code cycle, I voted against the panel when they rejected this same proposal. During the last code cycle, the panel was concerned about workman working around the conduit and that the conduit could be easily damaged. UL lists Schedule 80 RNMC as being resistant to physical damage and as being acceptable for electrical conduit installations. Now during this code cycle, the panel mistakenly concluded that the tests using 2 in. RNMC and 1 1/2 in. RMC were not equivalent and that UL choose the 2 in. because of its greater strength characteristics. UL selected the 2 in. RNMC based on equivalent wire sizing for the two types of conduit installations. The RNMC would require an additional ground wire while the RMC would not. The impact tests clearly show that the number of shorted wires in the RNMC conduit was as good as the GRC. The number of shorts during the crush test was exactly the same for both the RNMC and the RMC. The results of the flammability test for the 1/2 in. trade size were essentially the same. Although the flammability test time for the 1 1/2 in. RMC averaged 24 minutes, the lowest failure times for all the tests where essentially the same. The panel's statement that "the larger sizes of conduit used clearly shows that PVC does not equal GRC" is not the question. The question is not whether or not PVC equals GRC, but is RNMC safe for this application. The UL listing and the fact finding report clearly supports the safe use of RNMC for this application. It is also evident that the RNMC does a much better job of preventing the conduction of heat into the internal wiring. There is no sound reason for not including schedule 80 rigid nonmetallic conduit for this application.

HIRSCHLER: The UL fact finding report accompanying the proposal indicates that schedule 80 rigid nonmetallic conduit (RNMC) has appropriate performance for the application, in terms of impact resistance, crush resistance and flammability. The Fact-Finding report compared schedule 80 with rigid metallic conduit (i.e., aluminum conduit), and compares equivalent systems. The added use of grounding conductors in RNMC (not needed for the aluminum conduit) means that a larger outer diameter pipe is required to contain 3 circuit conductors of 1/0 AWG size; thus 40 percent conductor fill means a 1 1/2 inch diameter RMC conduit and a 2 inch diameter RNMC conduct. See details of results:

Impact test: for both RMC and RNMC the conduit protected the conductors from shorts when a 75 pound weight was dropped from up to a 6 ft height (with the larger diameter, compared to a listing requirement of 4 ft for RNMC) or when the weight was dropped from up to 1.5 ft (with the smaller diameter, compared to a listing requirement of 1.25 ft for RNMC).

Crush test: both RMC and RNMC the conduit protected the conductors from shorts when a crushing force was applied, with the crushing force required to cause a short being higher for the smaller size of RNMC than for that of RMC, while the opposite was true for the larger diameters, indicating comparable results.

Flammability: the smaller sizes of RMC and RNMC protected the conductors to exactly the same time, ca. 3 min. The flammability test on the larger diameter conduit was the single test for which there was a significant difference in circuit protection, with RMC being superior, but even there RNMC gave 5-12 min. circuit integrity, while 4 of the 6 RMC tests gave 10-16 min. circuit integrity, on exposure to a 60 kW gas burner flame.

Thus, schedule 80 rigid nonmetallic conduit is a UL-listed product, which has been shown in tests to be sufficiently resistant to physical damage for the application. It is also capable of preventing the heat transmission which occurs with metal conduit and which can destroy the conductors. The material used for schedule 80 rigid nonmetallic conduit is PVC, which has excellent fire performance, including low propensity for ignition and very low heat release once ignited. Moreover, supply conductors are required to be routed outside the buildings, or behind 2 inches of concrete or behind a fire rated wall, with a 1 hour rating.

KOVACIK: The Panel Statement that schedule 80 RNMC is not equal or superior to GRC is flawed logic. Schedule 80 RNMC needs to be equal or superior to only one and any of the raceways presently allowed by 695-6(e). If the Panel Statement were true, all raceways currently allowed would need to be equal or superior to GRC which is obviously not the case. The samples of conduit trade sizes were selected for testing based on equating wire fill rather than trade size. This was determined to provide a more accurate comparison of performance. The number of wires used in each trade size conduit was selected based on actual power supply configurations, which include ungrounded and grounded circuit conductors.

(Log #2995)

15- 99 - (695-6(e)): Reject

SUBMITTER: James Conrad, Rockbestors-Surprenant Cable Corp.

RECOMMENDATION: Revise Section 695-6(e) as follows:

All wiring from the controllers to the pump motors shall be in rigid metal conduit, intermediate metal conduit, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit Type LFNC-B, or Type MI cable, or Type MC cable having a smooth or corrugated sheath.

SUBSTANTIATION: It appears that the code is asking for some degree of mechanical protection as well as protection against liquids; while affording the installer the ability to maintain a flexible connection between the controller and the pump motor. Type MC cable having a smooth or corrugated sheath offers both mechanical and liquidtight protection in a flexible cable.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no technical substantiation offered that Type MC cable is equivalent to presently accepted wiring methods.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

(Log #1411)

15- 100 - (695-6(g)): Accept

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Mechanical Protection. All wiring from engine controllers and batteries shall be protected against ~~mechanical injury~~ physical damage, and shall be installed in accordance with the controller and engine manufacturers instructions.

SUBSTANTIATION: Editorial. "Physical damage" is the term used throughout the Code and seems more technically appropriate. Damage can occur from other than mechanical sources, such as chemicals, and inanimate material is usually not thought of as subject to "injury". The extracted Section 695-14(d) uses this same term.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

(Log #3920)

15- 101 - (695-7): Reject

SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.

RECOMMENDATION: Revise the paragraph to read:

695-7 Voltage Drop. The fire pump power source, wiring and any devices such as transformers, when used, shall provide adequate starting and continuous duty power for the fire pump or fire pumps and any pump room loads on said power source; and, shall meet both of the following voltage drop requirements.

[x](a) The voltage at the controller line terminals or at a controller transfer switch combination or at a fire pump transfer switch normal and emergency side line terminals shall not drop more than 15 percent below normal (controller-rated voltage) under normal automatic or manual electrical motor starting conditions. For reduced inrush (reduced voltage or reduced current) starting type controllers, the voltage shall not drop more than 15 percent under said reduced inrush starting. For across the line (full voltage) starting controllers, the voltage shall not drop more than 15 percent under said full voltage starting.

Exception: This limitation shall not apply for emergency run mechanical starting.

[x](b) The voltage at the motor terminals shall not drop more than 5 percent below the voltage rating of the motor when the motor is operating at 115 percent of the full-load current rating of the motor.
SUBSTANTIATION: There persists continuing and frequent confusion over sizing of a required backup generator and over sizing incoming service or transformers and power wiring to and from same. The text revision aims at helping to clarify same.
The exception is moved since it applies to starting a reduced inrush starting type controller; but, not to the motor running voltage, since exceeding the 5 percent limitation will always result in an overheated motor and/or damage (possibly incipient damage) to the motor.
PANEL ACTION: Reject.
PANEL STATEMENT: This is extract performance-based material (NFPA 20, 6-3.1.2), NOT an installation requirement. The underlining does NOT reflect the changes being requested.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3917)

15- 102 - (695-7, FPN No. 1 and 2 (New)): Reject
SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.
RECOMMENDATION: Add two Fine Print Notes:
FPN No. 1: The 15 percent maximum drop applies to normal reduced motor starting when a reduced inrush (starting) type of controller is used.
FPN No. 2: Exceeding the 15 percent maximum voltage drop during starting can cause motor or controller damage by causing the motor contactor(s) and/or other controller devices to chatter. Exceeding the 5 percent maximum voltage during running will cause the motor and/or controller components to overheat due by causing excessive motor full load and/or service factor currents.
SUBSTANTIATION: Undersized transformers and undersized emergency generators continue to cause a significant number of field problems or unreliable installations. This paragraph is the only NEC guide to proper sizing of these two items. Absent these guidelines, transformers and/or generators are sized based on thermal full load temperature rise ratings, which will rarely be near sufficient. The above FPNs may help to clarify both the requirements and their intent (need).
PANEL ACTION: Reject.
PANEL STATEMENT: The FPNs are handbook material, not Code material. These are extract material (NFPA-20, 6-3.1.2) and may belong in NFPA 20 Appendix A.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3918)

15- 103 - (695-10): Reject
SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.
RECOMMENDATION: New text: Add fire pump engines, combination controller-transfer switches, and high voltage controllers to the list.
Revised text: change "electric motor" to "electric fire pump motor" and rearrange the list.
Paragraph to read: Diesel fire pump engines, diesel engine fire pump controllers, electric fire pump motors, electric fire pump controllers, high voltage controllers, limited service controllers, combination fire pump fire pump controller and transfer switch, fire pump power transfer switches, and foam pump controllers shall be listed for fire pump service.
SUBSTANTIATION: List is incomplete as it stands.
PANEL ACTION: Reject.
PANEL STATEMENT: These are extract material (NFPA-20, 6-4.1.1, 7-1.1.1, 7-7, 7-8.1, 7-9.1, and 9-1.1.1); NEC does not cover engines.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3919)

15- 104 - (695-11 (New)): Reject
SUBMITTER: James Stanley Nasby, Master Control Systems, Inc.
RECOMMENDATION: Add new paragraph to read:
[x]695-11. Short Circuit and Withstand Rating Coordination. Electric fire pump controllers of all types shall be labeled with a short circuit current (withstand) rating at least equal to the available short circuit current available at the line terminals of the fire pump controller or at both sets of inputs at wither a power transfer switch or a combination transfer switch fire pump controller. When power transfer switches require upstream protection on their normal source input, such protection shall meet the continuous locked rotor requirements of Section 695-4(b)(1). Both...
SUBSTANTIATION: This coordination is often overlooked in field installations until inspection of the installation. The result can be installations of unknown safety. This requirement is important for: 1) personnel safety, 2) equipment and premises safety, and 3) reliability of the fire protection.
The second sentence is an attempt to clarify the very prevalent lack of understanding and compliance with this coordination requirement.
Notes:
1) The extract material reference is NFPA 20, Paragraph 7-1.2.2.
2) The above paragraph number (695-11) is tentative only. Extant text lacks paragraphs 695-8, -9, -11, and -13.
PANEL ACTION: Reject.
PANEL STATEMENT: The recommended material is presently covered by NEC Article 110 and NFPA 20 6-3.2.2.4. The recommedation re-introduces the term "withstand rating" not elsewhere used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1178)

15- 105 - (695-12(a)): Reject
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Revise by deleting references to transfer switches as follows:
"(a) Controllers ~~and Transfer Switches~~. Electric motor-driven fire pump controllers ~~and power transfer switches~~ shall be located as close as practicable to the motors that they control...".
SUBSTANTIATION: The fire pump controller includes the disconnecting means for the fire pump motor so there is no safety need for the transfer switch to be located within sight of the motor. In existing facilities where the fire pump is being added to the generator, it may not be possible to locate the transfer switch in the pump room. Since conduits to the fire pump room are required to be protected from fire, locating the transfer switch closer to either the normal or generator source of power reduces the installed cost by use of a common set of cables and conduit rather than two sets both fire protected. If both normal power and automatic operation of the transfer switch are lost, a manual operation of the transfer switch will not necessarily restore power. The automatic control of the transfer switch also starts and monitors availability of generator power. The manual means of transfer switch operation will not start a generator set that isn't running.
Installation is within the scope of the NEC, not NFPA 20.
PANEL ACTION: Reject.
PANEL STATEMENT: NFPA 20 6-6.4 requires that transfer of power shall take place within the pump room. "In-sight" provides for consideration of safe maintenance and emergency manual transfer.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1412)

15- 106 - (695-12(c)): Accept in Principle
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Storage batteries. Storage batteries for diesel engine drives shall be rack supported above the floor, secured against displacement, and located where they will not be subject to physical damage, excessive temperature, vibration, ~~mechanical injury,~~ or flooding with water.

SUBSTANTIATION: Same as proposal for Section 695-6(g). Additionally, this section only prohibits "excessive" mechanical injury which is not defined. What degree of damage is acceptable?
PANEL ACTION: Accept in Principle.
Rearrange revision to read:
Storage Batteries. Storage batteries for diesel engine drives shall be rack supported above the floor, secured against displacement, and located where they will not be subject to physical damage, flooding with water, excessive temperature or excessive vibration.
PANEL STATEMENT: All installations are subject to temperature and vibration; the rearrangement satisfies the intent of the submitter and clarifies that EXCESSIVE temperature and vibration are to be avoided
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1173)

15- 107 - (695-12(g) (New)): Reject
SUBMITTER: Morgan Chesnutt, Morgan Chesnutt, Inc.
RECOMMENDATION: Add new text to read:
(g) Controllers shall be installed for unobstructed access per 695-2.
SUBSTANTIATION: Many controllers are installed where access is beyond the pump, driver, piping, making access, especially emergency access, hazardous: steam from relief valve not working properly, engine overheating from hose break, pipe break and spraying water making crawling on floor or feeling the way with flashlight. I test and/or start-up many controllers per year, write reports, but it is worse.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed text is redundant; it is covered in 695-2 and 110-26.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #3060)

15- 108 - (695-14(a)): Accept in Principle in Part
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Add a new phrase in the first sentence and add a new last sentence:
[x](a) Control Circuit Failures.[x] External control circuits that extend outside the fire pump room shall be arranged so that failure of any external circuit (open or short circuit) shall not prevent the operation of a pump(s) from all other internal or external means. Breakage, disconnecting, shorting of the wires, or loss of power to these circuits may cause continuous running of the fire pump, but shall not prevent the controller(s) from starting the fire pump(s) due to causes other than these external control circuits. All control conductors within the fire pump room that are not fault tolerant (that is, breaking or shorting could disable the controller from starting) shall be protected against mechanical injury.
SUBSTANTIATION: The purpose of this proposal is to alert the CMP that new extract material is included in NFPA 20-1999 (7-5.2.6, External Circuits Connected to Controllers) which needs to be incorporated in NFPA 70. This proposal accomplishes that.
PANEL ACTION: Accept in Principle in Part.
Revise the submitter's recommendation to read as follows:
Add a new phrase in the first sentence and add a new last sentence:
[x](a) Control Circuit Failures.[x] External control circuits that extend outside the fire pump room shall be arranged so that failure of any external circuit (open or short circuit) shall not prevent the operation of a pump(s) from all other internal or external means. Breakage, disconnecting, shorting of the wires, or loss of power to these circuits may cause continuous running of the fire pump, but shall not prevent the controller(s) from starting the fire pump(s) due to causes other than these external control circuits. All control conductors within the fire pump room that are not fault tolerant shall be protected against physical damage.[NFPA 20 1999, 7-5.2.5]
PANEL STATEMENT: The statement in parentheses was eliminated because the definition introduced by Proposal 15-78 explains the concept. The term mechanical injury was replaced by physical damage to be consistent with 15-100 and 15-106 in compliance with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #1044)

15- 109 - (695-14(b), FPN (New)): Reject
SUBMITTER: James L. Boyer, Firetrol, Inc.
RECOMMENDATION: Add new text:
FPN: This excludes those sensors which may be factory installed in the listed fire pump controller.
SUBSTANTIATION: NFPA 20-1999 7-4.5.6 Exception now permits loss-of-phase sensors to prevent the controller from attempting to start a three-phase motor under loss of phase condition. These are to be ONLY in the Listed factory assembled fire pump controller, not field installed.
PANEL ACTION: Reject.
PANEL STATEMENT: The FPN is not enforceable. Refer to the panel action on Proposal 15-110.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #374)

15- 110 - (695-14(b), Exception (New)): Accept
SUBMITTER: Manuel J. DeLerno, S-P-D Industries Inc.
RECOMMENDATION: Add an exception to read as follows:
Exception: Phase loss sensor(s) shall be permitted only as a part of a listed fire pump controller.
SUBSTANTIATION: No phase loss sensor(s) should be field installed because of the high probability of misapplication.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #CP1504)

15- 110a - (695-14(d)): Accept
SUBMITTER: CMP 15
RECOMMENDATION: Replace the words "mechanical injury" with "physical damage"
SUBSTANTIATION: The words are changed to be consistent with the terminology used in the NEC.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

(Log #2982)

15- 111 - (695-14(e)): Reject
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:
(e) Electric Fire Pump Control Wiring Methods. All electric motor-driven fire pump control wiring shall be in rigid metal conduit, intermediate metal conduit, liquidtight flexible metal conduit, Schedule 80 Rigid PVC Conduit, or Type MI cable.
SUBSTANTIATION: This proposal adds Schedule 80 Rigid Nonmetallic Conduit as an approved raceway for control wiring.
The UL Fact Finding Report on Schedule 80 Rigid PVC Conduit, 97NK31953, dated October 17, 1997, was first introduced to Panel 15 at the ROC for the 1999 NEC. It should be noted that all product exceeded the product standard's physical requirements. It should also be noted that Rigid Metal (aluminum) Conduit was selected for the comparison for its superior physical properties compared to the other approved pump wiring methods such as intermediate metal conduit, liquidtight flexible metal conduit or Type MI cable. 2-in. Schedule 80 Rigid PVC Conduit is used compared to the 1 1/2-in. Rigid Metal (aluminum) Conduit since a grounding conductor would

be required in the Schedule 80 Rigid PVC Conduit increasing its wirefill.

The UL Fact Finding Report compares Schedule 80 Rigid PVC Conduit to Rigid Metal (aluminum) Conduit. Three types of tests were performed on these products, Impact, Crush, and Flammability. It should be noted that the test values for both Impact and Crush were increased from the product standards so that an electrical short would occur.

In both impact and crush testing Schedule 80 Rigid PVC Conduit satisfactorily protected the conductors in the conduit compatible, if not better than, to Rigid Metal (aluminum) Conduit. In the Flammability test, the integrity of the circuit remained with the Schedule 80 Rigid PVC Conduit as long as it would with the Rigid Metal (aluminum) Conduit.

The UL Fact Finding Report does provide sufficient technical substantiation that Schedule 80 Rigid PVC Conduit will resist physical damage equally to those wiring methods currently listed.

Note: Supporting material available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Proposal 15-98.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 14

NEGATIVE: 4

EXPLANATION OF NEGATIVE:

AMOS: See my Explanation of Negative Vote on Proposal 15-98.

GLENN: I am voting against the panel action to reject this proposal. The submitter provided adequate documentation in the form of a UL fact-finding report that supports the acceptance of schedule 80 rigid nonmetallic conduit to be installed for electric motor-driven fire pump control wiring.

During the last code cycle, I voted against the panel when they rejected this same proposal. During the last code cycle, the panel was concerned about workman working around the conduit and that the conduit could be easily damaged. UL lists Schedule 80 RNMC as being resistant to physical damage and as being acceptable for electrical conduit installations. Now during this code cycle, the panel mistakenly concluded that the tests using 2 in. RNMC and 1 1/2 in. RMC were not equivalent and that UL choose the 2 in. because of its greater strength characteristics. UL selected the 2 in. RNMC based on equivalent wire sizing for the two types of conduit installations. The RNMC would require an additional ground wire while the RMC would not. The impact tests clearly show that the number of shorted wires in the RNMC conduit was as good as the GRC. The number of shorts during the crush test was exactly the same for both the RNMC and the RMC. The results of the flammability test for the 1/2 in. trade size were essentially the same. Although the flammability test time for the 1 1/2 in. RMC averaged 24 minutes, the lowest failure times for all the tests where essentially the same. The panel's statement that "the larger sizes of conduit used clearly shows that PVC does not equal GRC" is not the question. The question is not whether or not PVC equals GRC, but is RNMC safe for this application. The UL listing and the fact finding report clearly supports the safe use of RNMC for this application. It is also evident that the RNMC does a much better job of preventing the conduction of heat into the internal wiring. There is no sound reason for not including schedule 80 rigid nonmetallic conduit for this application.

HIRSCHLER: See my Explanation of Negative Vote on Proposal 15-98.

KOVACIK: See my Explanation of Negative Vote on Proposal 15-98.

(Log #2983)

15- 112 - (695-14(e)): Accept

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions

RECOMMENDATION: Revise text as follows:

(e) Electric Fire Pump Control Wiring Methods. All electric motor-driven fire pump control wiring shall be in rigid metal conduit, intermediate metal conduit, liquidtight flexible metal conduit, Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B), or Type MI cable.

SUBSTANTIATION: This proposal adds Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) as an approved raceway for control wiring.

The UL Fact Finding Report on Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B), 97NK31950, dated October 17, 1997, was first introduced to Panel 15 at the ROC for the 1999 NEC. It should be noted that all product exceeded the product standard's physical requirements. 2-in. Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) is used compare to the 1 1/2-in. Liquidtight Flexible Metal Conduit since a grounding conductor would be required in the Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) increasing its wirefill.

The UL Fact Finding Report compares Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) to Liquidtight Flexible Metal Conduit. Three types of tests were performed on these products, Impact, Crush, and Flammability. It should be noted that the test values for both Impact and Crush were increased from the product standards so that an electrical short would occur.

In both impact and crush testing Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) satisfactorily protected the conductors in the conduit compatible, if not better than, to Liquidtight Flexible Metal Conduit. In the Flammability test, the integrity of the circuit remained with the Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) as long as it would with the Liquidtight Flexible Metal Conduit.

Based on the data from this Fact Finding Report, Panel 15 accepted Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) as an approved pump wiring raceway for the 1999 NEC, Section 695-6(e).

The UL Fact Finding Report does provide sufficient technical substantiation that Liquidtight Flexible Nonmetallic Conduit Type B (LFNC-B) will resist physical damage equally to those wiring methods currently listed.

Note: Supporting material available for review at NFPA Headquarters.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

(Log #2996)

15- 113 - (695-14(e)): Reject

SUBMITTER: James Conrad, Rockbestors-Surprenant Cable Corp.

RECOMMENDATION: Revise Section 695-14(e) as follows:

All electric motor-driven fire pump control wiring shall be in rigid metal conduit, intermediate metal conduit, liquidtight flexible metal conduit, or Type MI cable, or Type MC cable having a smooth or corrugated sheath.

SUBSTANTIATION: It appears that the code is asking for some degree of mechanical protection as well as protection against liquids; while affording the installer the ability to maintain a flexible connection between the controller and the pump motor. Type MC cable having a smooth or corrugated sheath offers both mechanical and liquidtight protection in a flexible cable.

PANEL ACTION: Reject.

PANEL STATEMENT: There is no technical substantiation offered that Type MC cable is equivalent to presently accepted wiring methods. See also panel action on Proposal 15-99.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

(Log #284)

15- 114 - (695-14(f) (New)): Accept in Principle

SUBMITTER: Gerald N. Scampoli, Rosemont Engineering Inc.

RECOMMENDATION: Add new text to read:

695-14 Control Wiring.

(f) Generator Control Wiring Methods. Control conductors installed between the Fire Pump Power Transfer Switch and the Back-up Generator supplying the Fire Pump during normal power loss shall be kept entirely independent of all other wiring. They shall be protected to resist potential damage by fire or structural failure. They shall be permitted to be routed through a building(s) encased in 2 in. (50.8 mm) of concrete or within enclosed construction dedicated to the Fire Pump circuits and having a minimum a 1-hour fire resistance rating, or circuit protective systems with a minimum of 1-hour fire

resistance. The installation shall comply with any restrictions provided in the listing of the electrical circuit protective system used.
SUBSTANTIATION: Loss of the "start" conductors for the Fire Pump back-up generator during a fire, when the normal power is likely to be lost, could lead failure of the generator to start and to loss of sprinkler protection to the entire building. One hour fire rated wiring methods are already required for the conductors supplying in the normal and emergency power to the fire pump. It is not unreasonable to require the generator control wiring to be protected in a similar manner.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation as follows:
Replace "Back-Up Generator" with "standby generator."
Change the order of units from "2 in. (50.8 mm)" to "50 mm (2 in.)"
PANEL STATEMENT: Meets the submitter's intent and maintains consistent use of "standby generator."
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18

ARTICLE 700 — EMERGENCY SYSTEMS

(Log #2348)

15- 115 - (700-1, FPN No. 3): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Revise text in FPN No. 3 as follows, delete text that is struck out.
FPN No. 3: Emergency systems are generally installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of persons, such as hotels, theaters, sports arenas, health care facilities, and similar institutions. ~~Emergency systems may also provide power for such functions as ventilation where essential to maintain life, fire detection and alarm systems, elevators, fire pumps, public safety communications systems, industrial processes where current interruption would produce serious life safety or health hazards, and similar functions.~~
SUBSTANTIATION: This is an effort to clarify that only those systems that are classified by the Authority(s) Having Jurisdiction (AHJ) as emergency systems are permitted on an emergency system. FPN No. 3 has been interpreted to permit many systems that are in fact legally required standby systems on the emergency system, thus reducing the reliability of the emergency system. An example would be placing an elevator that is required by a model code to be on a "standby system" on the emergency system that provides emergency egress lighting.
It is believed by many that when a model code requires equipment to be supplied by a "standby system" the equipment may be placed on the emergency system because FPN No. 3 lists some or even all of that equipment. NEC 90-5(c) clearly states that the FPN(s) are not enforceable, they are informational, yet when confronted with this, the common reply is that the FPN shows the intent of the NEC. The NEC is written so that it may be used with many model codes, due to this, it can not specify which equipment is to be supplied by emergency, legally required or for that matter optional standby systems, again this is done by the AHJ per 700-1 and 701-2.
It must be clarified that the National Electrical Code does not determine what loads are to be placed on the emergency or legally required systems. This is to be done by the Authority Having Jurisdiction which may use any model building code to make the determination. Once the authority having jurisdiction has made a determination as to what equipment must be place on an emergency or legally required system, the NEC then dictates how those systems must be installed, if in fact the NEC has been adopted by the authority having jurisdiction.
As an example, if a Jurisdiction adopted model building code "XYZ" and that code stated in section 123-1 "Standby systems shall supply the following equipment: Smoke control, elevators, and all paths of egress." In that same code "XYZ" section 124-1 states "The following are classified as emergency systems, Exit signs, egress illumination that serves an occupant load of X occupants. These systems must be available in 10 seconds". In this example per NEC 700-1 and NEC 701-2, the first system (section 123-1) would be a legally required standby system (NEC 701) due to the fact that the authority having jurisdiction by adoption of code "XYZ" has required the equipment be placed on a standby system. In section 124-1 of code "XYZ" it has been clearly stated that these are emergency loads. Since code "XYZ" classified these as emergency, the system that supplies these must comply with NEC 700.
NOTE: This code "XYZ" is an imaginary code and uses verbiage that mimics some model codes, but is not verbatim from any model code, it is not the intent of this submittal to gain any clarification of any other code.
In the above example, these loads can not be supplied from the same system but may be supplied from the same power source per NEC 700-9(b). In other words two transfer switches would be required, one for the emergency system and one for the legally required system. This very closely mimics the Essential Electrical System required in some health care facilities, in which the life safety branch supplies a limited amount of equipment (again to insure reliability) and the critical branch.
By using multiple transfer switches to separate the emergency and legally required systems, the electrical system as a whole will become more complex and therefore the overall reliability of the system may suffer. It must be noted that the most critical part of the building electrical system, the emergency system, becomes more reliable by the exclusion of equipment, and since the equipment on the legally required system has been limited, it too becomes more reliable.
The intent here is not to mandate that power to the legally required system take 60 seconds to become available, that is a design consideration, if the designer wishes they may have that system available within 10 seconds, in fact, it would be permissible to design the legally required system to meet or exceed all the requirements of an emergency system, but, again the systems must be kept entirely separate from one another.
In the end the following should be clarified:
1. Limiting the amount of equipment on the emergency system will help its reliability.
2. The FPN(s) do not permit, mandate or instruct us to install any equipment on the emergency system, it is informational only.
3. FPN No. 3 is to illustrate that these are only examples of equipment that model codes may consider to be emergency loads.
4. The NEC is written to work with many different model codes in this respect, and again, the NEC does not determine what equipment is to be supplied by the emergency system.
5. The NEC only dictates the minimum requirements for emergency, legally required and optional standby systems.
PANEL ACTION: Reject.
PANEL STATEMENT: There is insufficient substantiation to prompt this code panel to eliminate the inclusion of any life safety function included in the referenced fine print note.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #1705)

15- 116 - (700-3, Exception (New)): Reject
SUBMITTER: A. Dan Chisholm, Healthcare Circuit News
RECOMMENDATION: Add the following:
"Exception: Factory assembled Emergency Power Supplies (EPS or Generators as defined by NFPA 110) meeting or exceeding design and testing specifications of NFPA 110, 101, and 99 where applicable."
SUBSTANTIATION: EPSs already meet design standards set forth in other NFPA standards and do not need additional approval from laboratories where the only result would be a higher cost of equipment with no increased benefits to life safety.
PANEL ACTION: Reject.
PANEL STATEMENT: Approval of equipment can only be issued by the Authority Having Jurisdiction. No electrical installation within the auspices of the NEC is exempt.
The proposed exception would circumvent the approval/listing process accepted universally.
Compliance to design standards is only substantiated by third party testing and is even then subject to approval by the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #3948)

15- 117 - (700-3, Exception (New)): Reject
SUBMITTER: Harry Patterson, Plantation General Hospital
RECOMMENDATION: Add the following exception:
Exception: Factory assembled emergency power supplies (EPS or generators as defined by NFPA 110) meeting or exceeding design and testing specifications of NFPA 110 and NFPA 99 where applicable.
SUBSTANTIATION: EPSs-generators already meet design standards set forth by NFPA and should not be subjected to additional testing which would result in increased equipment cost with no additional benefit to life safety.
PANEL ACTION: Reject.
PANEL STATEMENT: Approval of equipment can only be issued by the Authority Having Jurisdiction. No electrical installation within the auspices of the NEC is exempt.
The proposed exception would circumvent the approval/listing process accepted universally.
Compliance to design standards is only substantiated by third party testing and is even then subject to approval by the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #3949)

15- 118 - (700-3, Exception (New)): Reject
SUBMITTER: Russ Schilling, Plantation General Hospital
RECOMMENDATION: Add the following exception:
Exception: Factory assembled emergency power supplies (EPS or generators as defined by NFPA 110) meeting or exceeding design and testing specifications of NFPA 110 and NFPA 99 where applicable.
SUBSTANTIATION: EPSs already meet design standards set forth in other NFPA standards and do not need additional approval from laboratories where the only result would be a higher cost of equipment with no increased benefits to life safety.
PANEL ACTION: Reject.
PANEL STATEMENT: Approval of equipment can only be issued by the Authority Having Jurisdiction. No electrical installation within the auspices of the NEC is exempt.
The proposed exception would circumvent the approval/listing process accepted universally.
Compliance to design standards is only substantiated by third party testing and is even then subject to approval by the authority having jurisdiction.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #4406)

15- 119 - (700-3, Exception (New)): Reject
SUBMITTER: Terry Marsh, Centex-Rodgers Construction Co.
RECOMMENDATION: Add the following to 700-3:
Exception: Approval of generator sets and stationary combustion engines shall be in accordance with the Standard for Emergency and Standby Power Systems, NFPA 110, and Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37 respectively.
SUBSTANTIATION: By adding the exception to 700-3, it will clarify the standard by which approval of this specific equipment is gained. The authority having jurisdiction can use these standards in conjunction with NFPA 70 as the tools for determining if the equipment is approved for use on emergency systems. NFPA 37 and 110 contain not only testing and acceptance criteria, but also aid in determining if the equipment or component is approved for its intended use. Use of these standards for this purpose by the authority having jurisdiction also aligns itself with NFPA's ideas on determining the acceptability of installations, procedures, equipment, or materials..., "In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards." (excerpt from NFPA 110, A-2).
PANEL ACTION: Reject.
PANEL STATEMENT: The stated proposal is not an exception to the equipment approval requirements of section 700-3. There has been no evidence to suggest that the referenced standards are necessary to focus the authority having jurisdiction on the appropriate standards. NFPA 110 is already referenced in FPN No. 5 within the scope of Article 700 and NFPA 37 does not specifically apply to emergency systems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #1911)

15- 120 - (700-4): Reject
SUBMITTER: A. Dan Chisholm, Healthcare Circuit News
RECOMMENDATION: Add a sentence after the title, "Tests and Maintenance", which reads:
"For testing and maintenance procedures of Emergency Power Supply Systems (EPSSs), see NFPA 110, Standard for Emergency and Standby Power Systems".
SUBSTANTIATION: Presently there is a conflict between items (b), (c), and (d), and NFPA 110. By referring to NFPA 110 these conflicts will be eliminated.
PANEL ACTION: Reject.
PANEL STATEMENT: Since not all jurisdictions have adopted NFPA 110, not all requirements are applicable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2204)

15- 121 - (700-4): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(b) Tested Periodically. Systems shall be tested periodically on <u>an approved</u> ~~a~~a schedule ~~acceptable to the authority having jrusidiction~~ to ensure the systems are maintained in proper operating condition.
SUBSTANTIATION: "Approved" is defined in Article 100 of the NEC as "acceptable to the authority having jurisdiction."
"Standard terms have been established through accepted use or by definition and are to be used..." . [NEC Style Manual 3.2.4 Standard Terms]. "Approved" is listed as one of the standard terms in Annex B of the Style Manual and defined in the code; therefore, "approved" should be used in place of its definition.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal's language of "approved" would lead to controversy. The existing language needs to remain to ensure that the AHJ is the one who accepts the schedule.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #418)

15- 122 - (700-5(a)): Reject
SUBMITTER: Jack D. Echols, Baltes/Valentino California, Inc.
RECOMMENDATION: Add to 700-5(a):
This requirement is not to be construed as eliminating the use of 220-13 as a method of load calculation when sizing emergency generators.
SUBSTANTIATION: Problem: Code enforcement agencies are unsure as to how to proceed when confronted with load calculations using 220-13 for general use receptacles. Some argue that 180va for these receptacles are connected loads not to be considered diversifiable despite physical evidence to the contrary.
PANEL ACTION: Reject.
PANEL STATEMENT: Chapters 1 through 4 automatically apply to all other chapters except as modified by the other chapters. Refer to 90-3.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #CP1509)

15- 122a - (700-6): Accept
SUBMITTER: CMP 15
RECOMMENDATION: Revise 700-6 to read as follows:
700-6 Transfer Equipment.
(a) General. Transfer equipment, including automatic transfer switches, shall be automatic, identified for emergency use, and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources of supply in any operation of the transfer equipment.
(b) Bypass Isolation Switches. Means shall be permitted to bypass and isolate the transfer equipment. Where bypass isolation switches are used, inadvertent parallel operation shall be avoided.
(c) Automatic Transfer Switches. Automatic transfer switches shall be electrically operated and mechanically held.
(d) Use. Transfer equipment shall supply only emergency loads.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.
[The addition text resulting from panel action on Proposal 15-123 should also be added at the end of (a).]
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #4057)

15- 123 - (700-6(a)):
Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to remove the statement of intent from the Fine Print Note. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information. This action will be considered by the Panel as a Public Comment.
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.
RECOMMENDATION: Revise text as follows:
700-6. Transfer Equipment.
(a) Transfer equipment, including automatic transfer switches, shall be automatic, identified for emergency use, and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.
FPN: The purpose of this section is to protect the public, protect the electric system from catastrophic damage; and protect line workers from back feed while repairing supply lines.
SUBSTANTIATION: Operation of a generator in parallel with the supply system creates hazards to line workers, the public, and the generator unless the system is designed for parallel operation. Section 705-3 permits parallel operation of emergency systems with the normal source; however, there is no reference in Article 700 specifying that the requirements of Article 705 be met. Adding this language will clarify the requirement to comply with Article 705 when parallel operation is planned. This change will reduce the dangers. Adding the FPN will clarify the reasons for not permitting parallel operation.
PANEL ACTION: Accept in Principle.
Accept the submitter's recommendation but revise the proposed FPN to read as follows:
FPN: The purpose of this section is to protect the public, to protect line workers from back feed while repairing supply lines and to protect standby systems from catastrophic damage.
PANEL STATEMENT: The revision to the FPN revert the order of the information to improve the readibility.
It is recommended that the Technical Correlating Committee refer this proposal to CMP 4 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #CP1510)

15- 123a - (700-9(b)): Accept
SUBMITTER: CMP 15
RECOMMENDATION: Revise 700-9(b) to read as follows:
(b) Wiring. Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet. Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall be kept entirely independent of all other wiring and equipment, unless otherwise permitted in (1) through (4):
(1) Wiring from the normal power source located in transfer equipment enclosures
(2) Wiring supplied from two sources in exit or emergency lighting fixtures
(3) Wiring from two sources in a common junction box, attached to exit or emergency luminaires
(4) Wiring within a common junction box attached to unit equipment, containing only the branch circuit supplying the unit equipment and the emergency circuit supplied by the unit equipment
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #4465)

15- 124 - (700-9(b)(3)): Reject
SUBMITTER: Charles E. Pinkerman, Mentor, OH
RECOMMENDATION: Revise text as follows:
In a common junction box or raceway ~~attached to~~ supplying exit or emergency lighting fixtures, only the wiring ~~supplied from two sources~~ from the normal branch circuit supply and the emergency branch circuit supply shall be permitted.
SUBSTANTIATION: Section 700-9(b)(3) permits the use of two lamp exit or two lamp emergency fixtures where one lamp is connected to the normal supply and one lamp is connected to the alternate supply. This revision clarifies this section and also will allow the use of strut type raceways and two circuit manufactured wiring systems to be utilized for lighting circuit installations.
PANEL ACTION: Reject.
PANEL STATEMENT: The emergency system shall be kept entirely separate until it is at the device requiring emergency power. This will prevent inadvertent disruption of emergency wiring to the device on the emergency circuit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

Log #CP1511)

15- 124a - (700-9(d)): Accept
Note: The Technical Correlating Committee understands that this action is modified by the action on Proposal 15-125.
SUBMITTER: CMP 15
RECOMMENDATION: Revise 700-9(d) as follows:
(d) Fire Protection. Emergency systems shall meet the following additional requirements in assembly occupancies ~~greater~~ no less than 1000 persons or in buildings above ~~75 ft (23m)~~ 23m (75 ft) in height with any of the following occupancy classes: assembly, educational, residential, detention and correctional, business, and mercantile.
(1) Feeder-Circuit Wiring: Feeder-circuit wiring shall meet one of the following conditions:
(a) Be installed within buildings that are fully protected by an approved automatic fire suppression system
(b) Be a listed electrical circuit protective system with a minimum 1-hour fire rating
(c) Be protected by a listed thermal barrier system for electrical system components
(d) Be protected by a fire-rated assembly having a minimum fire rating of 1 hour
(e) Be embedded in ~~a minimum of~~ not less than 50mm (2 in.) ~~2 in. (50.8 mm)~~ of concrete

(f) Be a cable listed to maintain circuit integrity for ~~a minimum of~~ not less than 1 hour when installed in accordance with the listing requirements

(2) Feeder-Circuit Equipment: Equipment for feeder circuits (including transfer switches, transformers, panelboards ~~etc.~~) shall be located either in spaces fully protected by approved automatic fire suppression systems (including sprinklers, carbon dioxide systems ~~etc.~~) or in spaces with a 1-hour fire resistance rating.

FPN: For the definition of occupancy class, see Section 4-1 of Life Safety Code, NFPA 101-1997.

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
COMMENT ON AFFIRMATIVE:
VANNICE: In accepting the editing, we have inadvertently included exactly 1000 persons.

(Log #239)

15- 125 - (700-9(d)): Accept in Part

NOTE: The following proposal consists of Comment 15-117 on Proposal 15-130a in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 15-130a was:

Revise existing Section 700-9(c)(1) to read as follows:

"(1) Feeder-circuit wiring shall meet one of the following conditions:

(a) Be installed within buildings that are fully protected by an approved automatic fire suppression system

(b) Be a listed electrical circuit protective system with a minimum 1-hour fire rating.

(c) Be protected by a listed Thermal Barrier System for Electrical System Components.

(d) Be protected by a fire-rated assembly having a minimum fire rating of 1-hour.

(e) Be embedded in a minimum of 2 inches (50.8 mm) of concrete."

SUBMITTER: Jim Milne, BICC Pyrotenax
RECOMMENDATION: Revise 700-9(c)(1) as follows:

(d) Be protected by a fire-rated assembly designed and listed to achieve a minimum fire rating of 1 hour.

SUBSTANTIATION: Sections (b) and (c) of Proposal 15-130a recognize the need for third party testing and listing for the critical circuits covered in this section. These methods have been specifically tested for their ability to keep critical wiring functional during fire conditions and receive listing on the basis of performance during these tests. The same criteria must apply for the fire-rated assemblies mentioned in (d) of the proposal. Without this, there can be no confidence in the survivability of the emergency wiring during a fire.
PANEL ACTION: Accept in Part.
In the submitter's recommended text delete the words "designed and".
PANEL STATEMENT: The correct section reference is 700-9(d)1(d). The words have been deleted because the intent of the design is not relevant as the listing already encompasses the design.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #488)

15- 126 - (700-9(d), 700-9(d)(1)(e), 700-12, 700-12(e)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 700-9(d) - change "75 ft (23 m)" to "23 m (75 ft)"

700-9(d)(1)(e) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"

700-12, fourth paragraph - change "75 ft (23 m)" to "23 m (75 ft)"

700-12(e), last paragraph before Exception - change "3 ft (914 mm)" to "900 mm (3 ft)"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #3766)

15- 127 - (700-9(d)(1)): Reject
SUBMITTER: L. James Milne, BICCGeneral
RECOMMENDATION: Revise as follows:

Fire Protection. Emergency systems shall meet the following additional requirements in assembly occupancies greater than 1000 persons or in buildings above 75 ft (23 m) in height with any of the following occupancy classes: assembly, educational, residential, detention and correctional, business, and mercantile.

1. Feeder-circuit wiring shall meet one of the following conditions:

a. Be installed within buildings that are fully protected by an approved automatic fire suppression system.

b. Be a listed electrical circuit protective system with a minimum 1-hour fire rating.

c. Be protected by a listed thermal barrier system for electrical system components.

~~d. Be protected by a fire-rated assembly having a minimum fire rating of 1 hour~~

d. Be embedded in a minimum of 2 in. (50.8 mm) of concrete

e. Be a cable listed to maintain circuit integrity for a minimum of 1 hour when installed in accordance with the listing requirements.

SUBSTANTIATION: The 1996 National Electrical Code took an enormous step forward in the area of life safety by requiring emergency feeders to be protected from fire for a period of one hour. However, the 1996 NEC was substantially weakened in the 1999 version. In the 1996 NEC, fire protection of emergency feeders had to be achieved using "listed electrical circuit protective systems with a minimum of 1-hour fire resistance" or be installed in "spaces fully protected by approved automatic fire suppression systems". Electrical circuit protective systems are required to pass a fire endurance test and subsequent fire hose test at a recognized testing facility like Underwriters Laboratories. In addition to electrical circuit protective systems, the 1999 NEC allows a "fire-rated assembly having a minimum fire rating of 1 hour" to be used. The most common of these fire rated assemblies would be gypsum board enclosures. This additional method of compliance is concerning for the following reasons:

• Lack of 3rd Party Testing. Gypsum board does not have a UL listing for electrical circuit protection but rather is used to achieve fire separation. The UL Building Materials Directory lists several electrical circuit protective systems and gives specific installation requirements. This sort of control is essential to assure the highest quality installation of wiring that safeguards human life and property. Even the 1999 National electrical Code Handbook states: "It is important to understand the difference between a 1-hour fire rating of an electrical cable and a 1-hour fire resistance rating of a structural member, such as a wall. Simply stated, at the end of a 1-hour fire rating test on an electrical cable, the circuit and its insulation must be intact and electrically functioning. (No short circuits, grounds, or opens are permitted.) However, a wall subjected to a 1-hour fire resistance test must only prevent a fire from passing through or past the wall, without regard to damage to the wall. All fire ratings and fire-resistance ratings are based on the assumption that the structural supports for the assembly are not impaired by the effects of fire." The Underwriters Laboratories Fire Resistance Directory contains a similar warning — "All ratings are based on the assumption that the stability of structural members supporting the assembly are not impaired by the effects of fire. The extent of damage of the test assembly at the rating time is not a criteria for the rating." By requiring emergency feeders to be a listed electrical circuit protective system, there is assurance that the method used has been subjected to testing that confirms survival of this critical wiring during a fire emergency. By allowing gypsum board enclosures, compliance moves from distinct, tested methods to vague options subject to a wide spectrum of interpretation. Something as important as this demands specific means of compliance and backing by appropriate tests related directly to the protection of electrical wiring.

• Difficult to Inspect. The enclosure is constructed in the field often under less than ideal conditions. In many cases the enclosure is

constructed by the general contractor (not the electrical contractor) who may not fully appreciate the role of the enclosure, viewing it as "putting up a little more sheet rock", an inexpensive and ineffective solution. The quality of the enclosure can be very difficult to inspect in the limited access areas so common in retrofit installations.

• Compliance Conflicts. When gypsum enclosures are used it is very difficult to comply with Article 346-11 Bends Number in One Run while meeting the requirements of Article 370-29 Conduit Bodies, Junction, Pull, and Outlet Boxes to be Accessible. In a conduit run, there can be no more than the equivalent of four quarter bends (360° total) between pull points, e.g. conduit bodies and boxes. If the installation mandates pull boxes, the pull boxes can't be inside the gypsum enclosure and still be "rendered accessible without removing any part of the building..." as stated in 370-29.

• System Easily Compromised. Even if properly constructed, the fire resistance of a typical gypsum enclosure can easily be compromised after the installation and often is. The photographs I have provided show how an additional conduit was run through the gypsum enclosure (the shortest routing), completely negating any fire rating it may have had. In most cases this goes unnoticed, resulting in a severely compromised emergency system.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The option of one hour fire-resistant construction rating needs to remain. What happens after the original installation is not part of the NEC. Any wiring methods or protection can be compromised after the original installation.

Access to the conduit system can be acheived through a one hour rated access panel.

Also refer to the panel actions and statements on Proposals 15-95 and 15-125.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #3767)

15- 128 - (700-9(d)(1)): Reject

SUBMITTER: L. James Milne, BICCGeneral

RECOMMENDATION: Revise as follows:

Feeder-circuit wiring shall meet one of the following conditions:

a. Be installed within buildings that are fully protected by an approved automatic fire suppression system.

b. Be a listed electrical circuit protective system with a minimum ~~1~~ 2-hour fire rating.

c. Be protected for 2 hours by a listed thermal barrier system for electrical system components

d. Be protected by a fire-rated assembly having a minimum fire rating of 1 2 hours.

e. Be embedded in a minimum of ~~2~~ 5 in. (50.8 mm) of concrete.

f. Be a cable listed to maintain circuit integrity for a minimum of ~~1~~ 2 hours when installed in accordance with the listing requirements.

SUBSTANTIATION: Section 700-12(b)(2) of the 1999 NEC states: "Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with an on-premise fuel supply sufficient for not less than 2 hours full demand operation of the system." Building codes in the US and Canada have the same requirement. This proposal would assure the emergency feeder circuit wiring would survive at least as long as the emergency generator.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation does not provide evidence of a relationship between the required 2 hour fuel supply and the 2 hour fire rating.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #4091)

15- 129 - (700-9(d)(1), FPN (New)): Reject

SUBMITTER: L. James Milne, BICCGeneral

RECOMMENDATION: Add the following Fine Print Note:

Fire Protection. Emergency systems shall meet the following additional requirements in assembly occupancies greater than 1000 persons or in buildings above 75 ft (23 m) in height with any of the following occupancy classes: assembly, educational, residential, detention and correctional, business, and mercantile.

(1) Feeder-circuit wiring shall meet one of the following conditions:

(a) Be installed within buildings that are fully protected by an approved automatic fire suppression system*

(b) Be a listed electrical circuit protective system with a minimum 1-hour fire rating

(c) Be protected by a listed thermal barrier system for electrical system components

(d) Be protected by a fire-rated assembly having a minimum fire rating of 1 hour

(e) Be embedded in a minimum of 2 in. (50.8 mm) of concrete

(f) Be a cable listed to maintain circuit integrity for a minimum of 1 hour when installed in accordance with the listing requirements

FPN: See NFPA 13, Standard for the Installation of Sprinkler Systems, for details on buildings fully protected by sprinkler systems.

SUBSTANTIATION: This cross reference would serve as a reminder that there are criteria that must be met for a building to be considered fully protected.

PANEL ACTION: Reject.

PANEL STATEMENT: NFPA 13 may not have been adopted by all jurisdictions and also contains much material that is not concerned with the electrical system.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #1176)

15- 130 - (700-12): Reject

SUBMITTER: Lawrence A. Bey, Onan Corp.

RECOMMENDATION: In the last sentence of the last paragraph of 700-12, revise as follows:

"...shall be installed either in ~~spaces~~ buildings fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, etc.) or in ~~spaces~~ rooms with a 1-hr fire rating."

SUBSTANTIATION: For editorial consistency with the change made to 700-9(d)(1)(a) last cycle.

PANEL ACTION: Reject.

PANEL STATEMENT: The term space is the appropriate term and there is no need to require protection for the entire building. The submitter's inclusion of the whole building changes the requirements without substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #1136)

15- 131 - (700-12, Exception (New)): Reject

SUBMITTER: Thomas F. Leake, Giant Food Inc. of Maryland

RECOMMENDATION: Add a new Exception to read:

Exception: When the branch circuit feeding normal lighting in the local area of the unit equipment originates in a panel that is contactor controlled, provision shall be made to allow normal off-hour operation of the normal lighting while not energizing the unit equipment. The unit equipment shall energize under loss of voltage source to the normal lighting equipment panel.

SUBSTANTIATION: In a general sales area of a mercantile store, lighting is generally accomplished by contactor controlled lighting panels. These panels, in effect, simulate a power outage under normal off-hour operation by deenergizing the entire panel. Unit equipment attached to a branch circuit from this type of panel would energize at end of day store illumination. The unit equipment would operate for the 1 1/2 hour specified time and then cease to function until recharged when the circuit is reenergized at store normal hours. The unit equipment device would not be able to operate as intended if not isolated to a constant voltage source circuit.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: The suggested exception would defeat the connection of unit equipment to the branch circuitry serving the normal lighting in the area requiring emergency lighting.

The existing exception to 700-12(e) permits a separate circuit for unit equipment. Your circumstance could easily be solved with a contactor panelboard with two busses; one contactor controlled and one normally on.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #4261)

15- 132 - (700-12, Exception (New)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add an Exception after the first paragraph as follows:
Exception: A fire pump shall be permitted to use a connection ahead of the service disconnecting means in accordance with Section 695-3(a)(1).
SUBSTANTIATION: This proposal corrects a lack of correlation between this article and Article 695 on the issue of whether a tap can be made ahead of a service main as a fire pump source. Some contend that there is no conflict, since the source in Article 695 is the normal source for the fire pump.
In general, it is true that Article 700 only applies to an emergency system when it is functioning in that mode, which is why the first paragraph of Section 700-1 uses the words "when the normal electrical supply or system is interrupted".
This means that a normal circuit to egress lighting, for example, need not comply with Article 700, provided that the full electrical circuit pathway to that lighting was arranged so as to comply with Article 700 during an outage. This train of logic might seem to support the view that a since the tap ahead of the main is the normal source for a fire pump, it need not comply with Article 700.
The fallacy in this is that in the case of a fire pump, where the reliability of the service connection is cited as the basis for not needing a standby generator as provided in Section 695-4(a), the tap ahead of the main is the standby source as well as the normal source. In other words, if the tap ahead of the main is augmented by a standby generator, then the circuiting to the fire pump from that generator becomes the Article 700 circuit. Suppose there is no generator due to a finding that the utility service connection is reliable, as is often the case in metropolitan areas with networked utility grids. Now that tap ahead of the main becomes not only the normal source, but also, in effect, the standby source as well.
The next question is whether the fire pump is properly classified as an emergency load. That depends on local rulemaking, as covered in the second paragraph of Section 700-1. Note that that paragraph doesn't only apply to lighting, but also power circuits. There are many instances where local rules will classify a fire pump as an emergency load, which is why they are specifically mentioned in Section 700-1, (FPN No. 3).
Therefore, if the fire pump is legally mandated equipment for life-safety purposes (usually), and if the fire pump has no other supply (depends on facility design and local conditions), then Article 700 will apply to the circuiting. The literal result will be to disallow the tap ahead of the main, because the rules in Chapters 6 and 7 are of equal rank. In this case the only way to comply with both chapters is to use a separate service [complies with Section 700-12(d) if the authority having jurisdiction goes along], or to use a standby generator that the system doesn't need in terms of its previously judged reliability [complies with Section 695-4(a)]. That is unfortunate.
Every consideration needs to be given to allowing this particular tap ahead of the main, even in cases where a jurisdiction had a policy of never approving such sources for emergency circuits. Remember, the fire pump provisions are based on concerns about firefighters deciding to disconnect the building and ending up opening every service switch including the fire pump disconnect. In this unique case, this is a problem with reliability of human behavior and not with the reliability of a utility power grid. The prospect of a utility outage is covered in different provisions in Article 695. This proposal addresses these technical issues through a very simple exception.
The panel rejected this in the previous cycle, saying that the tap ahead of the main wasn't an acceptable emergency source. As we took great pains to point out in the proposal, however, and do so again, when the fire pump is running in a municipality that has designated it by law as an emergency load, its source becomes, at that moment, an emergency system. To say otherwise is to say that an emergency load need not be connected to an emergency source. This section and Section 695-3(a) need better correlation. In general taps ahead of a service main don't work in any meaningful way, but this is a very unique load that has an entirely different set of technical assumptions governing its connections.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal allows a tap ahead of the service as emergency power. A tap ahead of the main is not considered emergency power by 700-12, only as normal power.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2281)

15- 133 - (700-12 Exception No. 2 (New)): Reject
SUBMITTER: Sal Reina, Reina Electric
RECOMMENDATION: Add Exception No. 2 to Section 700-12(e):
"The branch circuit feeding the unit equipment shall be the same branch circuit as that feeding the normal lighting in the area..."
Add exception – "It shall be permitted to have the emergency lighting unit served by the same branch circuit serving the smoke detectors where the smoke detectors have been retrofitted subsequent to the completion of the structure and have no other loads on this circuit."
SUBSTANTIATION: The general input of this section is that there be emergency lights when there is a power failure. However, in existing apartment buildings the hall lights have general utility receptacles on the same circuit as the hall lights. Retrofitted interconnected smoke detectors are on a dedicated circuit with no other loads; since this is already an emergency circuit, adding emergency lights provide a safer emergency lighting situation. Often hall lights have other loads and are often on time clocks. Installation of emergency lights in these situations require extensive and costly installations and provide no greater safety.
PANEL ACTION: Reject.
PANEL STATEMENT: The connection of unit equipment to the same branch circuit that supplies normal lighting in any given area is required so that a loss of power to normal lighting will energize emergency lighting automatically. Connection of unit equipment to any other branch circuit would circumvent this operation.
Article 760 covers fire alarm systems. The proposal does not comply with 760-10 or 760-26(b).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #CP1512)

15- 133a - (700-12(b)): Accept
SUBMITTER: CMP 15
RECOMMENDATION: Revise 700-12(b) to read as follows:
(b) Generator Set.
(1) Prime Mover-Driven. For a generator set driven by a prime mover acceptable to the authority having jurisdiction and sized in accordance with Section 700-5, means shall be provided for automatically starting the prime mover on failure of the normal service and for automatic transfer and operation of all required electrical circuits. A time-delay feature permitting a 15-minute setting shall be provided to avoid retransfer in case of short-time reestablishment of the normal source.
(2) Internal Combustion Engines as Prime Movers. Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with an on-premise fuel supply sufficient for not less than 2 hours full-demand operation of the system. Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, this pump shall be connected to the emergency power system.
(3) Dual Supplies. Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or municipal water supply for their cooling systems. Means shall be provided for automatically transferring from one fuel supply to another where dual fuel supplies are used.

Exception: Where acceptable to the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

(4) Battery Power and Dampers. Where a storage battery is used for control or signal power, or as the means of starting the prime mover, it shall be suitable for the purpose and shall be equipped with an automatic charging means independent of the generator set. Where the battery charger is required for the operation of the generator set, it shall be connected to the emergency system. Where power is required for the operation of dampers used to ventilate the generator set, the dampers shall be connected to the emergency system.

(5) Auxillary Power Supply. Generator sets that require more than 10 seconds to develop power shall be permitted if an auxiliary power supply energizes the emergency system until the generator can pick up the load.

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2205)

15- 134 - (700-12(b) and (d)): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:

(b) Generator Set.

1. A generator set driven by a prime mover approved ~~acceptable to the authority having jurisdiction~~ and sized in accordance with Section 700-5...

(d) Separate Service. Where approved ~~acceptable to the authority having jurisdiction~~ as suitable for use as an emergency source, a second service shall be permitted...

SUBSTANTIATION: "Approved" is defined in Article 100 of the NEC as "acceptable to the authority having jurisdiction."

"Standard terms have been established through accepted use or by definition and are to be used...". [NEC Style Manual 3.2.4 Standard Terms]. "Approved" is listed as one of the standard terms in Annex B of the Style Manual and defined in the code; therefore, "approved" should be used in place of its definition.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal's language of "approved" would lead to controversy. The existing language needs to remain to ensure that the AHJ is the one who accepts the installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #1181)

15- 135 - (700-12(b)(6) and 701-11(b)(5)): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.

SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Add a new 700-12(b)(6) and 701-11(b)(5) as follows:

"Where an outdoor housed generator set equipped with a generator disconnecting means according to 445-10 supplies a building or structure, an additional disconnecting means where ungrounded conductors pass through the building or structure shall not be required."

SUBSTANTIATION: Some inspection authorities are using Article 225-31 to require a disconnecting means where conductors from an outdoor generator set pass through the building, regardless of whether or not the generator is supplied with a disconnecting means. This then puts two disconnecting means in series in the generator output, which has an adverse effect on system reliability.
PANEL ACTION: Accept in Principle.
Add a new 700-12(b)(6) and 701-11(b)(5) as follows:

"Where an outdoor housed generator set equipped with a readily accessible disconnecting means supplies a building or structure, an additional disconnecting means shall not be required where ungrounded conductors pass through the building or structure."

PANEL STATEMENT: The revised text more clearly expresses the requirement and meets the intent of the submitter. The term readily accessible was included because the disconnecting means needs to be readily accessible.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
COMMENT ON AFFIRMATIVE:
FLACH: Change "pass through" to "enter", or add enter or before "pass through".

(Log #3437)

15- 136 - (700-25, FPN): Accept in Principle
SUBMITTER: Erik Swendsen, Pierce, SD
RECOMMENDATION: Change the FPN to a second paragraph. "Fuses and circuit breakers for emergency circuit overcurrent protection, shall be coordinated to ensure selective clearing of fault currents."
SUBSTANTIATION: This is a safety issue. As is currently written, the emergency system can be designed and installed with a built-in blackout. When the owner pays for an emergency system, he or she expects a system that will not shut down because of an insignificant short in a branch circuit. Both fuses and circuit breakers are available to meet this proposed requirement. Fuses can be coordinated by using ratio charts and circuit breakers have adjustable instantaneous trips, short time delay and zone selective interlocking to help them coordinate. Why pay good money for an emergency system if we are going to allow a design-in black-out?
PANEL ACTION: Accept in Principle.
Delete the FPN and add a new 700-26 to read as follows:

"700-26 Coordination. Fuses and circuit breakers for emergency circuit overcurrent protection shall be coordinated to selectively clear fault currents."

Renumber existing 700-26 to 700-27.
PANEL STATEMENT: The revised text more clearly expresses the requirement and meets the intent of the submitter. The requirement was added in a new section because the requirement is not related to accessibility.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
BOYER: This change from an informative Fine Print Note (FPN) to a mandatory requirement is restrictive and goes beyond the intent of the existing FPN.

ARTICLE 701 — LEGALLY REQUIRED STANDBY SYSTEMS

(Log #1910)

15- 137 - (701-5): Reject
SUBMITTER: A. Dan Chisholm, Healthcare Circuit News
RECOMMENDATION: Add identical wording as recommended in my proposal for 700-4.
SUBSTANTIATION: See my recommendation for Proposal 700-4.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action and statement on Proposal 15-120.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2206)

15- 138 - (701-5(b)): Reject

SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.

RECOMMENDATION: Revise as follows:

(b) Tested Periodically. Systems shall be tested periodically on a schedule and in an approved ~~a~~ manner ~~acceptable to the authority having jurisdiction~~ to ensure the systems are maintained in proper operating condition.

SUBSTANTIATION: "Approved" is defined in Article 100 of the NEC as "acceptable to the authority having jurisdiction."

"Standard terms have been established through accepted use or by definition and are to be used...". [NEC Style Manual 3.2.4 Standard Terms]. "Approved" is listed as one of the standard terms in Annex B of the Style Manual and defined in the Code; therefore, "approved" should be used in place of its definition.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal's language of "approved" would lead to controversy. The existing language needs to remain to ensure that the AHJ is the one who accepts the schedule.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #CP1513)

15- 138a - (701-7): Accept

SUBMITTER: CMP 15

RECOMMENDATION: Revise 701-7 to read as follows:

701-7. Transfer Equipment.

(a) General. Transfer equipment, including automatic transfer switches, shall be automatic and identified for standby use and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment.

(b) Bypass Isolation Switches. Means to bypass and isolate the transfer switch equipment shall be permitted. Where bypass isolation switches are used, inadvertent parallel operation shall be avoided.

(c) Automatic Transfer Switches. Automatic transfer switches shall be electrically operated and mechanically held.

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.

[The addition text resulting from panel action on Proposal 15-139 should also be added at the end of (a).]

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #4058)

15- 139 - (701-7(a)): Accept in Principal

Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to remove the statement of intent from the Fine Print Note. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information. This action will be considered by the Panel as a Public Comment.

SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.

RECOMMENDATION: Revise text as follows:

701-7. Transfer Equipment.

(a) Transfer equipment, including automatic transfer switches, shall be automatic, identified for emergency use, and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

FPN: The purpose of this section is to protect the public, protect the electric system from catastrophic damage; and protect line workers from back feed while repairing supply lines.

SUBSTANTIATION: Operation of a generator in parallel with the supply system creates hazards to line workers, the public, and the generator unless the system is designed for parallel operation. Section 705-3 permits parallel operation of legally required standby systems with the normal source; however, there is no reference in Article 701 specifying that the requirements of Article 705 be met. Adding this language will clarify the requirement to comply with Article 705 when parallel operation is planned. This change will reduce the dangers. Adding the FPN will clarify the reasons for not permitting parallel operation.

PANEL ACTION: Accept in Principle.

Accept the submitter's recommendation but revise the proposed FPN to read as follows:

FPN: The purpose of this section is to protect the public, to protect line workers from back feed while repairing supply lines and to protect standby systems from catastrophic damage.

PANEL STATEMENT: The revision to the FPN revert the order of the information to improve the readibility.

It is recommended that the Technical Correlating Committee refer this proposal to CMP 4 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #1741)

15- 140 - (701-9): Accept

SUBMITTER: Jamie McNamara, Hastings, MN

RECOMMENDATION: Revise as follows:

701-9. Signs

(a) .....

(b) Grounding. Where the grounded circuit conductor connected to the ~~emergency~~ legally required standby power source is connected to a grounding electrode conductor at a location remote from the ~~emergency~~ legally required standby power source, there shall be a sign at the grounding location that shall identify all ~~emergency~~ legally required standby power and normal sources connected at that location.

SUBSTANTIATION: This wording makes the requirement clearer, article 700 is emergency systems and article 701 is for legally required standby systems.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

COMMENT ON AFFIRMATIVE:

KLEIN: The Panel Action revises this section as follows:

701-9(b) Grounding. Where the grounded circuit conductor connected to the legally required standby power source is connected to a grounded electrode conductor at a location remote from the legally required standby source, there shall be a sign at the grounding location that shall identify all legally required standby power and normal sources connected at that location.

Although the word sign tacitly infers visibility, I would have altered the Panel's response in the following fashion:

7019(b) Grounding. Where the grounded circuit conductor connected to the legally required standby power source is connected to a grounded electrode conductor at a location remote from the legally required standby source, there shall be a sign at the grounding location where it first becomes visible that shall identify all legally required standby power and normal sources connected at that location.

(Log #993)

15- 141 - (701-9(b)): Accept in Principle in Part

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(b) Grounding. Where the grounded circuit conductor connected to the ~~emergency~~ legally required standby system is connected to a grounding electrode ~~conductor~~ at a location remote from the ~~emergency~~ legally required standby system source, there shall be a durable and permanent sign at the grounding electrode location that shall identify all ~~emergency~~ legally required standby and ~~normal~~ other sources ~~connected~~ grounding connections at that location.

SUBSTANTIATION: Editorial. "Emergency" source relates to Article 700 and has special meaning. This article deals with a different system. It is assumed this section is intended to address remote grounding electrode connections and not the grounding electrode conductor connection to the grounded circuit conductor. Identification of the grounding connections would be more informative than indicating that different systems are grounded at that location, which is obvious if more than one grounding connection is present. "Normal" is not defined; does it exclude emergency or optional standby sources or separately derived systems?
PANEL ACTION: Accept in Principle in Part.
The panel accepts in principle the changes to replace "emergency" with "legally required standby" in three places. The remaining changes are rejected.
PANEL STATEMENT: Refer to the panel action on Proposal 15-140 for portion accepted in principle.
Reject the deletion of conductor because connections can still be made.
Reject durable and permanent since these words cannot be enforced.
Reject electrode since each electrode may not be visible (concrete encased electrode or ground ring).
Reject other since normal is appropriate in the context used.
Reject grounding connections since it is not appropriate to the issue of providing a sign.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
COMMENT ON AFFIRMATIVE:
KLEIN: See my Comment on Affirmative on Proposal 15-140.

(Log #2036)

15- 142 - (701-9(b)): Accept in Principle
SUBMITTER: Ray C. Mullin, Ray C. Mullin Books
RECOMMENDATION: Revise text to read as follows:
(b) Grounding. Where the grounded circuit conductor connected to ~~the emergency source~~ a legally required standby source is connected to a grounding electrode conductor at a location remote from the emergency source, there shall be a sign at the grounding location that shall identify all emergency and normal sources connected at that location.
SUBSTANTIATION: I believe the wording suggested in this proposal more accurately describes and corresponds to Legally Required Standby Systems. I do not believe the present wording "emergency systems" is correct.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action on Proposal 15-140.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2207)

15- 143 - (701-11): Reject
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
(b) Generator Set.
1. A generator set driven by a prime mover approved ~~acceptable to the authority having jurisdiction~~ and sized in accordance with Section 701-6...
Exception: Where approved ~~acceptable to the authority having jurisdiction,~~ the use of other than on site...
(d) Separate Service. Where approved ~~acceptable to the authority having jurisdiction,~~ a second service shall be permitted...
(e) Connection Ahead of Service Disconnecting Means. Where approved ~~acceptable to the authority having jurisdiction,~~ connectons ahead of,...
SUBSTANTIATION: "Approved" is defined in Article 100 of the NEC as "acceptable to the authority having jurisdiction."
"Standard terms have been established through accepted use or by definition and are to be used..." [NEC Style Manual 3.2.4 Standard Terms]. "Approved" is listed as one of the standard terms in Annex B of the Style Manual and defined in the Code; therefore, "approved" should be used in place of its definition.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal's language of "approved" would lead to controversy. The existing language needs to remain to ensure that the AHJ is the one who accepts the installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #CP1514)

15- 143a - (701-11(b)): Accept
SUBMITTER: CMP 15
RECOMMENDATION: Revise 701-11(b) to read as follows:
(b) Generator Set.
(1) Prime Motor-Driven. For a generator set driven by a prime mover acceptable to the authority having jurisdiction and sized in accordance with Section 701-6, means shall be provided for automatically starting the prime mover upon failure of the normal service and for automatic transfer and operation of all required electrical circuits. A time-delay feature permitting a 15-minute setting shall be provided to avoid retransfer in case of short-time re-establishment of the normal source.
(2) Internal Combustion Engines as Prime Mover. Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with an on-premise fuel supply sufficient for not less than 2 hours full-demand operation of the system.
(3) Dual Fuel Supplies. Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or municipal water supply for their cooling systems. Means shall be provided for automatically transferring one fuel supply to another where dual fuel supplies are used.
Exception: Where acceptable to the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.
(4) Battery Power. Where a storage battery is used for control or signal power, or as the means of starting the prime mover, it shall be suitable for the purpose and shall be equipped with an automatic charging means independent of the generator set.
SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #3282)

15- 144 - (701-11(e)): Accept
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise 701-11(e) with the additions (underlined) and deletions (strike through) as shown. The entire text is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
(e) Connection Ahead of Service Disconnecting Means. Where acceptable to the authority having jurisdiction, connections located ahead of~~, but~~ and not within the same cabinet, enclosure, or vertical switchboard section as, the ~~main~~ service disconnecting means shall be permitted. The legally required standby service shall be sufficiently separated from the normal main service disconnecting means to prevent simultaneous interruption of supply through an occurrence within the building or groups of buildings served.
SUBSTANTIATION: The problem with the present wording is that it is not clear as to the panel intent for the location of the connection. The revised wording clarifies where the connection can be made in the equipment (such as a switchboard). A similar clarification was accepted during the 99 NEC cycle for fire pumps in 695-3(a)(1).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #489)

15- 145 - (701-11(f)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: In the last paragraph before the Exception - change "3 ft (914 mm)" to "900 mm (3 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

ARTICLE 702 — OPTIONAL STANDBY SYSTEMS

(Log #2456)

15- 146 - (702-1): Accept in Principle
SUBMITTER: Stan Pukash, Automatic Switch Co.
RECOMMENDATION: Change the second sentence in 702-1 as follows:
"The systems covered by this article consist ~~only~~ of those that are permanently installed in their entirety, including prime movers, and those that include portable generators that are intended to be connected to permanent wiring."
SUBSTANTIATION: Section 445-1 references Article 702, but the current wording of 702 implies that 702 is not applicable to systems connected to portable generators. Therefore, the current wording of 702 should be revised to include applicability of systems using portable generators, which can represent a safety issue if installed in systems that are not in conformance with the NEC. The recent proliferation of portable generators being sold to homeowners in retail stores, and through catalogs,has exacerbated the safety issue.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action and statement on Proposal 15-147.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2576)

15- 147 - (702-1): Accept in Principle
Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action. The Technical Correlating Committee directs that this proposal be referred to Code-Making Panels 3 and 4 for information.
SUBMITTER: Gordon S. Johnson, Dundee, FL
RECOMMENDATION: Revise the second paragraph to read:
The systems covered by this article consist ~~only~~ of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a portable alternate power supply.
SUBSTANTIATION: Many optional power systems are designed to be supplied by a portable alternate power supply. These systems are not covered by any section of the National Electrical Code. The users of these systems should not be left to improvise connection of the portable power supply, Improvised connection can energize the normal line and cause a hazard to linemen thinking that the line is unenergized. It can also cause unauthorized paralleling of the normal and standby source. It is also common to have the connection made at an inappropriate point in the system such as a receptacle. In addition, the standby source must be appropriately grounded.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept in Principle.
Revise the second paragraph to read:
The systems covered by this article consist of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a connection to a premises wiring system from a portable alternate power supply.
PANEL STATEMENT: The revised text meets the intent of the submitter.
It is recommended that the Technical Correlating Committee refer this proposal to CMP 4 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2928)

15- 148 - (702-1): Accept in Principle
SUBMITTER: Jeffrey F. Morin, State of Maine / Rep. Maine Dept. of Prof. and Finalcial Regulation
RECOMMENDATION: Revise text to read as follows:
702-1. Scope. The provisions of this article apply to the installation and operation standby systems.
~~(The systems covered by this article consist only of those that are permanently installed in their entirety, including prime movers.)~~
SUBSTANTIATION: With the removal of NEC Article 230-83 in the 1999 NEC, there presently is no requirement for transfer equipment to be installed in an alternate power source or separately derived power source that is used as an optional standby system, where the prime mover is not permanently installed.
Current wording of the National Electrical Code for Optional Standby Systems only applies to "...those systems that are permanently installed in their entirety, including the prime movers."
It is not uncommon for the prime mover to be installed in a portable configuration. One reason is for the connection of that prime mover to be used at other locations.
The submitter is very aware of the life safety hazards that are presented to emergency personnel if proper transfer equipment is not installed in an optional standby system where the prime mover is portable.
During the most recent ice storm that the northeastern section of the United States endured in 1998, many residents relied solely upon alternate power sources in which portable prime movers were used to protect their lives and property. Through the requirements of the then current 1996 National Electrical Code of which the State of Maine adopted, the State was able to use NEC Article 230-83 to require transfer equipment in such installations. With the adoption of the 1999 National Electrical Code, there is no longer any way to require such equipment through enforcement of the National Electrical Code.
The hazards associated with the interconnection of different systems range from destruction of equipment to loss of life. Consumers, utility workers and emergency personnel depend upon properly installed equipment to protect against these preventable hazards.
Removal of the last paragraph of Article 702-1 would prevent the electrical hazards associated with the simultaneous interconnection of the standby and normal power sources. The new wording would require that suitable transfer equipment be installed in all optional standby systems whether or not the prime mover is permanently installed.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-147. The revised text meets the intent stated by the submitter's substantiation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #3283)

15- 149 - (702-1): Accept in Principle
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise NEC 702-1 with the additions (underlined) and deletions (strike through) as shown. The entire text of 702-1 is shown for clarity, but only those changes shown underlined or strike through are part of this proposal.
702-1. Scope. The provisions of this article apply to the installation and operation of optional standby systems.
The systems covered by this article consist ~~only~~ of ~~those that are~~ the permanently installed electrical system and either ~~in their entirety,~~

~~including~~ a permanently connected or temporarily connected power source ~~prime movers~~.

SUBSTANTIATION: The Scope of Article 702 does not recognize the installation of electrical systems for connection to a portable power sources such as a generator, UPS, power cell, ... that is not permanently connected. This proposal simply expands the scope of Article 702 in order to include other than permanently installed prime movers. Optional Standby Systems are installed in residential and commercial facilities using portable generators with a temporary connection to the electrical system through transfer equipment. Installation and inspection for these optional standby systems are using Article 702 even though the scope of the article does not include a temporary installation. The objective is to modify the scope to give the enforcing authority some basis for their judgement to use Article 702.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-147. The revised text meets the intent stated by the submitter's substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #3875)

15- 150 - (702-1): Accept in Principle in Part

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.

SUBMITTER: J. Philip Simmons, Olympia, WA

RECOMMENDATION: Revise text as follows:

702-1. Scope. The provisions of this article apply to the installation and operation of optional standby systems.

The systems covered by this article consist ~~only~~ of those where the transfer equipment is permanently installed and the prime mover is either ~~that are~~ permanently installed or supplies power to the system on a temporary basis ~~in their entirety, including prime movers~~.

SUBSTANTIATION: The scope of this article needs to be changed to apply to optional standby systems whether the generator is installed or located on a permanent or temporary basis.

Without the coverage of optional standby systems supplied from portable generators, there is no location in the NEC that clearly requires the installation of transfer equipment for disconnecting all utility sources of power before connecting the optional source. This certainly is a safety concern to inspectors and utility personnel.

Section 230-83 in the 1996 NEC contained a requirement that a transfer switch be installed to disconnect all sources of supply before connecting another. That section was deleted during the processing of the 1999 NEC. As a result, there is no clear requirement for transfer equipment for optional standby systems where the prime mover is not permanently installed.

Many installations of feeder circuits have been (and are being) made where all the electrical equipment is permanently installed except for the generator and prime mover. This includes sites for telephone systems, cellular telephone equipment repeaters, and sewer or storm water pumping stations.

Finally, Section 250-34 covers the grounding requirements for portable and vehicle-mounted generators so the fact that the generator often is portable or vehicle-mounted for these optional standby systems should not prevent those systems from being covered by Article 702.

PANEL ACTION: Accept in Principle in Part.

PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-147. The revised text meets the intent stated by the submitter's substantiation.

The reference to transfer equipment is rejected because it is not appropriate to 702-1. It is properly addressed in 702-6.

It is recommended that the Technical Correlating Committee refer this proposal to CMP 4 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #4056)

15- 151 - (702-1): Accept in Principle

SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.

RECOMMENDATION: Delete text as follows:

702-1. Scope. The provisions of this article apply to the installation and operation of optional standby systems.

~~The systems covered by this article consist only of those that are permanently installed in their entirety, including prime movers.~~

SUBSTANTIATION: The use of portable generators has increased dramatically. Permanent equipment and wiring is being installed for connecting portable generators to premises wiring. Present wording of this scope precludes application to portable systems. Many users connect portable generators to premises wiring using methods and equipment that present hazards to themselves and others. The intent of this proposal is to revise this section so that it covers the installation and operation of portable generators.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-147.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #4262)

15- 152 - (702-1): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

"The provisions of this article apply to the installation and operation of optional standby systems.

The systems covered by this article consist ~~only~~ of those that are permanently installed in their entirety, including prime movers, or those for which permanent electrical arrangements have been made for periodic connection to a portable or stationary prime mover as necessary."

SUBSTANTIATION: Frequently portable generators are used for optional standby purposes. Misapplications abound, as witnessed in the successful effort in the 1999 cycle to add language prohibiting the energization of a female receptacle from a male cord cap, in Section 410-56(g). Now comes the big enchilada, in this scope statement. The proposal makes permanent wiring arrangements subject to the provisions of the article, even if the actual power source isn't always connected. For example, the article would cover a permanently installed power inlet and feeder to a transfer switch and standby panel, even if the actual prime mover were cord-connected.

We now have enforceable language to get a power inlet instead of a receptacle, but what about the utility line crew? Thanks to Y2K hysteria, thousands of installations of standby panels went in, with no transfer equipment. An untrained owner is supposed to remember to turn off the main before pulling the cord on his generator. Sure. 702-6? Useless. It doesn't mandate transfer equipment. Even if it did, the present language of this section keeps this application out of the scope of Art. 702. 230-83? Oops, CMP 4 deleted it in 1999.

Protection of utility line crews from inadvertent backfeed is a basic, longstanding assumption behind code requirements, and the protection has effectively disappeared. The combined membership of the EC&M Code Forum Panel (Hartwell, Summers, Stallcup, Ross, Leaf) couldn't find a single mandatory requirement in the NEC to enforce this principle at this time. It's time to revisit this scope statement, because it effectively precludes effective action to make these installations safe.

There is a separate proposal to broaden Section 702-6 from the Massachusetts Electrical Code Advisory Committee. However, unless this scope statement changes, that proposal even if accepted would be a very limited improvement. If, on the other hand, both this proposal and the Massachusetts proposal are accepted, then we have the basis for real, properly enforceable protection.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Proposal 15-147.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #4358)

15- 153 - (702-1): Reject
SUBMITTER: Michael A. Anthony, Univ. of Michigan
RECOMMENDATION: Proposal: A complete rewrite of Article 702 — Optional Standby Systems.
SUBSTANTIATION: Some consideration should be given to putting together a special workgroup to reconfigure/refine the scope of Article 702 and/or Article 445 to include portable, small residential generators--typically low voltage single-phase equipment in the 750 to 7500 watt range—which are not permanently installed in their entirety. Such systems are either operated isolated from home wiring or connected to home wiring during power outages through a permanent transfer switch.

With more commerce and medical care occurring within the home (and in multiple occupancy dwellings not covered by Article 701) in the same time frame in which there is very little impetus for local utilities to invest in the reliability of the last mile of power infrastructure, the next upgrade to the National Electrical Code ought to put in one place as many safety requirements as practical that apply to this type of installation; even at the risk of creating redundancy with respect to other parts of the code. Among the issues that should be pulled together in this article:

1. Equipment grounding methods that are unique to portable generators. (How to size the bare wire, for example)
2. Listing and/or service equipment rating of transfer switches
3. Restoring proper grounding regimes if portable units are moved among various locations
4. Ground fault protection for kitchen and bathrooms
5. Plug and receptacle requirements for generator flexible cords
6. References to other NFPA documents that cover fuel handling and ventilation safety
7. Reference to the NESC

In many cases electrical equipment manufacturers and retailers make enigmatic references to National Electrical Code requirements (in their disclaimers in manuals and on terminal tags) which point the finger at local inspection authorities and/or installers. The authorities and/or installers point the finger at the manufacturers. These and all other parties involved in this market need a simple written tool to explain to the paying customer how the safety requirements of the National Electrical Code figure into the installation cost. Cross-references to generic safety requirements in three or four other articles are not simple as they might be if put under one roof.

A specialty workgroup might be able to pull together the details and cast them in fresh language (rather than try to cut, patch, or paint the existing language). If homeowners can see something more in the National Electrical Code that applies to their situation they may be more educated consumers when retaining a qualified electrical installer. It would position the framers of the National Electrical Code as having begun to meet the challenge of small, distributed generation systems which may be even more prevalent by the time the 2005 National Electrical Code is in the making.
PANEL ACTION: Reject.
PANEL STATEMENT: No specific recommendation is provided as required by NFPA Regulations Governing Committee Projects, Section 4-3.3, Contents of Proposals.

The submitter should consider providing specific text as a comment.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #994)

15- 154 - (702-2): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Optional Standby System. Optional standby systems are intended to protect public or private facilities and ~~or~~ property where life safety does not depend on the performance of the system. Optional standby systems are intended to supply on-site electric power to selected loads either automatically or manually. The optional standby system shall be supplied by on-site generated power.

FPN: No change.
SUBSTANTIATION: Editorial. Clarification of perceived intent. If on-site generated power is required, the phrase "are intended to supply on-site generated power" is not specific enough. I have assumed separate services were not intended as the power source, especially since Section 702-1 notes prime movers. Section 230-2, Exception No. 2. indicates an additional service may be the source of power. Comment 14-168 in the 1995 ROC, intended to recognize service-supplied power was rejected. Proposal 4-48 in the 1998 ROP was rejected with panel statement indicating service-supplied power is suitable. Comments 4-39 and 4-96 in the 1998 ROC were rejected with panel statements indicating optional standby systems supplied by a service are not covered by Article 702. Such disparate responses by code panels leads to confusion by code users, and clarification of intent is warranted.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing language already addresses power as being generated on-site. Article 702 is intended only for on-site standby sources.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2479)

15- 155 - (702-6): Accept in Principle
SUBMITTER: Gordon S. Johnson, Dundee, FL
RECOMMENDATION: In the second paragraph place a period after current and delete ~~that the generator can deliver.~~
SUBSTANTIATION: The equipment must be capable of interrupting the fault current of either the normal or standby source.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action on Proposal 15-156 which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #3284)

15- 156 - (702-6): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.
SUBMITTER: Alan Manche, Square D Co.
RECOMMENDATION: Revise NEC 702-6 with deletions (strike through) as shown. The entire text of 702-6 is shown for clarity, but only those changes shown as strike-through are part of this proposal.

702-6. Transfer Equipment. Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment.

~~Transfer equipment, located on the load side of branch circuit protection, shall be permitted to contain supplementary overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver.~~

SUBSTANTIATION: The permission to place supplemental protection on the load side of branch circuit protection is not required in Article 702. The general rule is found in section 240-10, which states: "Supplementary Overcurrent Protection. Where supplementary overcurrent protection is used for lighting fixtures, appliances, and other equipment or for internal circuits and components of equipment, it shall not be used as a substitute for branch-circuit overcurrent devices or in place of the branch-circuit protection specified in Article 210." Since chapter 7 modifies chapters 1 through 4, there is no need for the text in 702-6.

Furthermore, the text in section 702-6 is being misinterpreted to allow supplemental protection to be used in place of branch circuit protection, leaving the branch circuit wiring and outlets unprotected. Transfer equipment is being listed for installation on the "load side of the branch-circuit protection." When the transfer equipment is switched to the alternate power source (generator), the branch-circuit protection is switched out of the circuit leaving the branch circuit protected by a Supplementary Protector.

Utilizing supplementary protection as the branch circuit protector is compromising the protection of the branch circuit. This is inconsistent with the definition of a branch-circuit in Article 100 "Branch Circuit. The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s)."

Branch circuit protectors are evaluated to comply with UL 489 Molded Case Circuit Breakers and also the UL 248 series of nonsupplemental fuse standards. Supplemental protectors are evaluated to UL 1077 Supplementary Protectors. Reviewing the scope of UL 489 and UL 1077 supports that misapplication and compromised safety is occurring due to the misinterpretation of 702-6.

UL 489: Scope - The requirements of this Standard cover molded case circuit breakers, ... These circuit breakers are specifically intended to provide service entrance, feeder, and branch circuit protection in accordance with the National Electrical Code, NFPA 70….

UL 1077: Scope - These requirements apply to supplementary protectors intended for use as overcurrent, or over- or under-voltage protection within an appliance or other electrical equipment where branch circuit overcurrent protection is already provided, or is not required. Compliance with the following is acceptable for use as a component of an end product.

In order to fully understand the significance of this issue, a review of theses two standards will point to the safety issues that have been created due to misinterpretation of section 702-6.

The first basic difference is branch circuit protection devices are Listed to UL 489 (Circuit Breakers) or UL 248 (Fuses) and Supplementary Protectors are Recognized Components evaluated in accordance with UL 1077. Conditions of Acceptability are placed on supplementary protectors that must be considered for each appliance in which they are installed. Products Listed to UL 489, which include circuit breakers and fuses, are periodically tested as part of the certification agency's Follow-Up inspection testing program. Supplemental Protectors are not held to this rigorous Follow-Up testing program.

Secondly, a circuit breaker must perform within the predetermined overload trip curve characteristics established in the UL 489 standard in order to demonstrate protection of branch circuit conductors. Supplemental protectors evaluated to UL 1077 are not required to perform within predetermine overload trip characteristics, which means a supplementary protector may not properly protect the branch circuit conductors from an overload condition. Also, supplementary protectors are permitted to be tested in series with a branch-circuit device and may become inoperable after testing. Therefore a branch circuit device can not be replaced with a supplemental protection device, the supplementary protector must always be used on the load side of a branch circuit device such as a circuit breaker or fuse, and as required in section 240-10.

Finally, clearance and spacing are also an issue. Many supplemental protectors have shorter spacings than devices evaluated to UL 489. There is a perceived benefit to fit these smaller devices into tighter package, but a supplemental protector with short spacings does not comply with the performance requirements of a branch circuit device and the compromised spacings establishes a safety hazard associated with “pollution” levels and overvoltage coordination (insulation coordination). The installation of supplemental protectors due to the misinterpretation of section 702-6 is an unnecessary safety hazard that can easily be addressed by deleting the text in section 702-6 and allowing section 240-10 to address the use of supplemental protection.

PANEL ACTION: Accept.

PANEL STATEMENT: It is recommended that the Technical Correlating Committee refer this proposal to CMP 4 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #4059)

15- 157 - (702-6): Accept in Principal

Note: The Technical Correlating Committee directs that the Action on this Proposal be rewritten to comply with the NEC Style Manual to remove the statement of intent from the Fine Print Note. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information. This action will be considered by the Panel as a Public Comment.

SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst.

RECOMMENDATION: Revise text as follows:

702-6. Transfer Equipment. Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

Transfer equipment, located on the load side of branch-circuit protection, shall be permitted to contain supplementary overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver.

FPN: The purpose of this section is to protect the public, protect standby systems from catastrophic damage; and protect line workers from back feed while repairing supply lines.

SUBSTANTIATION: Operation of a generator in parallel with the supply system creates hazards to line workers, the public, and the generator unless the system is designed for parallel operation. Section 705-3 permits parallel operation of optional standby systems with the normal source; however, there is no reference in Article 702 specifying that the requirements of Article 705 be met. Adding this language will clarify the requirement to comply with Article 705 when parallel operation is planned. This change will reduce the dangers. Adding the FPN will clarify the reasons for not permitting parallel operation.

PANEL ACTION: Accept in Principle.

Accept the submitter's recommendation but revise the proposed FPN to read as follows:

FPN: The purpose of this section is to protect the public, to protect line workers from back feed while repairing supply lines and to protect standby systems from catastrophic damage.

PANEL STATEMENT: The revision to the FPN revert the order of the information to improve the readibility.

It is recommended that the Technical Correlating Committee refer this proposal to CMP 4 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #4263)

15- 158 - (702-6): Accept

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 4 for information.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Revise by adding the following as a third paragraph:

“Transfer equipment shall be required for all permanently installed standby systems subject to the provisions of this article and for which an electric-utility supply is either the normal or standby source.”

SUBSTANTIATION: This proposal was first accepted and then rejected during the 1996 NEC cycle. In the end it failed because it would have inadvertently affected some large industrial systems that generate their own power and use other switching methods than transfer switches to bring alternate sources on line. The panel action was well taken because the former proposal was never intended to apply to such installations. This proposal takes the panel objections into account and fashions a more technically correct amendment.

In the 1999 cycle, CMP 15 rejected this for reasons that would astound CMP 4 were they ever to find out that a panel thinks a noninteractive system can coexist with a utility supply without a transfer switch. These days we increasingly see unqualified people putting utility line crews at risk through improper or nonexistent transfer arrangements, especially with the Y2K paranoia abroad everywhere. CMP 15 should be tightening these rules, not making excuses.

PANEL ACTION: Accept.

PANEL STATEMENT: It is recommended that the Technical Correlating Committee refer this proposal to CMP 4 for information.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

COMMENT ON AFFIRMATIVE:

FLACH: Delete “permanently installed”.

The change will now read:

“Transfer equipment shall be required for all standby systems subject to the provisions of this article...”.

(Log #2927)

15- 159 - (702-7): Reject
SUBMITTER: Jeffrey F. Morin, State of Maine/Rep. Maine Dept. of Prof. and Financial Regulation
RECOMMENDATION: Revise text to read as follows:
702-7. Signals. (Where Optional Standby Systems are installed in their entirety, including prime movers,) audible signal devices shall be provided, where practicable for the following purposes.
SUBSTANTIATION: Following a proposal for a change in the wording of National Electric Code 702-1 (see additional proposal by submitter for NEC Article 702-1), signals should only be required for Optional Standby Systems that are installed in their entirety, including the prime mover.
This change in wording is no change from present requirements of Article 702, as it is now required by the Scope, if the optional standby systems is installed in its entirety, including the prime mover.
A large number of small prime movers, that are designed to be installed in a portable configuration, do not have provisions for "signals". The submitter is not aware of any situations where the installation of the portable prime mover without "signals" has caused an electrical hazard.
The new wording as proposed, would also be in positive text, keeping in line with the positive text format.
PANEL ACTION: Reject.
PANEL STATEMENT: The existing language already addresses the optional standby system. There is no need to be redundant.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #1742)

15- 160 - (702-8): Accept
SUBMITTER: Jamie McNamara, Hastings, MN
RECOMMENDATION: Revise as follows:
702-8. Signs
(a) .....
(b) Grounding. Where the grounded circuit conductor connected to the ~~emergency~~ optional standby power source is connected to a grounding electrode conductor at a location remote from the ~~emergency~~ optional standby power source, there shall be a sign at the grounding location that shall identify all ~~emergency~~ optional standby power and normal sources connected at that location.
SUBSTANTIATION: This wording makes the requirement clearer, article 700 is emergency systems and article 702 is for optional standby power sources.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #995)

15- 161 - (702-8(b)): Accept in Principle in Part
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Grounding. Where the grounded circuit conductor connected to the ~~emergency~~ optional standby system source is connected to a grounding electrode conductor at a location remote from the ~~emergency~~ optional standby system source, there shall be a durable and permanent sign at the grounding electrode location that shall identify all ~~emergency~~ optional standby system and ~~normal~~ other source ~~connected~~ grounding connections at that location.
SUBSTANTIATION: See substantiation for proposal for Section 710-9(b).
PANEL ACTION: Accept in Principle in Part.
PANEL STATEMENT: Refer to panel action on Proposal 15-160 for the part accepted in principle.
The parts rejected are the same as those listed in the panel statement on Proposal 15-141.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2037)

15- 162 - (702-8(b)): Accept in Principle
SUBMITTER: Ray C. Mullin, Ray C. Mullin Books
RECOMMENDATION: Revise text to read as follows:
(b) Grounding. Where the grounded circuit conductor connected to ~~the emergency source~~ an optional standby source is connected to a grounding electrode conductor at a location remote from the emergency source, there shall be a sign at the grounding location that shall identify all emergency and normal sources connected at that location.
SUBSTANTIATION: I believe the wording suggested in this proposal more accurately describes and corresponds to Legally Required Standby Systems. I do not believe the present wording "emergency systems" is correct.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action on Proposal 15-160 which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #3874)

15- 163 - (702-8(b)): Accept in Principle
SUBMITTER: J. Philip Simmons, Simmons Electrical Services
RECOMMENDATION: Revise as follows:
(b) Grounding. Where the grounded circuit conductor connected to the optional power ~~emergency~~ source is connected to a grounding electrode conductor at a location remote from the optional power ~~emergency~~ source, there shall be a sign at the grounding location that shall identify all optional power ~~emergency~~ and normal sources connected at that location.
SUBSTANTIATION: These changes are necessary as Article 702 applies to "Optional Standy Systems" and not emergency systems.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action on Proposal 15-160 which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19

(Log #2349)

15- 164 - (702-10 (New)): Reject
SUBMITTER: Mark Ptashkin, City of Phoenix, AZ
RECOMMENDATION: Add the following new section:
702-10. Ground-Fault Protection or Equipment. Each feeder disconnect rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 600 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with the provisions of Section 230-95.
Exception No. 1: The provisions of this section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.
SUBSTANTIATION: The acceptance of this article in whole, part, or principle will show that the intent of NEC 702-3 is to require GFP per NEC 215-10. Since this equipment is not to provide power to systems that are critical to life safety, the ground fault protection does not impose additional hazards to the facility.
If the proposal is accepted it will clearly show that GFP is required for these systems. Just because 702 does not specifically address GFP, does not mean that GFP is not required.
PANEL ACTION: Reject.
PANEL STATEMENT: The optional standby power may be a portable power source. The ground fault protection should not be required since the power source is optional.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
FLACH: I do not agree with the Panel Statement. The hazard is the same whether the power source is optional or not.

(Log #2480)

15- 165 - (702-10 (New)): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 5 for information.

SUBMITTER: Gordon S. Johnson, Dundee, FL

RECOMMENDATION: Add a new Section 702-10 to read as follows:

A portable optional standby source if used as a separately derived system must be grounded to a grounding electrode in accordance with Article 250, or if used as a nonseparately derived system the equipment ground and the grounded conductor must be bonded to the system grounding electrode.

Note: Only cord and plug connected equipment plugged into a receptacle on the standby set is permitted to be connected to an ungrounded set. Even in that case the equipment ground system must be complete.

SUBSTANTIATION: Failure to properly ground a portable generator can be a shock hazard to anyone working around the set.

PANEL ACTION: Accept in Principle.

Add a new Part III (Part C) to read as follows:

Part III Grounding

702-10 Portable Generator Grounding.

(A) Separately Derived System. Where a portable optional standby source is used as a separately derived system, it shall be grounded to a grounding electrode in accordance with 250-30.

(B) Nonseparately Derived System. Where a portable optional standby source is used as a nonseparately derived system, the equipment grounding conductor shall be bonded to the system grounding electrode.

(C) Cord- and Plug-Connected Equipment. Only cord and plug connected equipment plugged into a receptacle on the standby generator shall be permitted to be connected to an ungrounded generator in accordance with 250-34.

PANEL STATEMENT: The text is revised to comply with the Manual of Style and meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #2350)

15- 166 - (702-10 Exception No. 2 (New)): Reject

SUBMITTER: Mark Ptashkin, City of Phoenix, AZ

RECOMMENDATION: Add the following Exception:

Exception No. 2: The provisions of this section shall not apply to the output breaker on Uninterruptible Power Supply systems rated 1000 amps or more provided all of the following conditions are met:

1. The output breaker is located in the UPS enclosure.
2. The UPS is part of a listed multi-module paralleling system.
3. The paralleling switch gear has Ground Fault Protection.

SUBSTANTIATION: Presently manufacturers of multi-module UPS systems are not providing Ground Fault Protection of their systems if the system is 1000 amps or greater and is a 277/480 volts. In addition, when larger systems that employ multiple UPS units that may be rated 1000 KVA or more are utilized and these units have an output breaker they believe that the units themselves should not be required to have GFP. They state that the GFP at the paralleling gear is sufficient. It is clear in 215-10 that these disconnects must have GFP. It must be pointed out that since these are in fact feeders, these conductors may be run in unlimited lengths through a structure. In a feeder this large, this could be unsafe. The intent of this proposal is to show that GFP is required for the output breaker or switch on a UPS unit per 215-10 or, if units are paralleled, to show that the output breaker or switch in the paralleling gear should have Ground Fault Protection.

PANEL ACTION: Reject.

PANEL STATEMENT: The ground fault protection should not be required since the power source is optional.

There is no existing 702-10., let alone any exception. The ground fault protection is not required since the system grounding may interfere with the service ground fault protection.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ARTICLE 705 — INTERCONNECTED ELECTRICAL POWER PRODUCTION SOURCES

(Log #3293b)

3- 207 - (705-3): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Kenneth Krastins, Plug Power, Inc.

RECOMMENDATION: Revise the Exception to Section 705-3 to read as follows:

Exception No. 1: Installation of solar photovoltaic systems operated as interconnected power sources shall be in accordance with Article 690.

Exception No. 2: Installation of fuel cell systems operated as interconnected power sources shall be in accordance with Article 691.

SUBSTANTIATION: This proposal is submitted to provide correlation for a new Article 691.

An important goal of building codes is to permit to the fullest extent possible, the use of modern methods, devices and technological improvements while protecting the health, safety, and welfare of the end user and general public. While new technology may offer many worthwhile benefits, appropriate regulations are needed to allow safe adoption of the technology and prevent misapplication. The fuel cell represents just such an emerging technology. Fuel cells provide a means, via an electrochemical process, of converting a fuel gas (such as natural gas, propane, etc.) into electrical energy that may then be used to power a building or residential dwelling. Fuel cells are virtually pollution free, very quiet when compared to other means of electric power generation, and can operate at high efficiency levels using very abundant and cheap fuels such as natural gas and LP gas.

There is growing interest in small, clean and quiet independent power generating units. The installation of fuel cell electrical generating systems used at residential and light commercial establishments is imminent. Recent advances in fuel cell technologies and more economical means of production will foster widespread acceptance of small distributed electrical generating units (under 50 kW) for single family home use and medium size units (51 kW to 250 kW) for multifamily units and small commercial buildings.

The interest in other clean forms of distributed generation is demonstrated by the adoption of the NEC Article 690, Solar Photovoltaic Systems. The direct interpretation of this article and its application deals specifically with solar photovoltaic electrical generating systems. It has been suggested that this article can also adequately cover other forms of distributed generation including fuel cell systems. However, since much of the language in Article 690 is specific to photovoltaic systems and rather complex to accommodate the interconnection requirements of the many subsystems in photovoltaic systems, application of this article to fuel cells will be cumbersome.

Much of the information in Article 690 could apply to small and medium size electrical generating systems in general. Likewise, Article 705, Interconnected Electrical Power Production Sources, and Article 490, Equipment Over 600 Volts, Nominal, apply mainly to the large utility grid parallel independent electrical generating units. For example, Article 705-12, (b), (1) stipulates, “The aggregate of non-utility sources of electricity has a capacity in excess of 100k W, or the service is above 1000 volts.” Leaving the interpretation of Article 690 and other articles up to the local inspector to determine the requirements for fuel cell systems will be problematic and could hinder the use of this beneficial technology. While the combination of these existing articles and others may adequately address fuel cells, it is clearly advantageous to users of the National Electrical Code, to have an article which specifically articulates the electrical installation requirements of fuel cell systems.

This being stated, Article 690, Solar Photovoltaic Systems, does offer a good basis for the creation of a Fuel Cell Systems article. A description of and substantiation for the individual topics to be covered in the proposed article follows. Where appropriate, comparisons are made within the following detailed substantiation between this proposed fuel cell article and the extant Photovoltaic Article 690. Sections of the Photovoltaic article that do not appear at all in the proposed article are also discussed and distinguished in bold, italicized text.

Additional Changes – Revised wording is recommended for section 230-82 (5), the exception to section 705-3, and section 705-30 to include language to cover fuel cell systems, similar to what is currently included for solar photovoltaic systems.

Members of Plug Power, Inc. and DTE Energy Technologies drafted the original version of the proposed fuel cell article. The proposed article began to be referred to as 691 because of its similarity and relationship to Article 690. It is recognized that the number ultimately assigned to the article may be different from 691.

The article was then circulated, reviewed, and revised internally at Plug Power. Subsequently, an e-mail notification was forwarded on September 13, 1999 to the members of three different groups advising them of the existence of the proposed article and inviting them to request a copy for review and comment. The three different groups notified were

• The members of the IEEE Standards Coordinating Committee (SCC) 21 currently involved in the development of a national standard (P1547) to cover interconnection of distributed resources with electrical power systems

• The members of the technical working group involved in the development of Standard Interconnection Requirements (SIR) for New York State which have since been submitted to the NYS Public Service Commission

• The Codes & Standards Working Group of the US Fuel Cell Council

All totaled, these groups include over 200 individuals. Presentations concerning the proposed article were given by Plug Power at both the September 27, 1999 meeting of the IEEE-SCC21 committee in Arlington, Virginia and the October 8, 1999 Power Quality Workshop (Interconnect-3) sponsored by the US Fuel Cell Council in Phoenix, Arizona. Those individuals who requested a copy of the draft article as a result of the e-mail notification or the presentations were sent one for review. After comments were received, they were negotiated and incorporated in the proposed article currently being submitted. Substantial changes have been made to the proposed article since its original inception, but the input generously provided by the individuals of the groups listed above has served to help develop a much better article as a result.

PANEL ACTION: Accept in Principle.

Revise the exception in the existing code to be Exception No. 1 and accept the submitter's new Exception No. 2 to read as follows:

"Exception No. 1: Installation of solar photovoltaic systems operated as interconnected power sources shall be in accordance with Article 690.

Exception No. 2: Installation of fuel cell systems operated as interconnected power sources shall be in accordance with Article 691."

PANEL STATEMENT: The panel action has revised the proposal to add the Title "Exception No. 1" to the existing exception and accepted the proposed second exception, which meets the submitter's intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

(Log #CP1515)

15- 166a - (705-12): Accept

SUBMITTER: CMP 15

RECOMMENDATION: Revise 705-12 to read as follows:

705-12. Point of Connection. The outputs of electric power production systems shall be interconnected at the premises service disconnecting means,. unless permitted in (a) or (b).

(a) Integrated Electric System. The outputs shall be permitted to be interconnected at a point or points elsewhere on the premises where the system qualifies as an integrated electric system and incorporates protective equipment in accordance with all applicable sections of Article 685.

(b) General. The outputs shall be permitted to be interconnected at a point or points elsewhere on the premises where all of the following conditions are met.

(1) The aggregate of nonutility sources of electricity has a capacity in excess of 100 kW, or the service is above 1000 volts;

(2) The conditions of maintenance and supervision ensure that qualified persons will service and operate the system; and

(3) Safeguards and protective equipment are established and maintained.

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #CP1516)

15- 166b - (705-20): Accept

SUBMITTER: CMP 15

RECOMMENDATION: Revise 705-20 to read as follows:

705-20. Disconnecting Means, Sources. Means shall be provided to disconnect all ungrounded conductors of an electric power production source(s) from all other conductors.

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #CP1517)

15- 166c - (705-30): Accept

SUBMITTER: CMP 15

RECOMMENDATION: Revise 705-30 to read as follows:

705-30. Overcurrent Protection. Conductors shall be protected in accordance with 240. Equipment overcurrent protection shall be in accordance with the articles referenced in 240. Equipment and conductors connected to more than one electrical source shall have a sufficient number of overcurrent devices located so as to provide protection from all sources.

(a) Generators. Generators shall be protected in accordance with 445-4.

(b) Solar Photovoltaic Systems. Solar photovoltaic systems shall be protected in accordance with 690.

(c) Transformers. Overcurrent protection for a transformer with a source(s) on each side shall be provided in accordance with 450-3 by considering first one side of the transformer, then the other side of the transformer, as the primary.

SUBSTANTIATION: The revisions have been made to comply with NFPA National Electrical Code Style Manual.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

(Log #3293c)

3- 208 - (705-30(d)): Accept in Principle

Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 15 for action. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Kenneth Krastins, Plug Power, Inc.

RECOMMENDATION: Add an additional line to Section 750-20 to read as follows:

(d) Fuel cell systems shall be protected in accordance with Article 691.

SUBSTANTIATION: This proposal is submitted to provide correlation for a new Article 691.

An important goal of building codes is to permit to the fullest extent possible, the use of modern methods, devices and technological improvements while protecting the health, safety, and welfare of the end user and general public. While new technology may offer many worthwhile benefits, appropriate regulations are needed to allow safe adoption of the technology and prevent misapplication. The fuel cell represents just such an emerging technology. Fuel cells provide a means, via an electrochemical process, of converting a fuel gas (such as natural gas, propane, etc.) into electrical energy that may then be used to power a building or residential dwelling. Fuel cells are virtually pollution free, very quiet when compared to other means of

electric power generation, and can operate at high efficiency levels using very abundant and cheap fuels such as natural gas and LP gas.

There is growing interest in small, clean and quiet independent power generating units. The installation of fuel cell electrical generating systems used at residential and light commercial establishments is imminent. Recent advances in fuel cell technologies and more economical means of production will foster widespread acceptance of small distributed electrical generating units (under 50 kW) for single family home use and medium size units (51 kW to 250 kW) for multifamily units and small commercial buildings.

The interest in other clean forms of distributed generation is demonstrated by the adoption of the NEC Article 690, Solar Photovoltaic Systems. The direct interpretation of this article and its application deals specifically with solar photovoltaic electrical generating systems. It has been suggested that this article can also adequately cover other forms of distributed generation including fuel cell systems. However, since much of the language in Article 690 is specific to photovoltaic systems and rather complex to accommodate the interconnection requirements of the many sub-systems in photovoltaic systems, application of this article to fuel cells will be cumbersome.

Much of the information in Article 690 could apply to small and medium size electrical generating systems in general. Likewise, Article 705, Interconnected Electrical Power Production Sources, and Article 490, Equipment Over 600 Volts, Nominal, apply mainly to the large utility grid parallel independent electrical generating units. For example, Article 705-12, (b), (1) stipulates, "The aggregate of non-utility sources of electricity has a capacity in excess of 100k W, or the service is above 1000 volts." Leaving the interpretation of Article 690 and other articles up to the local inspector to determine the requirements for fuel cell systems will be problematic and could hinder the use of this beneficial technology. While the combination of these existing articles and others may adequately address fuel cells, it is clearly advantageous to users of the National Electrical Code, to have an article which specifically articulates the electrical installation requirements of fuel cell systems.

This being stated, Article 690, Solar Photovoltaic Systems, does offer a good basis for the creation of a Fuel Cell Systems article. A description of and substantiation for the individual topics to be covered in the proposed article follows. Where appropriate, comparisons are made within the following detailed substantiation between this proposed fuel cell article and the extant Photovoltaic Article 690. Sections of the Photovoltaic article that do not appear at all in the proposed article are also discussed and distinguished in bold, italicized text.

Additional Changes – Revised wording is recommended for section 230-82 (5), the exception to section 705-3, and section 705-30 to include language to cover fuel cell systems, similar to what is currently included for solar photovoltaic systems.

Members of Plug Power, Inc. and DTE Energy Technologies drafted the original version of the proposed fuel cell article. The proposed article began to be referred to as 691 because of its similarity and relationship to Article 690. It is recognized that the number ultimately assigned to the article may be different from 691.

The article was then circulated, reviewed, and revised internally at Plug Power. Subsequently, an e-mail notification was forwarded on September 13, 1999 to the members of three different groups advising them of the existence of the proposed article and inviting them to request a copy for review and comment. The three different groups notified were

- The members of the IEEE Standards Coordinating Committee (SCC) 21 currently involved in the development of a national standard (P1547) to cover interconnection of distributed resources with electrical power systems
- The members of the technical working group involved in the development of Standard Interconnection Requirements (SIR) for New York State which have since been submitted to the NYS Public Service Commission
- The Codes & Standards Working Group of the US Fuel Cell Council

All totaled, these groups include over 200 individuals. Presentations concerning the proposed article were given by Plug Power at both the September 27, 1999 meeting of the IEEE-SCC21 committee in Arlington, Virginia and the October 8, 1999 Power Quality Workshop (Interconnect-3) sponsored by the US Fuel Cell Council in Phoenix, Arizona. Those individuals who requested a copy of the draft article as a result of the e-mail notification or the presentations were sent one for review. After comments were received, they were negotiated and incorporated in the proposed article currently being submitted. Substantial changes have been made to the proposed article since its original inception, but the input generously provided by the individuals of the groups listed above has served to help develop a much better article as a result.

PANEL ACTION: Accept in Principle.
Change the recommended location from 750-20 to new 705-30(d).
The panel accepts the remainder of the proposal.
PANEL STATEMENT: The panel acknowledges that this text should be located to 705-30(d).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #34)

10- 85 - (710-20): Reject

NOTE: The following proposal consists of Comment 13-46 on Proposal 13-43 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 13-43 was:

Revise text:

"Overcurrent protection shall be provided for each ungrounded conductor at its point of supply by one of the following:"

SUBMITTER: Ted A. Stutheit, City of Lincoln, NE / Rep. City of Lincoln / NE State Elect. Board
RECOMMENDATION: Revise text:

"Overcurrent protection shall be provided for each ungrounded conductor at its point of supply by one of the following:".

SUBSTANTIATION: The problem and substantiation remain the same as in the original proposal, with the additional problem that CMP 13 doesn't understand the original substantiation. CMP 13 presumes there is "some device located well ahead of the actual point of supply." Then CMP 13 uses the circular argument "the point of supply is not defined in the Code." See 240-21(a), and the second sentence of Article 100 - Definitions - Scope regarding what a point of supply is.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and the submitter's substantiation on Proposal 10-77.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #35)

10- 86 - (710-20): Reject

NOTE: The following proposal consists of Comment 13-47 on Proposal 13-43 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 13-43 was:

Revise text:

"Overcurrent protection shall be provided for each ungrounded conductor at its point of supply by one of the following:"

SUBMITTER: Bill Whitmer, ABC Electric Co., Inc. / Rep. Nebraska State Electrical Board
RECOMMENDATION: Revise first sentence to read:

"Overcurrent protection shall be provided for each ungrounded conductor at it's point of supply by one of the following:"

SUBSTANTIATION: Protection at the load end of the conductor is not protection enough.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and the submitter's substantiation on Proposal 10-77.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #36)

10- 87 - (710-20): Reject

NOTE: The following proposal consists of Comment 13-48 on Proposal 13-43 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 13-43 was:

Revise text:

"Overcurrent protection shall be provided for each ungrounded conductor at its point of supply by one of the following:"

SUBMITTER: Terry L. Carlson, Nebraska State Electrical Board

RECOMMENDATION: Revise text to read:

"Overcurrent protection shall be provided for each ungrounded conductor at its point of supply by one of the following:"

The Code Panel should reconsider this proposal and accept it.

SUBSTANTIATION: The entire NEC is very unclear for overcurrent requirements of systems operating at over 600-volts. The present language does not address the location of protection devices in the circuit. It states that overcurrent protection must be in the circuit, but it is not a "clear cut" rule as to the location in the circuit. By adding the words "at its point of supply" to the present language, it makes it very clear that the device must be installed at the beginning of the circuit, not at the end or in the middle. The Panel Statement that "There is no reason why the required overcurrent protection cannot be provided by some device located well ahead of the actual point of supply. The point of supply is not defined in the Code." does not take into account that according to several electrical engineers, the present language allows the device to be on the load end of the circuit. This is an excellent chance for the Code Panel to clarify the rule by adding five words to the sentence, while at the same time they would be enhancing the usability of the Code.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action and the submitter's substantiation on Proposal 10-77.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

ARTICLE 720 — CIRCUITS AND EQUIPMENT OPERATING AT LESS THAN 50 VOLTS

(Log #996)

16- 23 - (720): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Delete this article.

SUBSTANTIATION: Since the exception for Section 720-1 excludes other installations of 50-volts or less covered by the code, this article appears to be relegated to power and lighting systems. I believe the original envisioned applications (battery-powered systems with windmill generators) have not been made for many years since the inception of the Federal Rural Electrification Administration, circa 1935 which extended power lines to rural areas. There are more practical and viable methods available today to provide power in remote isolated areas without utility power, such as generators and solar photovoltaic systems with inverters which can provide 120-volt power. Less than 50-volt systems are impractical for businesses, manufacturing, farms, and dwellings, if only due to lack of suitable utilization equipment. I am not aware of any utility which provides service at less than 50 volts ac or dc.

All the sections of this article are already covered in other articles, other than 720-4 and 720-5. Section 90-3 indicates Chapters 1 through 4 apply unless amended by Chapter 7. This indicates Chapter 3 wiring methods must be used and properly supported. Section 720-11 was added in the 1996 code because of an apparent assumption that some form of low-voltage cables are used.

The systems covered by this article cannot be reconciled with other code rules, e.g., (1) required 20-ampere laundry and small appliance branch circuits shall be computed at 1500 va per Section 220-16, but a 48 volt 20-ampere branch circuit can only supply a maximum 960 va load. Section 220-2 indicates where other voltages are specified, they shall be used. The panel stated in Proposal 2-183 in the 1989 TCR that Article 220 applies to this article. (2) GFCI protection required by Section 210-8 would be difficult to accomplish since available devices are suitable for ac grounded circuits at standard voltages (See UL listing). This article permits ungrounded ac or dc systems per Section 250-3 and 250-5. Section 250-162(b) would require a 3-wire dc 12-24 volt or 24-48 volt system to be grounded. (3) Identified (white) terminals of devices such as receptacles cannot be connected to ungrounded conductors per Section 200-9.

Over a period of many years I have never seen or been made aware of installations covered in this article. Is the panel aware of any?

PANEL ACTION: Reject.

PANEL STATEMENT: There are systems installed and may be installed for which this article would be applicable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #2568)

16- 24 - (720-1, Exception):

Note: The Technical Correlating Committee advises that Article Scope statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee rejects the Panel Action. The Technical Correlating Committee directs that the Panel review the text of the present Exception and the proposed second sentence for inclusion elsewhere in the Article.

SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.

RECOMMENDATION: Delete the exception.

Change the text to read as follows:

720-1. Scope. This article covers installations operating at less than 50 volts, direct current or alternating current. This article does not cover those installations covered in Articles 411, 551, 650, 669, 690, 725 and 760.

SUBSTANTIATION: There are numerous exceptions in the NEC which can be expressed in positive code language. This proposal converts the exception into the section text without altering its intent.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #1109)

16- 25 - (720-4): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Change: "No. 12" to "12 AWG"
"No. 10" to "10 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

ARTICLE 725 — CLASS 1, CLASS 2, AND CLASS 3 REMOTE-CONTROL, SIGNALING, AND POWER-LIMITED CIRCUITS

(Log #43)

16- 26 - (725, 760 and 800): Reject

NOTE: The following proposal consists of Comment 16-11 on Proposal 16-10 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 16-10 was:

Make global change from Type MP cables to Type PLMP cables and from "multipurpose" to "power-limited multipurpose."

Revise Sections 725-71(f) (new) and 800-51(g) by adding the following as the last sentence:

"The change in marking from MP to PLMP shall become effective on July 1, 2004."

SUBMITTER: Irving Mande, EST

RECOMMENDATION: In response to the Panel Statements for rejecting this Proposal, (that "All the applications of Type MP cables are not necessarily power-limited"), and for rejecting Proposal 16-56, (that "The panel established communications cables (Type CM) as the primary cable type for cable substitutions."), change the Panel Action from Reject to Accept after making the following revisions:

1. In addition to making the global change from Type MP to Type PLMP and from "multipurpose" to "power-limited multipurpose", add a second classification of communications cables for Type PLCM, power-limited communications cables.

2. Revise subsection 800-51(g) by adding the following after "MP," in the last line "....where used for nonpower-limited applications and Types PLMPP, PLMPR, PLMPG, and PLMP, where used for power-limited applications, respectively. The required change in cable marking for power-limited applications shall become effective on July 1, 2004."

3. Add a new 800-51(j) to read:

(j) Power-Limited Communications Cables. Where communications cables are used on power-limited circuits, they shall be marked PLCMP, PLCMR, PLCMG, and PLCM instead of CMP, CMR, CMG, and CM, respectively. This requirement shall become effective on July 1, 2004.

SUBSTANTIATION: The only reason the Panel gave for rejecting this Proposal was that all the applications of Type MP cables are not necessarily power-limited. If this is true, it creates a safety hazard that I am sure the Panel never intended. CMP 16 has always been very firm on requiring a separation between power-limited and nonpower-limited cables. I don't believe that the Panel now intends to change course and permit power-limited cables to be used for nonpower-limited applications which, in addition to the safety hazard, will cause an enforcement nightmare.

If some types of power-limited cables are being used on nonpower-limited circuits it is urgent that corrective action be taken. Since CL2, CL3 and FPL cables are always used with power-limited sources, the misapplications should be limited to CM and MP cables. The intent of this comment is to create a means for distinguishing between CM and MP Type cables used on power-limited and nonpower-limited circuits. It is also consistent with the original intent of Proposal 16-10.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Proposal 16-29. This proposal is similar and is rejected for the same reason.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #44)

16- 27 - (725, 760, and 800): Reject

NOTE: The following proposal consists of Comment 16-13 on Proposal 16-10 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 16-10 was:

Make global change from Type MP cables to Type PLMP cables and from "multipurpose" to "power-limited multipurpose."

Revise Sections 725-71(f) (new) and 800-51(g) by adding the following as the last sentence:

"The change in marking from MP to PLMP shall become effective on July 1, 2004."

SUBMITTER: Larry Miller, Nat'l Electrical Mfrs Assn. (NEMA)

RECOMMENDATION: In response to the Panel statements for rejecting this proposal, that "All the applications of Type MP cables are not necessarily power-limited," and for rejecting Proposal 16-56, that "The Panel established communications cables (Type CM) as the primary cable type for cable substitutions," change the Panel Action from Reject to Accept in Principle after making the following revisions:

a. In addition to making the global change from Type MP to Type PLMP and from "multipurpose" to "power-limited multipurpose," add a second classification of communications cables for Type PLCM, power-limited communications cables.

b. Revise subsection 800-51(g) by adding the following after "MP," in the last line "...where used for nonpower-limited applications and Type PLMPP, PLMPR, PLMPG, and PLMP, where used for power-limited applications, respectively. The required change in cable marking for power-limited applications shall become effective on July 1, 2004."

c. Add a new 800-51(j) to read:

(j) Power-Limited Communications Cables. Where communications cables are used on power-limited circuits, they shall be marked PLCMP, PLCMR, PLCMG, and PLCM instead of CMP, CMR, CMG, and CM respectively. This requirement shall become effective on July 1, 2004.

SUBSTANTIATION: The only reason the Panel gave for rejecting this proposal was that all applications of Type MP cables are not necessarily power-limited. If this is true, it creates a safety hazard that we are sure the Panel never intended. CMP 16 has always been very firm on requiring separation of power-limited and nonpower-limited cables. We don't believe it was the Panel's intent to change course and permit power-limited cables to be used for nonpower-limited applications, which, in addition to the safety hazard will cause an enforcement nightmare. If some types of power-limited cables are being used on nonpower-limited circuits, it is urgent that corrective action be taken. Since CL2, CL3 and FPL cables are always used with power-limited sources, the misapplications would be limited to CM and MP cables. The intent of this comment is to create a means for distinguishing between CM and MP Type cables used on power-limited and nonpower-limited circuits. It is also consistent with the original intent of Proposal 16-10.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action and statement on Proposal 16-29. This proposal is similar and is rejected for the same reason.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #1110)

16- 28 - (725): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise Article 725 as follows:

725-23 - change:
"No. 14" to "14 AWG"
"No. 18" to "18 AWG"
"No. 16" to "16 AWG"
725-24, Exception No. 4 - change "No. 14" to "14 AWG"
725-27(a) - change:
"No. 18 and 16" to "18 and 16 AWG"
"No. 16" to "16 AWG"
725-27(b) - change:
"No. 16" to "16 AWG"

"No. 18 and 16" to "18 and 16 AWG"
725-51, Exception - change:
"No. 14" to "14 AWG"
"No. 18" to "18 AWG"
725-71(e) - change "Nos. 22 through 12" to "22 through 12 AWG"
725-71(g) - change "No. 18" to "18 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2476)

16- 29 - (725, 760, 800, 820, 830): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: Globally, revise the required marking for communications cables permitted to be used as a substitute for types CL3-,CL2-,FPL-,CATV-, and BL- power-limited circuit cables by,

1. requiring the present "CM-" marking to be changed to "CM-/PLC"
2. changing the description of Type CM- cables from "communications cables" to "communications/power-limited circuit cables."

This change shall become effective on July 1,2003. Existing inventories shall be permitted to be used until depleted.

The sections of the listed Articles that will be affected by this change are,

- 725-61(g)FPN
- Figure 725-61
- Table 725-61
- 760-61(d)FPN
- Figure 760-61
- Table 760-61
- 800-50
- Table 800-50
- 800-51
- 800-53
- Figure 800-53
- Table 800-53
- Figure 820-53
- Table 820-53
- Table 830-58

SUBSTANTIATION: The Code permits Type CM- cables to be used for two distinctly different types of applications, as a communications cable for Article 800 applications and as a substitute for the power-limited circuit cables required by Articles 725, 760, 820 and 830. The required markings for communications cables used as substitutes for the power-limited circuit cables should identify its permitted use for both applications and not only as a communications cable.
PANEL ACTION: Reject.
PANEL STATEMENT: Additional marking is not required to be able to identify cables carrying power-limited circuits. Class 2 (CL2), class 3 (CL3) and power-limited fire alarm (FPL) cables are permitted to be used for power-limited circuits only. Using any of these cables will identify the circuit as power-limited.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #3333)

16- 30 - (725): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Delete the word "remote" where used throughout Article 725.
SUBSTANTIATION: The word remote is vague and adds no value. The term should be "control circuit". How far away is considered remote? If the control circuit and the "controlled equipment" are in the same enclosure is the circuit still considered remote? A corresponding proposal has been submitted to change the definition in Article 100.
PANEL ACTION: Reject.
PANEL STATEMENT: The word "remote" has long been associated with the term "remote control" and connotes controlling over some medium, such as metallic conductors. To use the term "remote control circuit" without the word "remote" would impart confusion because a control circuit is often an integral part of and embedded within electrical equipment, with no external access or transmission medium required.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #3197)

16- 31 - (725, Title): Accept

Note: The Technical Correlating Committee advises that Title Statements are the responsibility of the Technical Correlating Committee and the Technical Correlating Committee accepts the Panel Action.

SUBMITTER: S. E. Egesdal, Honeywell Inc.
RECOMMENDATION: Revise Article title to read as follows:
ARTICLE 725 —Class 1, Class 2, and Class 3 Remote-Control and Signaling Systems.
SUBSTANTIATION: This change coordinates with the deletion of the power-limited power sources from Section 725-21. "Circuits" is changed to "Systems" because Article 725 has requirements for equipment (power sources) as well as circuits.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
LANNI: If power limited class 1circuits are in use, the category cannot be eliminated from the code.

An example of a power limited class 1 circuit is a 24 volt damper motor circuit used to control environmental air flows.

Reference: "Guide to Low-Voltage & Limited - Energy Systems", page 4, by Mike Holt.

MANGAN: I support Mr. Lanni's reasons for Explanation of Negative Vote.
COMMENT ON AFFIRMATIVE:
EGESDAL: Support the Panel Action.

(Log #4039)

16- 32 - (725-2-Abandoned Cable (New)): Accept
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add a new definition to read as follows:
Abandoned Cable. Cable that is neither terminated at both ends, at a connector or other equipment, nor identified for future use with a tag.
SUBSTANTIATION: The definition of abandoned cable is needed to accompany the proposals that require removal of abandoned cable. This definition reflects industry practices.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 2
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
DORNA: The definition of "Abandoned Cable" should be the same here as what we accepted in Proposal 16-273. It should be "Cable that is neither terminated at ~~both ends, at a connector or other~~ equipment, nor identified for future use with a tag." (This is the same wording as Proposal 16-273.)

The reason we took out the reference to connectors in Proposal 16-273 is because CATV cable usually has connectors attached. It was our concern that CATV cables would have connectors attached and then would not fall under the proposed original definition and therefore would not have to be removed if abandoned. I believe this also could

be the case with cables in this Article 725. These cables could also have connectors attached, and therefore would not fall under the definition the panel had accepted in principal. If we make the definition the same as I have suggested above (the same as 16-273) then it will make it irrelevant on whether the cable has connectors or not. I can foresee someone using the fact that the cable has a connector on it, therefore it does not fall under "abandoned cable" and does not need to be removed.

JOHNSON: The provision for allowing cables with connectors still attached to be considered abandoned may not meet with the proposal's intent. Wording used in Proposal 16-273 is a more acceptable choice. I am in agreement with Mr. Dorna's comments on other related proposals.

COMMENT ON AFFIRMATIVE:

BRUNSSEN: I concur with the Panel's intent. However, the definition of "abandoned cable" should be identical throughout the code. The definition should be states as follows:

"Abandoned Cable. Cable that is neither terminated at equipment nor idntified for future use with a tag." It is possible for abandoned cable formerly used for any application, CATV, data, telecommunications, etc., to have a connector attached. Therefore, the presence of a connector should not be a determining factor.

KAHN: I agree with the Panel's intent but perhaps the definition should read "Cable that is neither terminated at equipment nor identified for future use with a tag." In many applications abandoned cables might have connectors and such cables should be removed.

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #4044)

16- 33 - (725-2-Excessive Accumulation of Abandoned Cables (New)): Reject

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add a new definition to read as follows:

Excessive Accumulation of Abandoned Cables. When the number of abandoned cables is greater than 1/3 of the total number of cables within a fire-containment zone.

SUBSTANTIATION: After the concept of plenum cables was introduced into the 1975 NEC, Underwriters Laboratories initially listed plenum cables by comparing the smoke production of plenum cables with the smoke production of conventional cables of the same physical design (but not plenum grade materials) in conduit. Plenum cables (not in conduit) were tested and compared with an equal number of conventional cables in conduit. It was assumed that the plenum cables were a replacement for conventional cables and that in case of a fire the amount of smoke would be reduced because of the lower smoke production of plenum cables. It was not anticipated that plenum cables would be abandoned. Since conventional cables in conduit were deemed to be acceptable the smoke from these cables is the benchmark for comparison and a fire involving an excessive amount of abandoned cables could emit excessive amount of smoke. Until research better defines what amount of abandoned cable might be excessive, allowing up to 1/3 excess of abandoned cables is prudent.

PANEL ACTION: Reject.

PANEL STATEMENT: The term is not used. The proposal that introduced this term was modified to eliminate the term.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #1801)

16- 34 - (725-3): Accept

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: Revise the first sentence as follows:

"Circuits and equipment shall comply with the Articles or Sections listed in (a) through (e)."

SUBSTANTIATION: The present wording requires compliance with (a) through (e), but these subsections are not even complete sentences. They contain no statements of requirements. The proposed revision will refer to the subsections as a list of requirements. However, as a list, the subsections would be more consistent with the editorial style of other code rules by changing the subsections to a numbered list.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #1134)

16- 35 - (725-3(a)): Reject

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Revise Section 725-3(a) as follows:

(a) Spread of Fire or Products of Combustion. See Sections 300-21 and 725-54(e).

SUBSTANTIATION: This proposal correlates with my proposal for Section 725-54(e).

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's recommendation for 725-54(e) was accepted in principle. Hence this correlating proposal is not needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #2465)

16- 36 - (725-3(a) (New)): Accept

SUBMITTER: Dann M. Strube, Lanesville, IN

RECOMMENDATION: Insert new subsection :

(a) Number and size of conductors in raceway. Section 300-17.

Renumber the remaining subsections.

SUBSTANTIATION: Section 725-28(a) refers to Section 300-17 so Section 725-3 should include the reference.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #3775)

16- 37 - (725-3(b)): Accept in Principal

Note: The Technical Correlating Committee directs that the action on this Proposal be rewritten to comply with the NEC Style Manual 3.3 to read as follows: "Section 300-22 for Class 1, Class 2, and Class 3 circuits installed in ducts, plenums or other space used for environmental air Type CL2P or CL3P cables shall be permitted for Class 2 and Class 3 circuits." This action will be considered by the Panel as a Public Comment.

SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.

RECOMMENDATION: Delete the Exception:

Change the text to read as follows:

(b) Ducts, Plenums and Other Air Handling Spaces. For Class 1, Class 2 and Class 3 circuits Section 300-22, where installed in ducts or plenums or other space used for environmental air. For Class 2 and Class 3 circuits listed Type CL2P or CL3P cables shall be permitted.

SUBSTANTIATION: There are numerous Exceptions in the NEC which can be expressed in positive code language. This proposal converts the Exception into the section text without altering its intent.

PANEL ACTION: Accept in Principle.

Change the submitter's recommendation as follows:

Delete the Exception

Change the text to read as follows:

"(b) Ducts, Plenums and Other Air Handling Spaces. For Class 1, Class 2 and Class 3 circuits Section 300-22, where installed in ducts or plenums or other space used for environmental air. For Class 2 and Class 3 circuits Type CL2P or CL3P cables shall be permitted."

PANEL STATEMENT: The word "listed" is deleted from the submitter's recommendation. Type CL2P and CL3P are always listed and the word "listed" is redundant.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #1664)

16- 38 - (725-5): Accept in Principal

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting of a similar Proposal 16-192. The Technical Correlating Committee directs that the action of this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable." Also, cables above suspended ceilings are considered to be exposed and the wording approved for this proposal could be considered to conflict with the Action on Proposal 16-39. This action will be considered by the Panel as a Public Comment. It was also the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Revise 725-5 as follows:

725-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to equipment shall not be denied by an excess accumulation of conductors and cables ~~that prevents~~ sufficient to prevent the removal of panels, including suspended ceiling panels.

SUBSTANTIATION: Section 725-5 may be misinterpreted to mean that conductors and cables may not be placed directly on suspended ceilings. While the 1999 National Electrical Code Handbook emphasizes "excess accumulation" in the interpretive text, Figures 725-2 and 725-3 lead the reader to conclude that no wires or cables are permitted to rest directly on the suspended ceiling. This was not the intent of CMP 16 when 725-5 was introduced into the 1993 NEC. At that time CMP 16 stated in response to a proposal to Article 725 (1992 TCD Comment 16-18) that the proposed requirement "... would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." The proposed revision emphasizes that it is an excessive accumulation of wire and cable that is of concern. A limited amount of wiring or cabling laid directly on a suspended ceiling is permitted, will not deny access to equipment, and does not present an unsafe working environment. This is a companion proposal and is intended to correlate with 760-5, 770-7, 800-5, 820-5 and 830-6.

PANEL ACTION: Accept in Principle.

Revise 725-5 to read as follows:

"725-5. Access to Electrical Equipment Behind Panels Designed to Allow Access

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems.

Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."

PANEL STATEMENT: The revised text satisfies the intent of the original recommendation in that it allows some cabling of a limited quantity above ceiling tile but not an excessive amount, which would interfere with accessibility.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

EGESDAL: See my Explanation of Negative on Proposal 16-192.

COMMENT ON AFFIRMATIVE:

BRUNSSEN: I concur with the panel action in providing relief for a limited amount of after-construction fire alarm and low voltage signaling wiring and cable to be placed directly on the suspended ceiling tiles. However, proposed Section 725-5(b)(2), as presently written, is confusing and could be interpreted as permitting a total of only three unsupported cables. The intent of the panel was that up to a maximum of three unsupported cables may be routed across each and every ceiling tile. Revising 725-5(b)(2) to state: "...permissible to install a maximum of three unsupported cables on top of ~~any one~~ each ceiling tile, i.e., up to three cables are permitted to lay on a ceiling tile." would clarify the intent. Note that the word "of" is inserted and is missing in the original text.

(Log #3100)

16- 39 - (725-7): Accept in Principle

SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)

RECOMMENDATION: Revise text to read as follows:

"Mechanical Execution of Work. Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike manner. Exposed ~~C~~cables and conductors shall be supported by ~~the~~ structural components of the building ~~structure~~ in such a manner that the cable or conductors will not be damaged by normal building use. Exposed cables and conductors shall be attached to structural components at intervals not exceeding 5 ft (1.52 m) and within 12 in. (305 mm) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable or conductors. The installation shall also conform with Section 300-4(d).

Also, delete the Fine Print Note.

SUBSTANTIATION: Systems continue to be installed by "tossing" exposed cables and conductors across lay-in ceiling tiles and routed through open joist construction with no regard for proper support of the cables and conductors as just one example. The intent is that these exposed cables and conductors are supported by structural components of the building, such as; beams, joists, columns or walls. Too often, the sole means of support is by laying these cables and conductors on removable ceiling panels or attaching them to a ceiling support system (T-bars or wires) which is prohibited by the National Electrical Code.

Another common observation is seeing them "strung" through open joist construction with little or no means of support other than occasionally being wrapped around a portion of the joist to keep them from sagging. The addition and use of "exposed" was carefully chosen to avoid conflict with acceptable methods within the section of installing "concealed" cables and conductors, which typically are not going to be subjected to physical damage. The reference to 300-4(d) is to protect concealed cables and conductors when appropriate.

The new text has been taken partially from, and with, Sections 330-12, 333-7 and 336-18 in mind which also deal with exposed cable systems. These changes will ensure that cables and conductors are supported properly as well as provided with strain relief when entering electrical enclosures for connections, splicing and termination's.

PANEL ACTION: Accept in Principle.

Revise the submitter's recommendation to read as follows:

Revise text to read as follows:

"Mechanical Execution of Work. Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike manner. Cables and conductors installed exposed on the surface of ceiling and sidewalls shall be supported by ~~the~~ structural components of the building ~~structure~~ in such a manner that the cable or conductors will not be damaged by normal building use. Such cables and conductors shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable or conductors. The installation shall also conform with Section 300-4(d)."

Also, delete the Fine Print Note.

PANEL STATEMENT: The revised text conforms to the definitions in Article 100, and satisfies the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

HUGHES: The submitter's desire is to require measurable intervals between supports and from points of attachment. I agree with the concept but disagree with the distances identified. Limiting the minimum support intervals to 5 ft will result in unnecessary installation costs with very little or no benefit. A more practical support interval would be 2 meters. As to minimum distance from

cabinets, etc., it is more important to provide some sort of strain relief at the cabinet so the cable will not pull out than to establish a minimum distance.

I suggest a change to the last sentence of the proposal that says:

"Such cables and conductors shall be secured to structural components at intervals not exceeding 2 meters and within 2 meters from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable or conductors. Strain relief shall be provided at cabinets, boxes, or fittings so the cables or conductors will not pull out."

JOHNSON: See my Explanation of Negative Vote on Proposal 16-2a.

(Log #3659)

16- 40 - (725-7): Accept

SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.

RECOMMENDATION: Delete the FPN associated with this section.

SUBSTANTIATION: Problem: The standards listed contain insufficient information to determine accepted industry practice for systems and equipment included in Article 725.

Substantiation: A detailed review of ANSI/EIA/TIA/568A-1995, ANSI/EIA/TIA/569-1990 , and ANSI/EIA/TIA/570-1991 was completed by the submitter and no significant information, guidance, or directives were found, that would be helpful to a user of this Article of the Code. These standards were developed by the telecom and computer industries. They provide the details covering telecommunication infrastructure such as cable pathways, equipment spaces, telephone grounding/bonding, and telecommunication administration. They are excellent standards but they do not address typical cabling installation issues such as:

(a) how to properly pull wire(s) above a lay in ceiling.

(b) when and where to support the wire in a building structure.

(c) how to dress various types of audio signal wires coming into and within an equipment cabinet.

(d) how and where to set up wire reels for riser cables in tall structures.

(e) how and where to dress audio speaker wire along a steel beam in a gymnasium or factory.

(f) what to watch out for when pulling a cable into a raceway.

These standards are purported to be the concept standards for guiding the users of the Code in determining appropriate mechanical execution of work and determination of acceptable industry practices. However, such is not the intent of the standards. For those who do not have a set of the standard available, the submitter has provided an Appendix that summarizes each section of each standard. The appendix will give you an overview of the contents of each section of each standard and enable you to gain a better understanding of what the standards cover.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept.

PANEL STATEMENT: The proposed recommendation has been incorporated by the panel action on Proposal 16-39.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

LANNI: After reviewing the NECA index No. 5037, I realized that there are very useful National Electrical Installation Standards available and a Fine Print Note is the appropriate way to guide the code user. I also feel that the panel did satisfy the original submitter when the Fine Print Note was incorporated into the code. Improving the references, instead of removing the Fine Print Note, would improve our original work. Installation documents are being produced all the time partially in response to our note in the code. The panel could only answer one of the Submitter's concerns, namely, "when and where to support the wire in a building structure." Other issues are left unanswered. Good workmanship is an important component of a safe installation, but the code cannot address all these issues and other documents are more suited for the purpose.

ROMLEIN: See my Explanation of Negative Vote on Proposal 16-3.

(Log #4021)

16- 41 - (725-7): Reject

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Revise the FPN to read: "One way to determine accepted industry practice is to refer to nationally recognized standards such as Commercial Building Telecommunications Cabling Standard, ANSI/EIA/TIA 568-A-1995; Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA/EIA 569-A-1997; and Residential ~~and Light Commercial~~ Telecommunications Cabling ~~Wiring~~ Standard, ~~ANSI/EIA/TIA 570-1991~~ ANSI/EIA/TIA 570-A-1999, ANSI/NECA/BICSI 568 or other ANSI-approved installation standards."

SUBSTANTIATION: A revision to the standard number and the title for residential cabling has been updated. Another standard is currently under review that will be focused at the installation of telecommunications cabling and connectors and will become an ANSI standard within the next year.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 725-7 has been revised to remove the FPN and provide specific installation requirements. A FPN is no longer necessary. Refer to the panel action and statement on Proposal 16-39.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

LANNI: After reviewing the NECA index No. 5037, I realized that there are very useful National Electrical Installation Standards available and a Fine Print Note is the appropriate way to guide the code user. I also feel that the panel did satisfy the original submitter when the Fine Print Note was incorporated into the code. Improving the references, instead of removing the Fine Print Note, would improve our original work. Installation documents are being produced all the time partially in response to our note in the code. The panel could only answer one of the Submitter's concerns, namely, "when and where to support the wire in a building structure." Other issues are left unanswered. Good workmanship is an important component of a safe installation, but the code cannot address all these issues and other documents are more suited for the purpose.

(Log #3754)

16- 42 - (725-7(a)): Accept in Principle

SUBMITTER: Douglas R. Erb, Construction Insp. Dept., Ocean County, NJ

RECOMMENDATION: Add a new Section 725-7(a) to read as follows:

"Supports. Class 2 and Class 3 cables shall be secured by staples, cable ties, straps or similar fittings designed and installed as not to damage the cable. Cables shall be secured at intervals not exceeding 6 ft and within 12 in. from every cabinet, box or device.

Exception No. 1: For concealed work in finished buildings where such support is impracticable, it shall be permissible to fish cable between access points."

SUBSTANTIATION: The absence of a definitive support requirement for PLFA cables which is provided for other wiring method throughout this code is needed. Without a definite support requirement enforcement of the general requirements of 725-7 provide no consistency. With the increased presence of Class 2 and Class 3 cables especially in drop ceilings damage to these cables and the integrity of their systems has increased with the lack of proper support. Lack of support for these cables creates an unsafe work area for others attempting work in these spaces.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to the panel action and statement on Proposals 16-38 and 16-39. The revised text meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

JOHNSON: See my Explanation of Negative Vote on Proposal 16-2a.

(Log #3198)

16- 43 - (725-21): Accept

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: Delete "Classifications and" from section heading, delete (a) and (b), and change the first paragraph of Section 725-21 to read as follows:

725-21. Class 1 Circuit Power Source Requirements. The power source of Class 1 remote control or signaling circuits shall comply with Chapters 1 through 4, and the output voltage shall not be more than 600 volts, nominal.

SUBSTANTIATION: There is no apparent need for the power-limited requirement presently in Section 725-21(a). A review of UL listings shows no listed product meeting the requirements of Section 725-21(a). This requirement was introduced written in Article 725 in the 1975 edition of the NEC. The purpose of the requirement was to provide requirements equivalent to article 450. The proposed revision retains the Chapter 4 requirements, while reducing the confusion by deleting the term "power-limited source." The proposed change has requirements for Class 1 circuits identical to those for nonpower-limited circuits in Section 760-21.

The title is revised as "classification and" is no longer appropriate.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

LANNI: If power limited class 1circuits are in use, the category cannot be eliminated from the code.

An example of a power limited class 1 circuit is a 24 volt damper motor circuit used to control environmental air flows.

Reference: "Guide to Low-Voltage & Limited - Energy Systems", page 4, by Mike Holt.

The submitter's claim that there are no UL Listed products meeting the requirements of Section 725-21(a) is not accurate. If by "product" the submitter was only referring to "systems", his claim is true. But it ignores the abundance of Class I power-limited sources (mainly low voltage transformers) which do meet the requirements of Section 725-21(a) and are UL Listed.

If the proposed changes to Section 725-21(a) are adopted, it will eliminate numerous applications now permitted by the code with no substantiation that they constituted a safety hazard.

Most Article 725 installations are not systems (which can be UL Listed). They are field installations, using UL Listed power sources and conductors connected to loads using Article 725 wiring methods.

These installations use individual UL Listed components, but are not UL Listed as systems that can be listed in a UL directory.

Proposal 16-31 is based on the acceptance of proposal 16-43. If Proposal 16-43 is rejected, this proposal should also be rejected. If adopted, it would limit the use of Article 725 to remote-control and signaling applications and eliminate its use for all other power-limited applications.

MANGAN: I support Mr. Lanni's reasons for Explanation of Negative Vote.

COMMENT ON AFFIRMATIVE:

EGESDAL: Support the Panel Action.

(Log #997)

16- 44 - (725-21(b)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Add new text to read as follows:

Class 2 and Class 3 power sources shall be permitted to supply Class 1 circuits.

SUBSTANTIATION: This is not explicitly prohibited by the code although it appears many code users believe it is not permitted. The limitations indicated for Class 1 circuits are maximums; lower limits are not specified and could be within parameters for Class 2 and 3 circuits. Class 1 circuits powered by Class 2 sources are apparently permitted by UL (See January/February 1992 IAEI News).

PANEL ACTION: Reject.

PANEL STATEMENT: While the code does not prohibit the application, the proposed wording could result in confusion regarding the required separation of Class 1 from Class 2 and 3 systems.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #998)

16- 45 - (725-23): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise last sentence of first paragraph:

Overcurrent protection shall not exceed ~~7~~ 6 amperes for No. 18 conductors and ~~10~~ 8 amperes for No. 16.

SUBSTANTIATION: Section 725-27(b) basically requires No. 18 and No. 16 conductors to be fixture wire and doesn't allow it for larger sizes. Section 402-12 refers to Section 240-4 which requires overcurrent protection for fixture wires in accordance with ampacity specified in Table 402-5. Fixture wire is not covered by permissive conditions of Section 240-3(b). The basic overcurrent protection ratings should agree with basic ratings indicated elsewhere in the code to minimize confusion for code users. Why should Article 725 ampacities differ from table ampacities? Present ratings would permit possible current in excess of Table 402-5 ampacities.

PANEL ACTION: Reject.

PANEL STATEMENT: The intermittent nature of the circuits covered in Article 725 are different from the general conditons covered in Chapters 1 through 4 and more liberal limitations on the overcurrent protection permitted are appropriate. Also refer to the FPN following 725-1.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #4264)

16- 46 - (725-23 Exception No. 2): Reject

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Designate the existing Exception as Exception No. 1 and add a second exception as follows:

Exception No. 2: Conductors qualifying under the provisions of Section 725.27(c) shall be protected by overcurrent devices rated or set not over 5 amperes for No. 20 and larger conductors, and not over 3 amperes for No. 22 conductors.

SUBSTANTIATION: This is a companion proposal to another on Section 725.27 which brings the essential requirements of Article 727 into Article 725, and a third proposal to delete Article 727. The principal substantiation is on the proposal for the new Section 725.27(c). Please refer to that proposal for more information.

PANEL ACTION: Reject.

PANEL STATEMENT: 725-27(a) permits 18 and 16 AWG. No justification has been provided to allow the proposed smaller sizes for Class 1 circuits.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #3199)

16- 47 - (725-24): Accept in Principle

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: Revise as follows:

725-24. Class 1 Circuit Overcurrent Device Location. Overcurrent devices shall be located as specified in (a) through (e).

(a) Point of Supply. Overcurrent devices shall be located at the point where the conductor to be protected receives its supply.

(b) Feeder Taps. Class 1 circuit conductors shall be permitted to be tapped, without overcurrent protection at the tap, where the overcurrent device protecting the circuit conductor is sized to protect the tap conductor.

(c) Transformer Taps. Class 1 circuit conductors No. 14 and larger that are tapped from the load side of the overcurrent-protective device(s) of a controlled light and power circuit shall require only short-circuit and ground-fault protection and shall be permitted to be

protected by the branch-circuit overcurrent protective device(s) where the rating of the protective device(s) is not more than 300 percent of the ampacity of the Class 1 circuit conductor.

(d) Supply Side of Transformer. Class 1 circuit conductors supplied by the secondary of a single-phase transformer having only a 2-wire (single-voltage) secondary shall be permitted to be protected by overcurrent protection provided on the primary (supply) side of the transformer, provided this protection is in accordance with Section 450-3 and does not exceed the value determined by multiplying the secondary conductor ampacity by the secondary-to-primary transformer voltage ratio. Transformer secondary conductors other than 2 wire shall not be considered to be protected by the primary overcurrent protection.

(e) Supply Side of Electronic Power Source. Class 1 circuit conductors supplied by the output of a single-phase, listed electronic power source, other than a transformer, having only a 2-wire (single voltage) output for connection to Class 1 circuits shall be permitted to be protected by overcurrent protection provided on the input side of the electronic power source, provided this protection does not exceed the value determined by multiplying the Class 1 circuit conductor ampacity by the output-to-input voltage ratio. Electronic power source outputs, other than 2 wire (single voltage).

SUBSTANTIATION: The power source exceptions are changed to positive language in compliance with 3.1.4.2 of the Style Manual.

PANEL ACTION: Accept in Principle.

Revise the submitter's recommendation to read as follows:

"725-24. Class 1 Circuit Overcurrent Device Location. Overcurrent devices shall be located as specified in (a) through (e).

(a) Point of Supply. Overcurrent devices shall be located at the point where the conductor to be protected receives its supply.

(b) Feeder Taps. Class 1 circuit conductors shall be permitted to be tapped, without overcurrent protection at the tap, where the overcurrent device protecting the circuit conductor is sized to protect the tap conductor.

(c) Transformer Taps. Class 1 circuit conductors No. 14 and larger that are tapped from the load side of the overcurrent-protective device(s) of a controlled light and power circuit shall require only short-circuit and ground-fault protection and shall be permitted to be protected by the branch-circuit overcurrent protective device(s) where the rating of the protective device(s) is not more than 300 percent of the ampacity of the Class 1 circuit conductor.

(d) Primary Side of Transformer. Class 1 circuit conductors supplied by the secondary of a single-phase transformer having only a 2-wire (single-voltage) secondary shall be permitted to be protected by overcurrent protection provided on the primary side of the transformer, provided this protection is in accordance with Section 450-3 and does not exceed the value determined by multiplying the secondary conductor ampacity by the secondary-to-primary transformer voltage ratio. Transformer secondary conductors other than 2 wire shall not be considered to be protected by the primary overcurrent protection.

(e) Input Side of Electronic Power Source. Class 1 circuit conductors supplied by the output of a single-phase, listed electronic power source, other than a transformer, having only a 2-wire (single voltage) output for connection to Class 1 circuits shall be permitted to be protected by overcurrent protection provided on the input side of the electronic power source, provided this protection does not exceed the value determined by multiplying the Class 1 circuit conductor ampacity by the output-to-input voltage ratio. Electronic power source outputs, other than 2 wire (single voltage)."

PANEL STATEMENT: The text and titles have been revised to make them consistent with terminology used elsewhere in the code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #2524)

16- 48 - (725-24 Exception No. 1): Reject

SUBMITTER: Allen F. KnicKrehm, The KnicKrem Co.

RECOMMENDATION: Revise as follows:

725-24(a) Conductors shall be permitted to be protected by an overcurrent device rated less than the conductor ampacity.

SUBSTANTIATION: This proposal is to remove "Exceptions" and state requirements in positive language.

PANEL ACTION: Reject.

PANEL STATEMENT: 725-24 deals with the overcurrent device location. The proposed recommendation deals with the size of the overcurrent device.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #2525)

16- 49 - (725-24 Exception No. 2): Reject

SUBMITTER: Allen F. KnicKrehm, The KnicKrem Co.

RECOMMENDATION: Revise as follows:

Delete Exception No. 2 and insert a fine print note as follows:

FPN: See Section 240-3(f) for transformer secondary conductor protection.

SUBSTANTIATION: The revisions to Section 240-3 state the requirements in stand alone clear text. The jurisdiction for this requirement is with the CMP for Article 240. This proposal is in keeping with the effort to make the code easy to use.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation is incorrect. 240-3(g) refers specifically back to Article 725. Refer also to the panel action on Proposal 16-47 where all exceptions were converted into positive language. The FPN is not needed because the requirements are included in Proposal 16-47.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #2291)

16- 50 - (725-25): Accept in Principal

Note: The Technical Correlating Committee directs that the action on this Proposal be revised to comply with the NEC Style Manual 3.1.4 regarding the wording of Exceptions No. 1 and No.2. The Technical Correlating Committee notes that the revised wording in the Panel Action appears to conflict with Section 725-3 that states in part that "Only those sections of Article 300 referenced in this article shall apply." The revised Section 725-25 does not refer to any specific section of Article 300. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Dann M. Strube, Lanesville, IN

RECOMMENDATION: Add a new second and third sentence as follows:

"Splices and taps shall be made in accordance with Section 300-15. See Article 370 for rules on the installation and use of boxes and conduit bodies."

SUBSTANTIATION: Section 725-3 does not require the application of Section 300-15. Therefore, the only code path to require a box where Class 1 circuits are spliced is through the Chapter 3 rules for the type of raceway used. For example if EMT is used then Section 348-15 would require the use of Section 300-15. The problem with this is that Section 90-3 allows Chapter 7 to modify Chapters 1 through 4 but does not allow Chapter 3 to modify Chapter 7. Therefore, Chapter 3 cannot require the use of Section 300-15 which Article 725 has exempted in Section 725-3. The proposed change will correct this change.

PANEL ACTION: Accept in Principle.

Revise 725-25 to read as follows:

"725-25. Class 1 Circuit Wiring Methods

Installations of Class 1 circuits shall be in accordance with Article 300 and the other appropriate articles in Chapter 3.

Exception No. 1: As provided in Sections 725-26 through 725-28.

Exception No. 2: Where other articles of this Code permit or require other methods."

PANEL STATEMENT: The revised text provides clarification requested by the submitter that Article 300 is appropriate to the installation of Class 1 circuits. Confusion was added when the Technical Correlating Committee moved Exception No. 2 from 300-1 of the 1996 code to the main text of 725-3 in the 1999 code.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #CP1601)

16- 51a - (725-26): Accept
SUBMITTER: CMP 16
RECOMMENDATION: Revise as follows:
"725-26. Conductors of Different Circuits in the Same Cable, Cable Tray, Enclosure, or Raceway. Class 1 circuits shall be permitted to be installed with other circuits as specified in (a) through (b).
(a) Two or More Class 1 Circuits. Class 1 circuits shall be permitted to occupy the same cable, cable tray, enclosure, or raceway without regard to whether the individual circuits are alternating current or direct current, provided all conductors are insulated for the maximum voltage of any conductor in the cable, cable tray, enclosure, or raceway.
(b) Class 1 Circuits with Power Supply Circuits. Class 1 circuits shall be permitted to be installed with power supply conductors as specified in (1) through (4).
(1) In a Cable, Enclosure, or Raceway. Class 1 circuits and power supply circuits shall be permitted to occupy the same cable, enclosure, or raceway only where the equipment powered is functionally associated.
(2) In Factory- or Field-Assembled Control Centers. Class 1 circuits and power supply circuits shall be permitted to be installed in factory- or field-assembled control centers.
(3) In a Manhole. Class 1 circuits and power supply circuits shall be permitted to be installed as underground conductors in a manhole in accordance with (a), (b), or (c).
(a) The power-supply or Class 1 circuit conductors are in a metal-enclosed cable or Type UF cable.
(b) The conductors are permanently separated from the power-supply conductors by a continuous firmly fixed nonconductor, such as flexible tubing, in addition to the insulation on the wire.
(c) The conductors are permanently and effectively separated from the power supply conductors and securely fastened to racks, insulators, or other approved supports.
(4) In cable trays, where the Class 1 circuit conductors and power-supply conductors not functionally associated with them are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class 1 circuit conductors are in a metal-enclosed cable."
SUBSTANTIATION: The use of "cable tray" has been added within the requirements of this section. Refer to panel action on Proposal 16-54. The exceptions are changed to positive language. Refer to panel action on Proposal 16-51.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HUGHES: I do not feel cable tray needs to be added to this Section (625-26) of the code. This section addresses "conductors", which implies individual conductors and not cables. Individual conductors for this class of wiring are not allowed in cable tray. Adequate protection is provided in cable trays by the outer jacket of the cable assembly.

(Log #3200)

16- 51 - (725-26): Accept in Principle
SUBMITTER: S. E. Egesdal, Honeywell Inc.
RECOMMENDATION: Revise as follows:
725-26. Conductors of Different Circuits in Same Cable, Enclosure, or Raceway. Class 1 circuits shall be permitted to be installed with other circuits as specified in (a) through (b).
(a) Two or More Class 1 Circuits. Class 1 circuits shall be permitted to occupy the same cable, enclosure, or raceway without regard to whether the individual circuits are alternating current or direct current, provided all conductors are insulated for the maximum voltage of any conductor in the cable, enclosure, or raceway.
(b) Class 1 Circuits with Power Supply Circuits. Class 1 circuits shall be permitted to be installed with power supply conductors as specified in (1) through (3).
(1) In a Cable, Enclosure, or Raceway. Class 1 circuits and power supply circuits shall be permitted to occupy the same cable, enclosure, or raceway only where the equipment powered is functionally associated.
(2) In Factory- or Field-Assembled Control Centers. Class 1 circuits and power supply circuits shall be permitted to be installed in factory- or field-assembled control centers.
(3) In a Manhole. Class 1 circuits and power supply circuits shall be permitted to be installed as underground conductors in a manhole in accordance with (a), (b), or (c).
(a) The power-supply or Class 1 circuit conductors are in a metal-enclosed cable or Type UF cable.
(b) The conductors are permanently separated from the power-supply conductors by a continuous firmly fixed nonconductor, such as flexible tubing, in addition to the insulation on the wire.
(c) The conductors are permanently and effectively separated from the power supply conductors and securely fastened to racks, insulators, or other approved supports.
SUBSTANTIATION: The exceptions are changed to positive language in compliance with 3.1.4.2 of the Style Manual.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-51(a) for the final text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #999)

16- 52 - (725-26(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(b) Class 1 Circuits with Power Supply circuits. Class 1 circuits and power supply circuits shall be permitted to occupy the same cable, enclosure, or raceway only where the Class 1 circuit(s) ~~equipment powered~~ is functionally associated with one or more of the power supply circuits.
~~Exception No. 1: Where installed in factory or field asembled control centers.~~
Exception No. ~~2~~1: Underground conductors in a manhole or other enclosure shall not be required to be functionally associated where one or more of the following conditions is met:
a. The power-supply or Class 1 conductors are in a metal-armored cable or multiconductor Type UF cable;
b. The Class 1 circuit conductors are permanently separated from the power-supply conductors by a firmly fixed nonconductor, such as flexible tubing, in addition to insulation on the wire;
c. The conductors of the Class 1 circuits are permanently and effectively separated from the power-supply conductors and all conductors are securely fastened to racks, insulators, or other approved supports.
SUBSTANTIATION: Present wording requires all power circuits and all Class 1 circuits to be functionally associated regardless of the number of power circuits or Class 1 circuits. This does not permit a power circuit with its associated Class 1 circuit in a raceway with another set of power conductors with its associated Class 1 unless all are functionally associated. What is the added hazard? The proposal would allow, in many cases a single raceway in lieu of multiple runs. Subsection (a) permits mixing of different Class 1 circuits regardless of functional association and Section 300-3(c)(1) appears to indicate no safety hazard in mixing different system circuits in the same enclosure, nor does the intent of present Exception No. 1.
Present Exception No. 2 is revised to require Type UF cable to be multiconductor type and require power circuit conductors to be fastened, since they may be subject to movement which could result in contact with Class 1 circuit conductors.
The present exceptions do not specifically indicate what is excepted, literally except the permitted association under the condition of the rule. For example present Exception No. 1 does not permit the rule where installed in control centers whereas the intent is apparently to allow nonassociated conductors in control centers.
Section 760-26(a) permits Class 1 and nonpower-limited circuit conductors in the same raceway or cable without regard to functional association.
PANEL ACTION: Reject.
PANEL STATEMENT: While the code does not prohibit the application, the proposed wording could result in confusion regarding the required separation of Class 1 from Class 2 and 3 systems.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2464)

16- 53 - (725-26(b)): Reject
SUBMITTER: Dann M. Strube, Lanesville, IN
RECOMMENDATION: Add a new second sentence as follows:
All conductors shall be insulated for the maximum voltage of any conductor in the cable, enclosure, or raceway.
SUBSTANTIATION: This requirement is found in Section 725-26(a) and Section 300-3(c)(1) and should be included here.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation has been included to show that present insulation requirements for a Class 1 circuit with its power supply has posed a hazard. The insulation requirements for Class 1 circuits are enumerated in 725-27.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2493)

16- 54 - (725-26(b)): Accept in Principle
SUBMITTER: Peter D. Noval, Jr., Philadelphia, PA
RECOMMENDATION: Add text to read as follows:
(b) Class 1 Circuits with Power Supply Circuits. Class 1 circuits and power supply circuits shall be permitted to occupy the same cable, cable tray, enclosure, or raceway only where the equipment powered is functionally associated.
Exception No. 1: Where installed in factory- or field-assembled control centers.
Exception No. 2: Underground conductors in a manhole where one of the following conditions is met:
(a) The power-supply or Class 1 circuit conductors are in a metal-enclosed cable or Type UF cable.
(b) The conductors are permanently separated from the power-supply conductors by a continuous firmly fixed nonconductor, such as flexible tubing, in addition to the insulation on the wire.
(c) The conductors are permanently and effectively separated from the power supply conductors, and securely fastened to racks, insulators, or other approved supports.
Exception No. 3: In cable trays, where the Class 1 circuit conductors and power-supply conductors are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class 1 circuit conductors are in a metal-enclosed cable.
SUBSTANTIATION: Field experience has shown that there is often a total intermixing of all Class I circuits with all light and power circuits, where cable tray is utilized as a wiring method, particularly in heavy industrial installations.
This section, as presently written, does not appear to specifically address cable tray as a wiring method, and, as a result, its intent is being missed in both the design and construction phases of a project. The prohibited intermixing can only be inferred, putting the inspector at an extreme disadvantage.
The proposed text would help to eliminate any further misinterpretation of this section and any potential hazards caused by such intermixing of circuits on future installations.
This would also allow the electrical inspector to readily cite and convey the true intent of the section to designers and installers alike.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-51(a) for the final text. The additional change to the title is needed to include the scope for cable trays. Exception No. 3 is revised to clarify that the application is for non functionally associated power supplies.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HUGHES: See my Explanation of Vote on Proposal 16-51a.

(Log #2902)

16- 55 - (725-26(b)): Accept in Principle
SUBMITTER: Peter D. Noval, Jr., Philadelphia, PA
RECOMMENDATION: Add text to read as follows:
(b) Class 1 Circuits with Power Supply Circuits. Class 1 circuits and power supply circuits shall be permitted to occupy the same cable, cable tray, enclosure, or raceway only where the equipment powered is functionally associated.
Exception No. 1: Where installed in factory- or field-assembled control centers.
Exception No. 2: Underground conductors in a manhole where one of the following conditions is met:
(a) The power-supply or Class 1 circuit conductors are in a metal-enclosed cable or Type UF cable.
(b) The conductors are permanently separated from the power-supply conductors by a continuous firmly fixed nonconductor, such as flexible tubing, in addition to the insulation on the wire.
(c) The conductors are permanently and effectively separated from the power supply conductors and securely fastened to racks, insulators, or other approved supports.
Exception No. 3: In cable trays, where the Class 1 circuit conductors and power-supply conductors are separated by a solid fixed barrier of a material compatible with the cable tray, or where the power-supply or Class I circuit conductors are in a metal-enclosed cable.
SUBSTANTIATION: Field experience has shown that there is often a total intermixing of all Class I circuits with all light and power circuits, where cable tray is utilized as a wiring method, particularly in heavy industrial installations.
This section, as presently written, does not appear to specifically address cable tray as a wiring method, and, as a result, its intent is being missed in both the design and construction phases of a project. The prohibited intermixing can only be inferred, putting the inspector at an extreme disadvantage.
The proposed text would help to eliminate any further misinterpretation of this section and any potential hazards caused by such intermixing of circuits on future installations.
This would also allow the electrical inspector to readily cite and convey the true intent of the section to designers and installers alike.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposal is identical to 16-54. Refer to panel action on Proposal 16-51(a) for the final text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
HUGHES: See my Explanation of Vote on Proposal 16-51a.

(Log #4265)

16- 56 - (725-27(c) (New)): Reject
Note: The Technical Correlating Committee directs the Panel to reconsider the Proposal relative to the incorporation of Article 727 into Article 725. This action will be considered by the Panel as a Public Comment.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add a new subsection (c) as follows:
(c) Instrumentation Tray Cable, Type ITC. Class 1 control circuits other than those covered in Section 725-8(a) shall be permitted to be wired using multiconductor factory-assembled cables containing two or more conductors with insulation rated for 300 volts, cabled with or without grounding conductor(s), and enclosed in a nonmetallic jacket. The cables shall be permitted to be shielded, and a metallic sheath or armor shall be permitted to be applied over the nonmetallic jacket.
(1) Uses Permitted. Type ITC cable shall be permitted to be used only in industrial establishments where the conditions of maintenance and supervision assure that only qualified persons will service the installation. The cable shall only be permitted to be used where provided with additional protection and support as follows:
(1) In cable trays.
(2) In raceways.
(3) In hazardous locations as permitted in Articles 501, 502, 503 and 505.
(4) As open wiring where equipped with a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armor

applied over the nonmetallic sheath in accordance with this section. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).

Exception No. 1: Type ITC cable without a metallic sheath or armor shall be permitted to be installed as open wiring between cable tray and equipment in lengths not to exceed 50 ft, where the cable is supported and protected against physical damage using mechanical protection, such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).

Exception No. 2: Type ITC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring between the cable tray and the equipment in lengths not to exceed 50 ft (15.2m). The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).

(5) As aerial cable on a messenger.

(6) Direct buried where identified for the use.

(7) Under raised floors in control rooms and rack rooms where arranged to prevent damage to the cable.

(2) Uses Not Permitted. Type ITC cable shall not be installed for circuits operating at more than 150 volts nominal, or more than 5.0 amperes. Type ITC cable shall not be installed with power, lighting, or other nonpower limited circuits.

Exception No. 1: Type ITC cable shall be permitted to terminate within enclosures where the conductors are permanently and effectively separated from other nonpower limited conductors in accordance with the requirements for the separation of Class 2 and Class 3 circuits from nonpower limited circuits in Section 725-54(a)(1) Exception No. 2 or Exception No. 3. For the purposes of applying Exception No. 2 only, the insulation on Type ITC cables shall be assumed to be equivalent to Class 3 insulation.

Exception No. 2: Type ITC cable shall be permitted to be installed with power, lighting, or other nonpower limited circuits where otherwise permitted for Class 1 circuits by this article, and in addition where a smooth metallic sheath, welded and corrugated metallic sheath, or interlocking metallic tape armor is applied over the nonmetallic jacket.

(3) Construction. The insulated conductors of Type ITC cable shall be in sizes No. 22 through No. 12. The conductor material shall be copper or thermocouple alloy.

(4) Marking. Type ITC cable shall be marked in accordance with Section 310-11.

(5) Bends. Bends in Type ITC cable shall be made so as to not damage the cable.

SUBSTANTIATION: This proposal and its two companions incorporate the concepts in the new NEC Article 727 into Article 725 where they belong. The proposal has been updated since the version submitted in the last cycle to incorporate the changes CMP 16 made in the 1999 version of Article 727. Leaving a separate Article 727 in place leaves a standing, unavoidable conflict with other provisions in Article 725. In effect, it retains the disadvantages of the rejected Class 4 circuit concept with the additional confusion the inevitably stems from the fact that Article 727 wiring is for control circuits and not power circuits. We have no problem with and well understand the goals of the proponents of that article, but we cannot support the means.

There are a few changes from Article 727. The 600-volt insulation rule is retained for safety control equipment where a failure would create a direct fire or life hazard. Section 725-27(c)(1)c. excludes Article 504 because Class 1 circuits are not intrinsically safe. The cable could certainly be used for IS circuits, but not under this part of Article 725. Section 725-27(c)(2) Exception No. 1 includes a specific description of exactly how one maintains "separations ... by other means."

The only other way to accomplish the goals of the new article would be to include this wiring under the Class 3 category. That has merit if the users of ITC cable can live with the power limitations. On balance, the Advisory Committee has chosen this approach, as Class 1, because we believe in the objectives of the Article 727 submitters so strongly that we don't want to create an unintended barrier to the use of their methodology. As Class 1 they will have a free hand, and yet the separation requirements in place in this proposal are assuring safety in Massachusetts now and we are confident they will nationally if this proposal is accepted.

We have been dismayed at the hostility toward this proposal from members of CMP 16, given our constructive viewpoint on these issues. The Technical Correlating Committee, apparently, is going to have to aggressively address the continuing implicit and inevitable conflict between Article 725 and 727. Here's a multiple choice example I ran in EC&M Magazine to illustrate the problem: Suppose you run a 2A 120V control circuit for a motor contactor using the new Type ITC cable, with a 5A time-delay fuse for protection. Other than the fuse, there won't be any power limitation on this circuit. What insulation level do you need on this cable?

a. 150V
b. 300V
c. 600V
d. Ask the authority having jurisdiction.

And here's the answer I gave the readers: "d, Section 725-27(b); Section 727-4. This circuit squarely conforms to the scope of Article 725, and it cannot be a Class 2 or Class 3 control circuit because it doesn't have a listed source. It's well beyond the allowable energy parameters of such circuits anyway. That makes it a Class 1 control circuit, which has to have 600V insulation. On the other hand, the fact that it runs in Type ITC cable means it can have 300V insulation. These two provisions are in direct conflict, leaving the authority having jurisdiction with a decision. The panel intent is to allow the 300V insulation level."

We don't see how a stand-alone Article 727 will ever avoid this problem, and ITC cable, with its extreme power limitations, should never go back into Chapter 3 either. We see no realistic alternative than to accept some version of this approach.

PANEL ACTION: Reject.

PANEL STATEMENT: ITC Cable is limited to specific applications and is not applicable to all Article 725 wiring methods.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

COMMENT ON AFFIRMATIVE:

KAHN: The Panel is correct; this particular proposal should be rejected. All the Articles in Chapter 7 deal with Systems except Article 727, which deals with a Specific Type or Cable. The Panel should consider incorporating the requirements of Article 727 into the appropriate system Articles.

Log #1001)

16- 57 - (725-28(a), (b)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

(a) Class 1 Circuit Conductors. Where only Class 1 circuit conductors are in a raceway or cable the number of conductors in a raceway shall be determined in accordance with Section 300-17. (remainder unchanged).

(b) Power-Supply Conductors and Class 1 Circuit Conductors. Where power-supply conductors and Class 1 circuit conductors are permitted in a raceway or cable in accordance with Section 725-26, the number of conductors in a raceway shall be determined in accordance with Section 300-17. (remainder unchanged).

SUBSTANTIATION: Editorial. Although the second sentences of (a) and (b) do not literally preclude Section 310-15(b)(2)(a) from applying to cables, the provisions of this section may suggest the rating modifications only apply to conductors in a raceway, since cables are not mentioned. The proposal continues to indicate the number of conductors applies to a raceway but more clearly indicates the derating modifications apply also to cables.

PANEL ACTION: Reject.

PANEL STATEMENT: The section explicitly deals with the number of conductors permitted in a raceway. Inserting the word "cable" causes confusion and raises a question as to the number of Class 1 circuit conductors that are permitted in a cable.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #3201)

16- 58 - (725-30 (New), 725-31 (New), and 725-25): Reject

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: To correlate with the proposed new text in 725-30 and 31, revise Section 725-25, Exception No. 1 by changing "725-28" to "725-30" to read as follows:

"Exception No. 1: As provided in Sections 725-26 through 725-30."

The proposed new Section 725-30 and 31 text follows:

725-30. Multiconductor CL1 Cables. Multiconductor Class 1 cables that meet the requirements of Section 725-31 shall be permitted to be used on remote control circuits operating at 150 volts or less and shall be installed in accordance with (a) and (b).

(a) Class 1 Wiring Method. Multiconductor Class circuit cables shall be installed as follows.

1. In raceway or exposed on surface of ceiling and sidewalls or fished in concealed spaces. Cable splices or terminations shall be made in listed fittings, boxes, enclosures, fire alarm devices, or utilization equipment. Where installed exposed, cables shall be adequately supported and installed in such a way that maximum protection against physical damage is afforded by building construction such as baseboards, door frames, ledges, etc. Where located within 7 ft (2.13 m) of the floor, cables shall be securely fastened in an approved manner at intervals of not more than 18 in. (457 mm).

2. In metal raceway or rigid nonmetallic conduit where passing through a floor or wall to a height of 7 ft (2.13 m) above the floor unless adequate protection can be afforded by building construction such as detailed in (1), or unless an equivalent solid guard is provided.

3. In rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, or electrical metallic tubing where installed in hoistways.

Exception: As provided for in Section 620-21 for elevators and similar equipment.

(b) Applications of Listed Class I Cables. The use of Class I circuit cables shall comply with (1) through (4).

(1) Ducts and Plenums. Multiconductor Class 1 circuit cables. Type CL1P, CL1, and CL1, shall not be installed exposed in ducts or plenums. See Section 300-22(b).

(2) Other Spaces Used for Environmental Air. Cables installed in other spaces used for environmental air shall be Type CL1.

Exception No. 1: Types CL1R and CL1 cables installed in compliance with Section 300-22(c).

Exception No. 2: Other wiring methods in accordance with Section 300-22(c) and conductors in compliance with Section 760-27(c).

(3) Riser. Cables installed in vertical runs and penetrating more than one floor or cables installed in vertical runs in a shaft shall be Type CL1R. Floor penetrations requiring Type CL1R shall contain only cables suitable for riser or plenum use.

Exception No. 1: Type CL1 or other cables specified in Chapter 3 that are encased in metal raceway.

Exception No. 2: Type CL1 cables located in a fireproof shaft having firestops at each floor.

FPN: See Section 300-21 for firestop requirements for floor penetrations.

(4) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in Section 725-30(b)(1)(2) and (3) shall be Type CL1.

Exception No. 1: Chapter 3 wiring methods.

Exception No. 2: Type CL1P or Type CL1R cables shall be permitted.

760-31. Listing and Marking of CL1 Cables. Class 1 cables installed as wiring within buildings shall be listed in accordance with (a) and (b) and as being resistant to the spread of fire in accordance with (c) through (f), and shall be marked in accordance with (g).

(a) Class 1 Conductors. Conductors shall be No. 18 or larger, solid or stranded.

(b) Insulated Conductors. Insulated conductors shall be suitable for 600 volts. Insulated conductors No. 14 and larger shall be one of the types listed in Table 310-13 or one that is identified for this use. Insulated conductors No. 18 and No. 16 shall be in accordance with Section 725-27.

(c) Type CL1P. Type CL1P cable for use in other space used for environmental air shall be listed as being suitable for use in other space used for environmental air as described in Section 300-22(c) and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining low smoke-producing cable is by establishing an acceptable value of the smoke produced when tested in accordance with the Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables, NFPA 262-1994, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing a maximum allowable flame travel distance of 5 ft (1.52 m) when tested in accordance with the same test.

(d) Type CL1R. Type CL1R riser cable shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

FPN: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that cables pass the Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts, ANSI/UL 1666-1997.

(e) Type CL1. Type CL1 cable shall be listed as being suitable for general-purpose fire alarm use, with the exception of risers, ducts, plenums, and other space used for environmental air, and shall also be listed as being resistant to the spread of fire.

FPN: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in the Reference Standard for Electrical Wires Cables and Flexible Cords, ANSI/UL 1581-1991.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 4 ft 11 in. (1.5 m) when performing the CAS vertical flame test — cables in cable trays as described in Test Methods for Electrical Wires and Cables, CSA C22.2 No. 0.3-M-1985.

(f) NPLFA Cable markings. Multiconductor Class 1 circuit cables shall be marked in accordance with Table 725-31(f). Class 1 circuits cables shall be permitted to be marked with a maximum usage voltage rating of 150 volts.

Table 725-31(g) NPLFA Cable Markings

Cable Marking	Type	Reference
CL1P	Class 1 circuit cable for use in other space used for environmental air	725-31(c)
CL1R	Class 1 circuit riser cable	760-31(d)
CL1	Class 1 circuit cable	760-31(e)

FPN: Cable types are listed in descending order of fire-resistance rating.

SUBSTANTIATION: The proposed new sections are parallel requirements to those found in Article 760-30 and 31. There are a number of Class 1 circuits that become fire alarm circuits when a fire alarm system is installed, especially when a smoke control system is installed. The circuits fall under either Article 725 or Article 760, depending on the type of control system. The equipment controlled includes, but is not limited to the following: fans, dampers, lighting, process control equipment, and door locks. Where this equipment is connected to a fire alarm system, nonpower-limited multiconductor cable can be installed. If the equipment is connected to a remote control and signaling circuit, Class 1 conductors or Chapter 3 conductors must be installed in raceway to meet the requirements of Article 725, Part B.

The proposed multiconductor cable circuits permit 150 volts to ground, maximum.

PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation provides no justification other than to parallel a fire alarm system and did not address safety considerations. The allowance for nonpower limited fire alarm cable was given special consideration due to its specific application to fire alarm systems and limited use for this purpose.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #1802)

16- 59 - (725-41): Accept in Principle

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: Renumber or relocate 725-41(a)(5). It should be an unnumbered second paragraph in Section 725-41 (a). As an alternative, change the text of 725-41(a) to include (5).

SUBSTANTIATION: As presently written, 725-41(a) refers only to (1) through (4). Item (5) is left hanging with no reference. It is not recognized by Section 725-41(a) as a Class 2 power source. For this reason, it should be included as a separate explanatory paragraph or included in the text of 725-41(a).

PANEL ACTION: Accept in Principle.

Revise the lead in text of 725-41(a) to read as follows:

"(a) Power Source. The power source for a Class 2 or a Class 3 circuit shall be as specified in (1), (2), (3), (4) or (5):"

{the remaining text is unchanged}

PANEL STATEMENT: The Panel accepts the alternative recommendation of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #2142)

16- 60 - (725-41(a)(2), Exception (New)): Reject

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: The new Exception to 725(a)(2) will read:

"Where new or existing control panels do not have enough space for multiple Class 2 or 3 listed power supplies, a larger listed power supply may be fused multiple times to supply multiple circuits as long as each circuit meets the power requirements of Chapter 9 Tables 11(a) and 11(b)."

SUBSTANTIATION: The demand in the industry is for small control panels. The change in this article last year resulted in the exclusion of large power supplies feeding multiple control circuits. It now requires that only items in 725-41(a)(1) through (5) be acceptable as power sources. In the Minneapolis/St. Paul area, the panel shops are building control panels with listed power supplies that meet the requirements of Class 2 or 3 but are not specifically designated as Class 2 or 3 or are fused to meet the Class 2 or 3 requirement. Of the X vendors polled across the nation, only one manufacturer has taken this change to heart and produced listed power supplies specifically designated as Class 2 or 3. But, at this time, they only have 24 volt, 4 amp supplies and 8 amp are not available. There are, however, many listed 10 and 15 amp 24 volt power supplies available. The installations in thousands of control panels across the United States were safe before the 1993 code, and new installations after that date are still safe even after 1996 and 1999 code made them illegal. It is not the intent of the National Electrical Code to be ignored if a rule is found unenforceable. The rule must instead be modified to fit what reality is.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Overcurrent protection alone can not be used to create a Class 2, or Class 3 power source. Refer to the listing requirements in Chapter 9 Table 11(a). The panel understands that the proposal reference is 725-41(a)(2).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HUGHES: The Panel Action ignores a very real problem that exists in industry. This problem was adequately communicated by the proposer in the substantiation. Practical safeguarding will not be compromised by the addition of this exception.

(Log #2144)

16- 61 - (725-41(a)(2), Exception (New)): Reject

SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.

RECOMMENDATION: The new Exception to 725-41(a)(2) will read:

"Where new or existing control panels utilize a larger listed power supply which is fused multiple times to supply multiple circuits as long as each circuit meets the power requirements of a Class 2 or 3 listed power supply."

SUBSTANTIATION: The demand in the industry is for small control panels. The change in this article last year resulted in the exclusion of large power supplies feeding multiple control circuits. It now requires that only items in 725-41(a)(1) through (5) be acceptable as power sources. In the Minneapolis/St. Paul area, the panel shops are building control panels with listed power supplies that meet the requirements of Class 2 or 3 but are not specifically designated as Class 2 or 3 or are fused to meet the Class 2 or 3 requirement. Of the 27 vendors polled across the nation, three manufacturers have taken this change to heart and produced listed power supplies specifically designated as Class 2 or 3. But, at this time, they only have 24 volt, 4 amp supplies and 8 amp are not available. There are, however, many listed 10 and 15 amp 24 volt power supplies available. The installation in thousands of control panels across the United States were safe before the 1993 code, and new installations after that date are still safe even after 1996 and 1999 code made them illegal. It is not the intent of the National Electrical Code to be ignored. The rule must instead be modified to fit what reality is. An example of what this new rule has done to process machine control is that of a new machine that was built for 3M. To meet the requirement of the NEC, the panel manufacturer had to install 16 separate 4.2 amp power supplies, when in the past 1/2 to 1/4 of that many larger power supplies correctly fused would have sufficed. Because of this 3M incurred higher cost in the engineering and construction of that machine to the tune of more pages of elementrys, a larger panel, more internal equipment and more wiring on the machine and larger conduit to accommodate this wiring. It will also impact 3M in the future maintenance of that machine as there is now far more complexity, equipment and wiring that can go wrong.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: Overcurrent protection alone can not be used to create a Class 2, or Class 3 power source. Refer to the listing requirements in Chapter 9 Table 11(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

HUGHES: See my Explanation of Negative Vote on Proposal 16-60.

(Log #3202)

16- 62 - (725-42 (New), and 725-52): Accept in Principle

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: Revise text as follows. [Note: The existing first paragraph becomes 725-52(b).]

760-52. Wiring Methods and materials on Load Side of the Class 2 or Class 3 Power Source. Class 2 and Class 3 circuits on the load side of the power source shall be permitted to be installed using wiring methods and materials in accordance with either (a) or (b).

(a) Class I Wiring Methods and Materials. Installation shall be in accordance with Section 725-25.

Exception No. 1: The derating factors given in Section 310-15(b)(2)(a) shall not apply.

Exception No. 2: Conductors and multiconductor cables described in and installed in accordance with Sections 725-27 and 725-30 shall be permitted.

Exception No. 3: Class 2 and Class 3 circuits shall be permitted to be reclassified and installed as Class I circuits if the Class 2 and Class 3 markings required by Section 725-42 are eliminated and the entire circuit is installed using the wiring methods and materials in accordance with Part B, Class 1 Circuits.

FPN: Class 2 and Class 3 circuits reclassified and installed as Class I circuits are no longer power-limited circuits, regardless of the continued connection to a Class 2 or Class 3 power source.

(b) Conductors on the load side of the power source shall be insulated at not less than the requirements of Section 725-71 and shall be installed in accordance with Sections 725-54 and 725-61.

Exception No. 1: As provided for in Section 620-21 for elevators and similar equipment.

Exception No. 2: Other wiring methods and materials installed in accordance with the requirements of Section 725-3 shall be permitted to extend or replace the conductors and cables described in Section 725-71 and permitted by Section 725-52(b).

Add a new Section 760-42 to support the proposed Section 760-52(a) Exception No. 3.

760-42. Circuit Marking. The equipment shall be durably marked where plainly visible to indicate each circuit that is a Class 2 or Class 3 circuit.

FPN: See Section 725-52(a), Exception No. 3, where a Class 2 or Class 3 circuit is to be reclassified as a Class 1 circuit.

SUBSTANTIATION: Statement of Problem: Article 725 does not provide for installing Class 2 and Class 3 circuits with other than Class 2 or Class 3 wiring methods (cable), except in plenums and risers. The present Section 725-61(e) reads as follows:

"(e) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in (a) through (d) shall be Type CL2 or CL3." Many code jurisdictions require circuits to be installed in raceway, which is not specifically permitted by Article 725. The proposed revision provides an alternative to this requirement.

Substantiation: The proposed revision to Section 725-52 provides requirements equivalent to Section 760-52. The Article 760 wiring methods have a proven track record of safe installations using the installation methods proposed. The proposed change permits Class 2 and Class 3 circuits to be installed using Class 1 wiring methods, or appropriate Chapter 3 methods. Present day installations in commercial buildings typically use Class 1 wiring methods (Type TFN in EMT), even though not specifically permitted by Article 725.

The new Section 725-42 is a parallel requirement to Section 760-42. The new section provides for reclassification of Class 2 and Class 3 circuits to a Class 1 circuit by using Class I wiring methods and materials, and installing overcurrent protection.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to Panel Proposal 16-62(a). 16-62(a) satisfies the submitter's intent with changes for added clarity.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #CP1602)

16- 62a - (725-52, 725-42, 725-10): Accept

SUBMITTER: CMP 16

RECOMMENDATION: Revise text to read as follows:

725-52. Wiring Methods and Materials on Load Side of the Class 2 or Class 3 Power Source.

Class 2 and Class 3 circuits on the load side of the power source shall be permitted to be installed using wiring methods and materials in accordance with either (a) or (b).

(a) Class 1 Wiring Methods and Materials. Installation shall be in accordance with Section 725-25.

Exception No. 1: The derating factors given in Section 310-15(b)(2)(a) shall not apply.

(FPN): Class 2 and Class 3 circuits reclassified and installed as Class 1 circuits are no longer Class 2 or Class 3 circuits, regardless of the continued connection to a Class 2 or Class 3 power source.

(b) Conductors on the load side of the power source shall be insulated at not less than the requirements of Section 725-71 and shall be installed in accordance with Sections 725-54 and 725-61.

Exception No. 1: As provided for in Section 620-21 for elevators and similar equipment.

Exception No. 2: Other wiring methods and materials installed in accordance with the requirements of Section 725-3 shall be permitted to extend or replace the conductors and cables described in Section 725-71 and permitted by Section 725-52(b).

Add a new Section 725-42 to read as follows:

725-42. Circuit Marking

The equipment shall be durably marked where plainly visible to indicate each circuit that is a Class 2 or Class 3 circuit.

Add a new Section 725-10 to read as follows:

725-10. Class 1, Class 2, and Class 3 Circuit Identification

Class 1, Class 2, and Class 3 circuits shall be identified at terminal and junction locations, in a manner that will prevent unintentional interference with other circuits during testing and servicing.

SUBSTANTIATION: The proposed change permits Class 2 and Class 3 circuits to be installed using Class 1 wiring methods, or appropriate Chapter 3 methods. Present day installations in commercial buildings typically use Class 1 wiring methods (Type TFN in EMT), even though not specifically permitted by Article 725.

The addition of 725-10, Class 1, Class 2, and Class 3 Circuit Identification will provide authorities having jurisdiction with identification of the circuits installed using various permitted wiring methods and minimize system malfunctions during testing and servicing.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

EGESDAL: The new marking requirement is unsupported and is unnecessary, particularly where only Class 1 wiring is present. We are concerned about the protection of a Class 2 circuit when it is reclassified as a Class 1 circuit.

HUGHES: I don't have a problem with the proposed rewording of 725-52.

The addition of new Section 725-42 brings in several issues I don't think the Panel intended. The word "equipment" is defined as (in part) "material, fittings, devices, appliances, fixtures, apparatus, and the like". Do we really want conduit, fittings, doorbells, thermostats, etc. marked as to its wiring class. A more palatable solution might be to mark at the power supply only.

I don't really remember what the Panel's intention was for adding Section 725-10. The Panel substantiation does not make much sense as written. Taken literally, it would require unique identification of these classes of circuits everywhere, even when there are no other circuits around. If the Panel feels Section 725-10 belongs, it should be limited to Class 2 circuits being wired per Class 1 wiring methods.

(Log #1023)

16- 63 - (725-54): Reject

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Revise 725-54 as shown:

725-54. Installation of Conductors and Equipment

(a) Separation from Electric Light, Power, Class 1, Nonpower-Limited Fire Alarm Circuit Conductors, ~~and~~ Medium and High Power Network-Powered Broadband Communications Cables.

(1) In Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways. Cables and conductors of Class 2 and Class 3 circuits shall not be placed in any cable, cable tray, compartment, enclosure, manhole, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm circuits, ~~and~~ medium and high power network-powered broadband communications cables.

Exception No. 1: Where the conductors of the electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuits are separated by a barrier from the Class 2 and Class 3 circuits. In enclosures, Class 2 or Class 3 circuits shall be permitted to be installed in a raceway within the enclosure to separate them from Class 1, electric light, power, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuits.

Exception No. 2: Conductors in compartments, enclosures, device boxes, outlet boxes, or similar fittings, where electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductors are introduced solely to connect to the equipment connected to Class 2 or Class 3 circuits to which the other conductors are connected, and

a. The electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductors are routed to maintain a minimum of 0.25 in. (6.35 mm) separation from the conductors and cables of Class 2 and Class 3 circuits, or

b. The circuit conductors operate at 150 volts or less to ground and also comply with one of the following:

1. The Class 2 and Class 3 circuits are installed using Type CL3, CL3R, or CL3P or permitted substitute cables, provided these Class 3 cable conductors extending beyond the jacket are separated by a minimum of 0.25 in. (6.35 mm) or by a nonconductive sleeve or nonconductive barrier from all other conductors, or

2. The Class 2 and Class 3 circuit conductors are installed as a Class 1 circuit in accordance with Section 725-21.

Exception No. 3: Conductors entering compartments, enclosures, device boxes, outlet boxes, or similar fittings, where electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered communications circuit conductors are introduced solely to connect the equipment connected to Class 2 or

Class 3 circuits to which the other conductors in the enclosure are connected. If the conductors must enter an enclosure that is provided with a single opening, they shall be permitted to enter through a single fitting (such as a tee) provided the conductors are separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing.

Exception No. 4: Underground conductors in a manhole where one of the following conditions is met.

a. The electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductors are in a metal-enclosed cable or Type UF cable.

b. The conductors are permanently and effectively separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing, in addition to the insulation or covering on the wire.

c. The conductors are permanently and effectively separated from conductors of the other circuits and securely fastened to racks, insulators, or other approved supports.

Exception No. 5: As permitted by Section 780-6(a) and installed in accordance with Article 780.

Exception No. 6: In cable trays, where the conductors of the electric light, power, Class 1, and nonpower-limited fire alarm circuits are separated by a solid fixed barrier of a material compatible with the cable tray, or where the Class 2 and Class 3 circuits are installed in Type MC cable.

(2) In Hoistways. Class 2 or Class 3 circuit conductors shall be installed in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, or electrical metallic tubing in hoistways.

Exception: As provided for in Section 620-21 for elevators and similar equipment.

(3) Other Applications. Conductors of Class 2 and Class 3 circuits shall be separated by at least 2 in. (50.8 mm) from conductors of any electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits.

Exception No. 1: Where either (1) all of the electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductor or (2) all of the Class 2 and Class 3 circuit conductors are in raceway or in metal-sheathed, metal-clad, nonmetallic-sheathed, or Type UF cables.

Exception No. 2: Where all of the electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductors are permanently separated from all of the Class 2 and Class 3 circuit conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the conductors.

(b) Conductors of Different Circuits in Same Cable, Enclosure, or Raceway.

(1) Two or More Class 2 Circuits. Conductors of two or more Class 2 circuits shall be permitted within the same cable, enclosure, or raceway.

(2) Two or More Class 3 Circuits. Conductors of two or more Class 3 circuits shall be permitted within the same cable, enclosure, or raceway.

(3) Class 2 Circuits with Class 3 Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure, or raceway with conductors of Class 3 circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure, or raceway is at least that required for Class 3 circuits.

(4) Class 2 and Class 3 Circuits with Communications Circuits. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits, in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall meet the requirements of Article 800. The cables shall be listed as communications cables or multipurpose cables.

Exception: Cables constructed of individually listed Class 2, Class 3, and communications cables under a common jacket shall not be required to be classified as communications cables. The fire-resistance rating of the composite cable shall be determined by the performance of the composite cable.

(5) Class 2 or Class 3 Cables with Other Circuit Cables. Jacketed cables of Class 2 or Class 3 circuits shall be permitted in the same enclosure or raceway with jacketed cables of any of the following:

a. Power-limited fire alarm systems in compliance with Article 760

b. Nonconductive and conductive optical fiber cables in compliance with Article 770

c. Communications circuits in compliance with Article 800

d. Community antenna television and radio distribution systems in compliance with Article 820

e. Low power network-powered broadband communications in compliance with Article 830

(c) Circuit Conductors Extending Beyond One Building. Where Class 2 or Class 3 circuit conductors extend beyond one building and are run so as to be subject to accidental contact with electric light or power conductors operating at over 300 volts to ground, or are exposed to lightning on interbuilding circuits on the same premises, the requirements of the following shall also apply:

1. Sections 800-10, 800-12, 800-13, 800-30, 800-31, 800-32, 800-33, and 800-40 for other than coaxial conductors

2. Sections 820-10, 820-33, and 820-40 for coaxial conductors

(d) Support of Conductors. Class 2 or Class 3 circuit conductors shall not be strapped, taped, or attached by any means to the exterior of any conduit or other raceway as a means of support.

Exception: Except as permitted by Section 300-11(b)(2).

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. This proposal amends the separation rules between circuits to provide appropriate separation from these new high-power communications circuits.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #3203)

16- 64 - (725-54): Reject

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: Revise as follows:

725-54. Installation of Conductors and Equipment.

(a) Separation from Electric Light, Power, Class 1, Nonpower-Limited Fire Alarm Circuit Conductors, and Medium Power Network-Powered Broadband Communications Cables.

(1) In Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, and Raceways. Cables and conductors of Class 2 and Class 3 circuits shall not be placed in any cable, cable tray, compartment, enclosure, manhole, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm circuits, and medium power network-powered broadband communications cables, unless meeting requirements specified in (1) through (6).

(a) Where the conductors of the electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits are separated by a barrier from the Class 2 and Class 3 circuits. In enclosures, Class 2 or Class 3 circuits shall be permitted to be installed in a raceway within the enclosure to separate them from Class 1, electric light, power, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits.

(b) Conductors in compartments, enclosures, device boxes, outlet boxes, or similar fittings, where electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuit conductors are introduced soley to connect to the equipment connected to Class 2 or Class 3 circuits to which the other conductors are connected, and

(1) The electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuit conductors are routed to maintain a minimum of 0.25 in. (6.35 mm) separation from the conductors and cables of Class 2 and Class 3 circuits, or

(2) The circuit conductors operate at 150 volts or less to ground also comply with one of the following:

a. The Class 2 and Class 3 circuits are installed using Type CL3, CL3R, or CL3P or permitted substitute cables, provided these Class 3 cable conductors extending beyond the jacket are separated by a minimum of 0.25 in. (6.35 mm) or by a nonconductive sleeve or nonconductive barrier from all other conductors, or

b. The Class 2 and Class 3 circuit conductors are installed as a Class 1 circuit in accordance with Section 725-21.

(c) Conductors entering compartments, enclosures, device boxes, outlet boxes, or similar fittings, where electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered communications circuit conductors are introduced solely to connect the equipment connected to Class 2 or Class 3 circuits to which the other conductors in the enclosures are connected. If the conductors must enter an enclosure that is provided with a single opening, they shall be permitted to enter though a single fitting (such as a tee) provided the conductors are separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing.

(d) Underground conductors in a manhole where one of the following conditions is met:

(1) The electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuit conductors are in a metal-enclosed cable or Type UF cable.

(2) The conductors are permanently and effectively separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing, in addition to the insulation or covering on the wire.

(3) The conductors are permanently and effectively separated from conductors of the other circuits and securely fastened to racks, insulators, or other approved supports.

(e) As permitted by Section 780-6(a) and installed in accordance with Article 780.

(f) In cable trays, where the conductors of the electric light, power, Class 1, and nonpower-limited fire alarm circuits are separated by a solid fixed barrier of a material compatible with the cable tray, or where the Class 2 and Class 3 circuits are installed in Type MC cable.

(2) In Hoistways.

(a) Class 2 or Class 3 circuit conductors shall be installed in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, or electrical metallic tubing in hoistways.

(b) Class 2 or Class 3 circuit conductors shall be permitted to be installed in accordance with the requirements in Section 620-21 for elevators and similar equipment.

(3) Other Applications.

(a) Conductors of Class 2 and Class 3 circuits shall be separated by at least 2 in. (50.8 mm) from conductors of any electric light, power, Class 1, nonpower-limited fire alarm, or medium power network powered broadband communications circuits.

(b) Conductors of Class 2 and Class 3 circuits shall be permitted to be installed with electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuit conductor where either

(1) All of the electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuit conductor, or

(2) All of the Class 2 and Class 3 circuit conductors are in raceway or in metal-sheathed, metal-clad, nonmetallic-sheathed, or Type UF cables.

(c) Conductors of Class 2 and Class 3 circuits shall be permitted to be installed with electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuit conductor where all of the electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuit conductors are permanently separated from all of the Class 2 and Class 3 circuit conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the conductors.

(b) Conductors of Different Circuits in Same Cable, Enclosure, or Raceway.

(1) Two or More Class 2 Circuits. Conductors of two or more Class 2 circuits shall be permitted within the same cable, enclosure, or raceway.

(2) Two or More Class 3 Circuits. Conductors of two or more Class 3 circuits shall be permitted within the same cables, enclosure, or raceway.

(3) Class 2 Circuits with class 3 Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure, or raceway with conductors of Class 3 circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure, or raceway is at least that required for Class 3 circuits.

(4) Class 2 and Class 3 Circuits with Communications Circuits.

(a) Class 2 and Class 3 circuit conductors. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits, in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall meet the requirements of Article 800. The cables shall be listed as communications cables or multipurpose cables.

(b) Class 2 and Class 3 Cables. Cables constructed of individually listed Class 2, Class 3, and communications cables shall be permitted under a common jacket. The composite cables shall not be required to be classified as communications cables. The fire-resistance rating of the composite cable shall be determined by the performance of the composite cable.

(5) Class 2 or Class 3 Cables with Other Circuit Cables. Jacketed cables of Class 2 or Class 3 circuits shall be permitted in the same enclosure or raceway with jacketed cables of any of the following:

(a) Power-limited fire alarm systems in compliance with Article 760.

(b) Nonconductive and conductive optical fiber cables in compliance with Article 770.

(c) Communications circuits in compliance with Article 800.

(d) Community antenna television and radio distribution systems in compliance with Article 820.

(e) Low power network-powered broadband communications in compliance with Article 830.

(c) Circuit Conductors Extending Beyond One Building. Where Class 2 or Class 3 circuit conductors extend beyond one building and are run so as to be subject to accidental contact with electric light or power conductors operating at over 300 volts to ground, or are exposed to lightning or interbuilding circuits on the same premises, the requirements of the following shall also apply:

(1) Sections 800-10; 800-12; 800-13; 800-30; 800-31; 800-32; 800-33; and 800-40 for other than coaxial conductors.

(2) Sections 820-10, 820-33, and 820-40 for coaxial conductors.

(D) Support of Conductors.

(a) Supported by Building Structure. Class 2 or Class 3 circuit conductors shall be supported by the building structure as required by Section 725-7. Class 2 or Class 3 circuit conductors shall not be strapped, taped, or attached by any means to the exterior of any conduit or other raceway as a means of support, unless permitted by (b).

(b) Supported by Raceway. Class 2 circuit conductors shall be permitted to be supported by raceway in accordance with Section 300-11(b)(2).

SUBSTANTIATION: The exceptions are changed to positive code language in compliance with 3.1.4.2 of the Style Manual.

PANEL ACTION: Reject.

PANEL STATEMENT: Though a complete rewrite of the section should be done, the proposed draft does not completely and clearly reflect all requirements and permitted methods. Time limitations have precluded attempting to do this at the panel meetings. The panel chair appointed a task group to do a complete rewrite and submit such a rewrite as a comment for the consideration of the full panel. The rewrite should conform with all the requirements of the new Manual of Style.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #2984)

16- 65 - (725-54(2)): Reject

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions

RECOMMENDATION: Revise text as follows:

(2) In Hoistways. Class 2 or Class 3 circuit conductors shall be installed in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, <u>electrical nonmetallic tubing,</u> or electrical metallic tubing in hoistways.

Exception: As provided for in Section 620-21 for elevators and similar equipment.

SUBSTANTIATION: This proposal adds Electrical Nonmetallic Tubing (ENT) as an approved wiring method for Class 2 or Class 3 circuit conductors. ENT is currently allowed to be used for power conductors per Article 331. ENT will provide the required protection for Class 2 or Class 3 circuit conductors in a hoistway.

PANEL ACTION: Reject.

PANEL STATEMENT: Article 620 has jurisdiction over what may be installed in a hoistway; ENT is not presently permitted in hoistways.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2985)

16- 66 - (725-54(2)): Accept in Principal

Note: The Technical Correlating Committee directs that the Panel clarify the action on this Proposal. The Panel Action adds 620-37 in the Exception and refers to the Panel Action on Proposal 16-64. The Technical Correlating Committee notes that Proposal 16-64 was rejected so there is no action on it. The Technical Correlating Committee directs that this Proposal be forwarded to Code-Making Panel 12 for information. This action will be considered by the Panel as a Public Comment.

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:

(2) In Hoistways. Class 2 or Class 3 circuit conductors shall be installed in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or electrical metallic tubing in hoistways.

Exception: As provided for in Section 620-21 for elevators and similar equipment.

SUBSTANTIATION: This proposal adds Liquidtight Flexible Nonmetallic Conduit (LFNC) as an approved wiring method for Class 2 or Class 3 circuit conductors. LFNC is currently allowed to be used for power conductors per Article 351, Part B. LFNC will provide the required protection for Class 2 or Class 3 circuit conductors in a hoistway.
PANEL ACTION: Accept in Principle.
The panel accepts the proposal but adds a reference to 620-37 in the Exception. Refer to the panel action on Proposal 16-64.
PANEL STATEMENT: Refer to the panel action and panel statement on Proposal 16-64. 620-37 provides the uses permitted in a hoistway.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #493)

16- 67 - (725-54(a)(1) Exception No. 2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 725-54(a)(1) Exception No. 2(a) - change "0.25 in. (6.35 mm)" to "6.35 mm (0.25 in.)"
725-54(a)(1) Exception No. 2(b)(1) - change "0.25 in. (6.35 mm)" to "6.35 mm (0.25 in.)"
The CMP should consider rounding to "6 mm (0.25 in.)" if safety would not be compromised.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
In the submitter's recommended text revise "6.35 mm (0.25 in.)" to "6 mm (0.25 in.)."
PANEL STATEMENT: The panel has accepted the TCC suggestion to round to "6 mm (0.25 in.)" and has included in the panel action text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2302)

16- 68 - (725-54(a)(1) Exception No. 7): Reject
SUBMITTER: Paul E. Guidry, Fluor Daniel, Inc.
RECOMMENDATION: Add new text to read as follows:
Exception No. 7: In cable trays, where all circuit conductors operate at 150 volts or less to ground and the Class 2 and 3 circuits are installed as Class 1 circuits in accordance with Section 725-21.
SUBSTANTIATION: Some PLCs and DCS equipment are listed Class 2 or 3 power supplies while others are power limited, but not listed as Class 2 or 3 power supplies, and are therefore Class 1 by default. Existing Section 725-54(a)(1), Exception No. 2(b)(2) allows Class 2 and 3 circuits to be installed in the same enclosure, outlet box, etc. with Class 1 circuits as long as all are installed as Class 1 circuits. In industrial facilities it is a common practice to install all instrument circuits with 600V insulation and route all instrument circuits together. As long as all circuits are installed with 600 volt insulation, the intent of Section 725-54(a)(1), Exception No. 2(b)(2) has been met and there will not be any safety issues.
PANEL ACTION: Reject.
PANEL STATEMENT: Class 2 and Class 3 circuits are not permitted to be installed with Class 1 circuits. Insulation alone does not provide the required separation of circuits. The insulation alone does not change the classification of the circuit.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #491)

16- 69 - (725-54(a)(3), 725-61(d), Exception No. 3; 725-61(e), Exception Nos. 2 thru 4): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 725-54(a)(3) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
725-61(d), Exception No. 3:
change "50 ft (15.24 m)" to "15 m (50 ft)"
change "6 ft (1.83 m)" to "1.8 m (6 ft)"
725-61(e), Exception No. 2 - change "10 ft (3.05 m)" to "3.0 m (10 ft)"
725-61(e), Exception No. 3 - change "0.25 in. (6.4 mm)" to "6 mm (0.25 in.)" in two places.
725-61(e), Exception No. 4 - change "0.25 in. (6.4 mm)" to "6 mm (0.25 in.)" in two places.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #2774)

16- 70 - (725-54(a)(4)): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Revise as follows:
Raceways or Cable trays containing Class 1, Class 2, and Class 3 circuits shall not contain any pipe, tube, or equal for steam, water, air, gas, drainage, or any service other than electrical.
SUBSTANTIATION: There presently is no reference in Article 725 that prohibits this practice.
PANEL ACTION: Reject.
PANEL STATEMENT: Optical fiber cables are not electrical and they are permitted in raceway with other cables. Refer to 770-52. No technical substantiation has been provided. The revision is not required because it is covered in 300-8 and 725-25 has been revised to clarify the application of Article 300. There is no 725-54(a)(4) and it has been assumed that the proposer meant to add a new 725-54(a)(4).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #3343)

16- 71 - (725-54(b)(5)(f) (New)): Reject
SUBMITTER: Michael R. Puckett, Puckett Engineering
RECOMMENDATION: Add a new paragraph (f) to read as follows:
(f) Closed-circuit television systems.
SUBSTANTIATION: Outdoor cameras and integrated indoor cameras have one location for conduit/cable entry. Therefore, it is required that the camera class 2 or Class 1 power supply, Class 3 data,

and video (coaxial) cables be combined in one conduit. The systems are not affected by combining these cables (based on experience of many installations).
PANEL ACTION: Reject.
PANEL STATEMENT: Closed circuit television systems are already covered either by Article 725 (Class 2 or Class 3 circuits) or Article 820 and no reference is required here.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1000)

16- 72 - (725-54(c), Exception (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add an exception to read as follows:
Exception for (1): Conductors shall be permitted in accordance with Article 225.
SUBSTANTIATION: The fine print note for Section 725-1 indicates cables and conductors specifically listed for Class 2 or 3 circuits are alternatives to requirements in Chapters 1 through 4 but does not indicate a prohibition of wiring methods covered in those chapters. If installations are in accordance with requirements for power and lighting circuits including sizes as specified in Section 225-6 and types specified in Section 225-4, such installations appear to be suitable. Section 760-7 permits power-limited fire alarm circuits in accordance with Article 225.
PANEL ACTION: Reject.
PANEL STATEMENT: The Article 800 Sections referenced in Section 725-54(c) (1) pertain to low voltage communications wiring similar to Class 2 and Class 3 circuits. These circuits require the application of a listed primary protector when exposed to power over 300 volts RMS, or to lightning. Article 225 addresses branch circuit wiring, operating at secondary power voltages, that neither requires nor includes such protection. Therefore, it is inappropriate to apply Article 225 to Class 2 and Class 3 circuits.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #4016)

16- 73 - (725-54(d)): Accept in Principle
SUBMITTER: Christopher Pharo, Rep. IBEW
RECOMMENDATION: This proposal is to add a sentence before the current text.
Article 725-54(d) Support of Conductors. Class 2 and Class 3 circuit conductors shall be supported every 5 ft. Class 2 and Class 3 circuit conductors shall not be strapped, taped, or attached by any means to the exterior of any conduit or other raceway as a means of support.
SUBSTANTIATION: Article 725 deals with an ever increasing proportion of electrical installations. There are currently no maximum distances between circuit conductor supports. It may be installed with supports every 5 or 20 or even 100 feet. It does not matter because it is not addressed. The ANSI/TIA/EIA Standard 569 - Commercial Building Standard for Telecommunications Pathways and Spaces requires supports to be installed every 48 in. - 60 in. All other wiring methods used in the NEC have requirements for maximum supports. This method should be included.
If there continues to be no set requirements for supporting these conductors, then I think that inspectors would be forced to rely on 725-7 Mechanical Execution of Work. I am not an inspector but my concerns are probably theirs when it comes to the enforcement of "neat and workmanlike manner."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action on Proposal 16-39. The changes in 725-7 apply to all parts of Article 725 and meet the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1133)

16- 74 - (725-54(e) (New)): Accept in Principle in Part
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Insert a new Section 725-54(e) as follows:
(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed.
Exception: Type CL2P-50 and Type CL3P-50 cables shall not be required to be removed.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: See my proposal for Section 800-52(b).
PANEL ACTION: Accept in Principle in Part.
The part being rejected is the recommendation to add the exception. The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the exception. There is inadequate justification to leave any debris (e.g. abandoned cable).
The remaining part of the proposal is accepted in principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3204)

16- 75 - (725-54(e) (New)): Accept in Principle in Part
SUBMITTER: S. E. Egesdal, Honeywell Inc.
RECOMMENDATION: Insert a new Section 725-54(e) as follows:
(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed.
Exception: Type CL2P-50 and Type CL3P-50 cables shall not be required to be removed.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with Section 300-21.
The proposed fine print Note No. 1 note was copied from the first sentence of the fine print note in Section 300-21. It assists installers in locating firestop information.
Cables installed in plenums (other space used for environmental air) are often abandoned, rather than removed, when no longer in use. Consequently, there may exist layer upon layer of abandoned cable in a hung ceiling as communications systems are changed and modernized. Some of this abandoned cable may be nonplenum cable that was installed before plenum cable requirements were in place. These accumulations of abandoned cables serve no useful purpose and unnecessarily increase the potential fire load. The wording of the proposed prohibition on allowing abandoned cables to accumulate is based on NFPA 75, "Standard for the Protection of Electronic Computer/Data Processing Equipment, Section 4-2.4 that states

"Abandoned cables shall not be allowed to accumulate. Cables not identified for future use shall be removed."

This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only accumulations of abandoned cable, thus avoiding a burdensome requirement, which would require the removal of insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cable that is in place, plenum cable as well as nonplenum cable that was installed before the plenum cable requirements were in the code. The proposed second sentence, Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed, deals with already abandoned cable. The NEC requirements for plenum cable were first promulgated in the 1975 NEC, consequently, abandoned cables in older buildings often include unlisted cable along with listed plenum cable.

Other sections of the NEC require the removal of abandoned wiring.

Article 354 — Underfloor Raceways, Section 354-7. Discontinued Outlets

Article 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets

Article 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets

Article 305 — Temporary Wiring, Section 305-3(d). Time Constraints, (d) Removal.

Exempting Types CL2P-50 and CL3P-50, which are plenum cables that are also listed as limited combustible with a smoke developed rating of less than 50, correlates with NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. Correlating with NFPA 90A acknowledges that the NFPA Standards Council has assigned primary responsibility for fire protection of plenums to NFPA 90A. The basic requirement for materials in a plenum in NFPA 90A is that the materials either be noncombustible or limited combustible with a smoke developed rating of less than 50.

PANEL ACTION: Accept in Principle in Part.

The part being rejected is the recommendation to add the exception. The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the exception. There is inadequate justification to leave any debris (e.g. abandoned cable).

The remaining part of the proposal is accepted in principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-80.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

ABSTENTION: 1

EXPLANATION OF NEGATIVE:

LANNI: Even totally noncombustible cables should not be allowed to accumulate in the numbers that we have witnessed in the last ten years. The panel rejected the Exception because leaving debris in the work spaces is fundamentally bad workmanship in that:

1. It uses up already limited space.
2. It adds to the fuel load even if it has an excellent rating.
3. The accumulation causes confusion when combined with active systems.
4. It adds weight to the support structure.
5. It impedes the efforts of workmen forced to crawl in these spaces.
6. It attracts dust on the surface which adds to fuel load.
7. It has been reported that Type CL2P-50 and Type CL3P-50 insulation developed for this purpose produces toxic fumes at 200 degrees C, and should not be allowed to accumulate if not in service.

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3229)

16- 76 - (725-54(e) (New)): Accept in Principle

SUBMITTER: Hallie Smith-Petee, The Geon Co.

RECOMMENDATION: Insert a new Section 725-4(e) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts,plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.

SUBSTANTIATION: See Substantiation for Section 800-52(b).

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-80.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3254)

16- 77 - (725-54(e) (New)): Accept in Principle in Part

SUBMITTER: Allen C. Weidman, Society of the Plastics Industry/Rep. Fluoropolymers Division of The Society of the Plastics Industry

RECOMMENDATION: Insert a new Section 725-54(e) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods to maintain the fire resistance rating. Cables in ducts, plenums, and other spaces used for environmental air, which are not intended for future use shall be removed. Cables marked type CL2PP and type CL3PP are not required to be removed.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: 1. First two (2) sentences were copied from Article 300.21.

2. Fine print note was copied from Article 300.21s fine print note.

3. Cables installed in plenums and other space used for environmental air are very often left in these spaces after they have been removed from service. Therefore, many generations of unused cables can exist in the ceiling voids from previous systems which are no longer in service or intended for future use. There may also be cables, which are over 20 years old, which are not plenum rated cables. These unused cables increase the potential fuel load in plenums and other space used for environmental air.

This concept of removing unused cables, which will not be used in the future, is not a new concept. Other articles of the NEC have similar requirements. See the following Articles:

(a) 305, (b) 354, (c) 356, (d) 358

Also note NFPA 75 has a similar requirement.

Note: Underwriter Laboratories and Intertek (ETL), both are in a position to start listing this new type of plenum cable having of "Limited Combustibility" requirement, also potentially known as "permanent plenum cable, e.g., CL2PP, CL3PP, OFCPP, OFNPP, CMPP, and MPPP. There is a research program in place at FPRF to establish the protocol to list PP cables.

PANEL ACTION: Accept in Principle in Part.

The part being rejected is the recommendation to add the last sentence before the FPN.

PANEL STATEMENT: The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the last sentence before the FPN. There is inadequate justification to leave any debris (e.g. abandoned cable).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3801)

16- 78 - (725-54(e)): Accept in Principle

SUBMITTER: David B. Kiddoo, AlphaGary Corp.

RECOMMENDATION: Insert a new Section 725-54(e) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, ventilation ducts or air-handling plenums shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistant rating. Abandoned cables in these spaces, shafts ducts and plenums shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in these spaces, shafts, ducts, plenums, and other space used for environmental air, shall be removed.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

FPN No. 2: Definition of acceptable cable fire performance in various applications are described in Section 725-71.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents of the provisions for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments form the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TCs approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure, that as the TC undertakes to fully and fairly address these issues going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum

This proposal addressed the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function — except perhaps to serve as fuel for some future conflagration.

This proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standard Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Interlek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability for cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometry's and materials/conductor or fiber synergy's as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is partially why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than material tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A, Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulation's will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220 Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirement to removal ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-80 which meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3965)

16- 79 - (725-54(e) (New)): Accept in Principle

SUBMITTER: Hallie Smith-Petee, The Geon Co.

RECOMMENDATION: Insert a new Section 725-54 (e) to read as follows:

(e) Spread of Fire or Products of Combustion: Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts, plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.

SUBSTANTIATION: See Substantiation for Section 800-52(b).

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-80.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #4049)

16- 80 - (725-54(e) (New)): Accept in Principle

Note: The Technical Correlating Committee understands that "725-3(a)" in the Panel Action is "725-3(b)" based on the action on Proposal 16-36.

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Insert a new Section 725-54(e) as follows:

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed where practicable.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: BICSI members have been extensively involved with the design and installation of telecommunications cabling. Technology changes have resulted in newer high performance cabling being installed in support of those technologies. We have observed excessive accumulations of abandoned cabling adding to the fuel loading within plenum spaces. This proposal is offered to the NFPA to help reduce the fuel load within these plenum areas.

Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with section 300-21.

The proposed fine print No. 1 note was copied from the first sentence of the fine print note in section 300-21. It assists installers in locating firestop information.

Acceptance of this proposal will result in cable removal being included in the scope of the installation of a new communications and data system. The contractor will remove the old cable before installing the new system.

Acceptance of this proposal will result in many BICSI members specifying abandoned cable removal within the scope of the installation of new communications and data systems.

In two separate proposals, we have offered definitions for "abandoned cable" and "excessive accumulation of abandoned cables".

This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only excessive accumulations of abandoned cable, thus avoiding a burdensome requirement of removing insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cable that is in place, plenum cable as well as non-plenum cable that was installed before the plenum cable requirements were in the Code. The proposed second sentence, Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed, where practicable, deals with already abandoned cable. The wording of "where practicable" aid the situations where cable may be intertwined and cannot be removed without disruption of active services. The NEC requirements for plenum cable were first promulgated in the 1975 NEC, consequently, abandoned cables in older buildings often include unlisted cable along with listed plenum cable.

Other sections of the NEC require the removal of abandoned wiring.

ARTICLE 354 — Underfloor Raceways, Section 354-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case of abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 305 — Temporary Wiring, Section 305-3(d). Time Constraints, (d) Removal. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

PANEL ACTION: Accept in Principle.

Revise 725-3(a) to read as follows:

"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables not intended for future use shall not be permitted to remain."

PANEL STATEMENT: The revision meets the intent of the submitter. It is more appropriate to place the requirement in 725-3(a) which addresses the subject.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
COMMENT ON AFFIRMATIVE:
BRUNSSEN: I concur with the panel's intent, but feel that the words "not intended for future use" are redundant and should be removed.
DORNA: The revised wording for 725-3(a) should read as follows:
"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall not be permitted to remain."
The use of the phrase "not intended for future use" is redundant. The definition of "abandoned cable" has this phrase in the definition. To restate this phrase would be grammatically incorrect.
JOHNSON: I am in agreement with Mr. Dorna's comments on this proposal. "Abandoned cables not intended for future use..." is redundant when we have previously defined abandoned cables not to include those intended for future use.
KAHN: The words "not intended for future use" are redundant as that is included in the definition of Abandoned Cables.
LANNI: The word "abandoned" and the words "not intended for future use" are redundant, and the words "not intended for future use" should be removed.
WIERENGA: The revised wording for Panel Action for 725-3(a) should read as follows: "(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall ~~not~~ be removed.
The use of the phrase "not intended for future use" is redundant because it is already included in the definition of "abandoned cable". The deletion of the words "not" and "permitted to remain" can be readily stated by use of positive code language using the word "removed".
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3205)

16- 81 - (725-61): Reject
SUBMITTER: S. E. Egesdal, Honeywell Inc.
RECOMMENDATION: Revise as follows:
725-61. Applications of Listed Class 2, Class 3, and PLTC Cables. Class 2, Class 3, and PLTC cables shall comply with the requirements specified in (a) through (g).
(a) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be as specified in (1) through (2).
(1) Type CL2P or CL3P cables.
(2) Listed wires and cables installed in compliance with Section 300-22.
(b) Riser. Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be as specified in (1) through (3).
FPN: See Section 300-21 for firestop requirements for floor penetrations.
(1) Type CL2R or CL3R. Floor penetrations requiring Type CL2R or CL3R shall contain only cables suitable for riser or plenum use.
(2) Other cables as covered in Table 725-61 and other listed wiring methods as covered in Chapter 3, where installed in metal raceways or located in a fireproof shaft having firestops at each floor.
(3) Types CL2, CL3, CL2X, and CL3X cable in one- and two-family dwellings.
(c) Cable Trays. Cables installed in cable trays outdoors shall be Type PLTC. Cables installed in cable trays indoors shall be Types PLTC, CL3P, CL3R, CL3, CL2P, CL2R, and CL2.
FPN: See Section 800-52(d) for cables permitted in cable trays.
(d) Hazardous (Classified) Locations. Cables installed in hazardous (classified) locations shall be Type PLTC, except as permitted or required by (1) through (4).
(1) Where the use of Type PLTC cable is permitted in Sections 501-4(b), 502-4(b), and 504-20, the cable shall be installed in cable trays; in raceways; supported by messenger wire, or otherwise adequately supported and mechanically protected by angles, struts, channels, other mechanical means; or directly buried where the cable is listed for this use.
(2) Class 2 circuits as permitted by Section 501-4(b), Exception.
(3) Conductors in Type PLTC cables used for Class 2 thermocouple circuits shall be permitted to be any of the materials used for thermocouple extension wire.
(4) In industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation, and where the cable is not subject to physical damage, Type PLTC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring between cable tray and utilization equipment in lengths not to exceed 50 ft (15.24 m), where the cable is supported and protected against physical damage using mechanical protection such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).
(e) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in (a) through (d) shall be as specified in (1) through (6).
(1) Type CL2 or CL3.
(2) Type CL2X or CL3X where installed in a raceway, or other wiring methods as covered in Chapter 3.
(3) Cable in nonconcealed spaces where the exposed length of cables does not exceed 10 ft (3.05 m).
(4) Listed Type CL2X, Class 2 cables less than 0.25 in. (6.4 mm) in diameter and listed Type Cl#x, Class 3 cables less than 0.25 in. (6.4 mm) in diameter installed in one- or two-family dwellings.
(5) Listed Type CL2X, Class 2 cables less than 0.25 in. (6.4 mm) in diameter and listed Type CL3X, Class 3 cables less than 0.25 in. (6.4 mm) installed in nonconcealed spaces in multifamily dwellings.
(6) Type CMUC undercarpet communications wires and cables installed under carpet.
(f) Cross-Connect Arrays. Type CL2 or CL3 conductors or cable shall be used.
(g) Class 2 and Class 3 Cable Uses and Permitted Substitutions. The uses and permitted substitutions for Class 2 and Class 3 cables listed in Table 725-61 shall be considered suitable for the purpose and shall be permitted.
FPN: For information on Types CMP, CMR, CMG, CM, and CMX cables, see Section 800-50.
Figure 725-61. Cable substitution hierarchy. and Table 725-61. Cable Uses and Permitted Substitutions. remain unchanged.
SUBSTANTIATION: The exceptions are changed to positive language in compliance with 3.1.4.2 of the Style Manual.
PANEL ACTION: Reject.
PANEL STATEMENT: Though a complete rewrite of the section should be done, the proposed draft does not completely and clearly reflect all requirements and permitted methods. Time limitations have precluded attempting to do this at the panel meetings. The panel chair appointed a task group to do a complete rewrite and submit such a rewrite as a comment for the consideration of the full panel. The rewrite should conform with all the requirements of the new Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1215)

16- 82 - (Table 725-61): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Table 725-61. Cable Uses and Permitted Substitutions as follows:

Table 725-61. Cable Uses and Permitted Substitutions

Cable Type	Use	References	Permitted Substitutions
CL3P	Class 3 plenum cable	725-61(a)	CMP, CL3P-50
CL2P	Class 2 plenum cable	725-61(a)	CMP, CL3P-50, CL3P
CL3R	Class 3 riser cable	725-61(b)	CMP, CL3P-50, CL3P, CMR
CL2R	Class 2 riser cable	725-61(b)	CMP, CL3P-50, CL3P, CL2P-50, CL2P, CMR, CL3R
PLTC	Power-limited tray cable	725-61(c) and (d)	
CL3	Class 3 cable	725-61(b), (e), and (f)	CMP, CL3P-50, CL3P, CMR, CL3R, CMG, CM, PLTC
CL2	Class 2 cable	725-61(b), (e), and (f)	CMP, CL3P-50, CL3P, CL2P-50, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3
CL3X	Class 3 cable, limited use	725-61(b) and (e)	CMP, CL3P-50, CL3P, CMR, CL3R, CMG, CM, PLTC, CL3, CMX
CL2X	Class 2 cable, limited use	725-61(b) and (e)	CMP, CL3P-50, CL3P, CL2P-50, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3, CL2, CMX, CL3X

SUBSTANTIATION: If my proposal to establish a new section 725-71(b) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type CL3P-50 and Type CL2P-50. This proposal correlates Table 725-61 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:
KAUFMAN: In addition to revising Table 725-61, Figure 725-61 should be revised in order to illustrate the changes in Table 725-6.

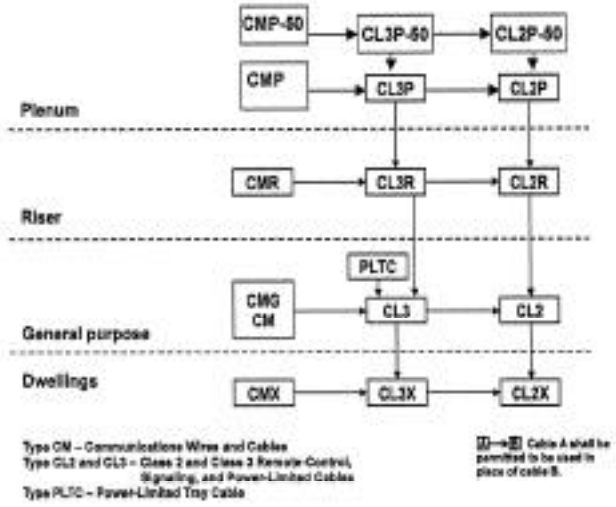


Figure 725-61. Cable Substitution Hierarchy

EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #4136)

16- 83 - (725-61(a)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH Int'l, Inc./Rep. Plenum Cable Assn.
RECOMMENDATION: Revise as follows:
725-61. Applications of Listed Class 2, Class 3, and PLTC Cables. Class 2, Class 3, and PLTC cables shall comply with (a) through (g) below.
(a) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CL2P or CL3P. Abandoned cables, not intended for future use, shall not be permitted to remain.
Exception: Listed wires and cables installed in compliance with Section 300-22.

SUBSTANTIATION: There is a significant amount of information indicating that the amount of cables installed in plenums, and other air-handling spaces, is increasing rapidly. An understanding of cabling practices indicates that the most common way in which cable installation is carried out is by disconnecting existing cable and leaving it abandoned in place, while introducing the cable needed to perform the additional functions. This creates an increased full load in plenum and other air-handling spaces, which is best controlled. There is, as yet, no indication that the additional cables in plenums causes an added fire hazard, and the fire record of cables in concealed spaces, both above ceilings and below floors, remains excellent. In fact, plenum cables, which meet the fire test requirements of NFPA 262, have been shown to have extremely good fire performance and to spread flame only very slowly, if at all. However, this type of preventive measure is worthwhile.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-80.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:
JOHNSON: See my Comment on Affirmative on Proposal 16-80.
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3802)

16- 84 - (725-71): Reject
SUBMITTER: David B. Kiddoo, AlphaGary Corp.
RECOMMENDATION: With regards to Section 725-71, "Limited Combustion Cable" or "Permanent Plenum Cable" should not be accepted as an additional Listing based on the lack of testing definition, the absence of cable Listing capability, and the proven adequacy of an integrated and enhanced NFPA 262 test method. NFPA 262 differentiates cables as to their fire performance to provide acceptable values for smoke generation and flame travel distance.
Proponents of "Limited Combustible Cable" or "Permanent Plenum Cable" have been actively soliciting support form cable market trade organizations, Code-Making Panel 16 Members or Alternates, cable manufacturers, etc. for a proposal to include a new paragraph in this section to provide for a new type of cable based on the definitions of "limited combustibility" and "smoke developed index" per the definitions in NFPA 90A. These definitions ONLY govern construction products for the installation of air conditioning and ventilating systems. The NFPA 255 and NFPA 259 fire test methods being promoted are NOT applicable to evaluate the fire hazard nor the geometry's and material synergy's in cables as they pertain to fire performance.
As these proposals have been made public through this solicitation for support, I wish to respond at this time to say that there is no safety record or fire performance issue necessitating any additional cable type for use in plenum cable applications. The inclusion of this new Type of cable is partially as a means to provide for an Exception from the proposed requirement in Section 725-54 to remove accumulations of abandoned cable. "Limited Combustible Cable" or "Permanent Plenum Cable" definitions seen in this proposals for a new cable type

are NOT based on any test incorporating an actual cable fire hazard evaluation. Without adequate test methods and with the current status of the NFPRF "Permanent Plenum Cable Project", NO cables have been shown to meet the requirements proposed. The data generated in the Project have NOT been related to any appropriate fire hazard evaluation and should NOT be used to establish ANY relative cable fire performance comparisons.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents of the provisions for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments form the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TCs approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure, that as the TC undertakes to fully and fairly address these issues going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum

This proposal addressed the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function — except perhaps to serve as fuel for some future conflagration.

This proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standard Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Interlek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability for cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometry's and materials/conductor or fiber synergy's as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is partially why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than material tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A, Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulation's will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220 Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from

service. The requirement to removal ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not conform to section 4-3.3(c) of the Regulations Governing Committee Projects. The submitter has made other proposals on this subject that meet the Regulations Governing Committee Projects. The issues raised in this proposal were addressed when the other proposals were considered.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1214)

16- 85 - (Table 725-71): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Table 725-71. Cable Marking as follows:

Table 725-71. Cable Markings

Cable Marking	Type	Listing References
CL3P-50	Limited combustible class 3 plenum cable	725-71(a),(b), (g), and (i)
CL3P	Class 3 plenum cable	725-71(a), (g), and (i)
CL2P-50	Limited combustible class 2 plenum cable	725-71(a), (b) and (i)
CL2P	Class 2 plenum cable	725-71(a) and (i)
CL3R	Class 3 riser cable	725-71(c), (g), and (i)
CL2R	Class 2 riser cable	725-71(c) and (i)
PLTC	Power-limited tray cable	725-71(f) and (i)
CL3	Class 3 cable	725-71(d), (g), and (i)
CL2	Class 2 cable	725-71(d), (g), and (i)
CL3X	Class 3 cable, limited use	725-71(e), (g), and (i)
CL2X	Class 2 cable, limited use	725-71(e), (g), and (i)

The fine print note is unchanged.
SUBSTANTIATION: If my proposal to establish a new section 725-71(b) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type CL3-50 and Type CL2P-50. This proposal correlates Table 725-71 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #492)

16- 86 - (725-71(a), FPN, 725-71(c) FPN; 725-71(e), FPN; 725-71(g), FPN): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 725-71(a) FPN - change "5 ft (1.52 m)" to "1.52 m (5 ft)"
725-71(c) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
725-71(e) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
725-71(g) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since the values specify a minimum safety level.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1516)

16- 87 - (725-71(a), FPN): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Change NFPA 262-1994 to NFPA 262-1999.
SUBSTANTIATION: NFPA 262 has been revised.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 22

(Log #1211)

16- 88 - (725-71(b)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Renumber sections as follows:
Existing section Renumbered section
725-71(b) 725-71(c)
725-71(c) 725-71(d)
725-71(d) 725-71(e)
725-71(e) 725-71(f)
725-71(f) 725-71(g)
725-71(g) 725-71(h)
725-71(h) 725-71(i)
Add a new section 725-71(b).
Add a new section 725-71(b).
(b) Limited Combustible Cable. Types CL2P and Types CL3P cables that are also listed as being limited combustible and having a maximum smoke developed index of 50 shall be permitted to be listed and marked as Types CL2P–50 and Types CL3P–50 respectively.
FPN No. 1: See NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems for a definition of limited combustible. See NFPA 255-2000, Standard Method of Test of Surface Burning Characteristics of Building Materials for a definition of the smoke developed index.
FPN No. 2: For further information on the requirements for materials in ceiling cavity and raised floor plenums, see NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems, Sections 2-3.10.1 Ceiling Cavity Plenum and 2-3.10.5 Raised Floor Plenum.
SUBSTANTIATION: See my proposal for section 800-51(h) to establish limited combustible cables.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's intent has been accomplished by the panel action on Proposal 16-89.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3206)

16- 89 - (725-71(b) (New)): Accept
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA 90A Technical Committee on Air Conditioning for comment.
SUBMITTER: S. E. Egesdal, Honeywell Inc.
RECOMMENDATION: Renumber sections as follows:
Existing Section Renumbered section
725-71(b) 725-71(c)
725-71(c) 725-71(d)
725-71(d) 725-71(e)
725-71(e) 725-71(f)
725-71(f) 725-71(g)
725-71(g) 725-71(h)
725-71(h) 725-71(i)
Add a new Section 725-71(b) to read:

(b) Limited Combustible Cable. Types CL2P and Types CL3P cables that are also listed as being limited combustible and having a maximum smoke developed index of 50 shall be permitted to be listed and marked as Types CL2P-50 and Types CL3P-50 respectively.

FPN No. 1: See NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems for a definition of limited combustible. See NFPA 255-2000, Standard Method of Test of Surface Burning Characteristics of Building Materials for a definition of the smoke developed index.

FPN No. 2: For further information on the requirements for materials in ceiling cavity and raised floor plenums, see NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems, Sections 2-3.10.1 Ceiling Cavity Plenum and 2-3.10.5 Raised Floor Plenum.

SUBSTANTIATION: The NFPA Standards Council has assigned primary responsibility for the fire protection of plenums to the Technical Committee on Air Conditioning. That technical committee is responsible for NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. The NFPA 90A (1996) requirements for ceiling cavity and raised floor plenums for electrical wires and cables are shown below:

2-3.10 Plenums.

2-3.10.1 Ceiling Cavity Plenum. The space between the top of the finished ceiling and the underside of the floor or roof above shall be permitted to be used to supply air to, or return or exhaust air from, the occupied area, provided that the following conditions are met:

(a) All materials exposed to the airflow shall be noncombustible or limited combustible and have a maximum smoke developed index of 50.

Exception No. 1: The following materials shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft (1.5 m) or less when tested in accordance with the specified test method:

(a) Electrical wires and cables. NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables.

2-3.10.5 Raised Floor Plenum. The space between the top of the finished floor and the underside of a raised floor shall be permitted to be used to supply air to, or return exhaust air from, or return and exhaust air from, the occupied area, provided that the following conditions are met:

(a) All materials exposed to the airflow shall be noncombustible or limited combustible and shall have a maximum smoke developed index of 50.

Exception No. 1: The following materials shall be permitted in the raised floor plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft (1.5 m) or less when tested in accordance with the specified test method:

(a) Electrical wires and cables. NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables.

Establishing Types CL2P-50 and CL3P-50 cables is a step toward correlating NFPA 70, the National Electrical Code and NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. Types CL2P-50 and CL3P-50 cables qualify for use by meeting the basic rule for plenum materials, i.e., limited combustible and a smoke developed rating below 50, and meeting the flame spread and smoke requirements of the NFPA 90A Exception which are identical to those in the NEC fine print notes.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #2237)

16- 90 - (725-71(d)): Accept in Principle

SUBMITTER: Ravindra H. Ganatra, Alcan Cable

RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."

SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.

[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]

PANEL ACTION: Accept in Principle.

Replace "flame retardant" with "resistant to flame spread"

PANEL STATEMENT: This change will correlate with the wording used for the requirements for CMX and CATVX.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #3633)

16- 91 - (725-71(e)): Accept

Note: The Technical Correlating Committee understands that the reference to "725-71(e)" in the Proposal is incorrect and should be "725-71(h)." The Technical Correlating Committee notes that this section will be renumbered "725-71(i)" based on the Action on Proposal 16-89. The Technical Correlating Committee directs that the action on this Proposal be revised to comply with the NEC Style Manual 3.1.4 regarding the use of an Exception within the same sentence as the main rule. The Technical Correlating Committee directs the Panel to refer to the action on similar Proposal 16-106 and correlate the wording of the two Proposals. A separate Exception may be appropriate. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.

RECOMMENDATION: In Section 725-71(e) in the first sentence, modify as follows:

"...marked in accordance with Section 310-11 (except voltage ratings shall not be marked on the cables) and Table 725-71."

SUBSTANTIATION: Section 310-11(a)(1) says "The maximum rated voltage for which the conductor was listed" is to be marked on the cable. However, 725-71 says that cables shall be marked in accordance with 725-71(h). 725-71(h) says "Voltage ratings shall not be marked on the cable." Which is it, to be marked or not to be marked? The UL standard for Power-Limited Circuit Cables, UL-13, says that for PLTC cables "PLTC 300 V" or "PLTC 300 volts" must be on the cable.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #1866)

16- 92 - (725-71(e) Exception No. 1): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise as follows:

Exception No. 1: Where a smooth metallic sheath, ~~welded and~~ continuous corrugated metallic sheath, or interlocking tape armor is applied over the nonmetallic jacket, an overall nonmetallic jacket shall not be required. On metallic-sheathed cable without an overall nonmetallic jacket, the information required in ~~Section~~ 310-11 shall be located on the nonmetallic jacket under the sheath.

SUBSTANTIATION: Welding is only one method of manufacturing a continuous corrugated sheath. This text is consistent with 727-4(4).

Section 4.1.2 of the 1999 National Electrical Code Style Manual stipulates that "...references shall include only the number of the rule being referenced; the word section, subsection, and paragraph shall not be used."

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #4149)

16- 93 - (725-71(f)): Accept

Note: It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. This action will be considered by the Panel as a Public Comment.

SUBMITTER: William Keezer, Bose Corp./Rep. Nat'l Systems Contractors Assn. (NSCA)

RECOMMENDATION: Revise subsection (f) to Section 725-71 as follows:

(f) Class 2 and Class 3 Cable Voltage ~~Rating~~ Ratings. Class 2 cables shall have a voltage rating of not less than 150 volts. Class 3 cables shall have a voltage rating of not less than 300 volts.

SUBSTANTIATION: Problem:

1) It has been stated that Class 2 cable has no requirement for dielectric integrity of the insulation. This has caused concern about whether Class 2 wire is suitable for the purposes for which it is used. This proposal adds a Class 2 requirement in the same manner as the voltage requirement for Class 3 is specified, and for the same reason - to insure a minimum level of electrical performance for Class 2 cables.

Substantiation:

1) The proposed subsection clarifies that all Class 2 cables must meet a minimum level of dielectric integrity. It has been argued that a Nationally Recognized Testing Laboratory (NRTL) other than UL can establish its own listing tests and ignore insulation integrity. This requirement would set a minimum dielectric integrity requirement specified by the code rather than within a listing standard. This requirement does not require the voltage rating to be marked on the wire.

2) This proposal would insure that non-UL NRTLs will be required to apply a dielectric withstand test or spark test to their testing protocol if they do not use UL 13 as the basis for listing.

3) UL 13 Power-Limited Circuit Cables, Second Edition is a listing standard for Class 2 cables. That standard specifically requires that Class 2 cables be tested using either a spark test or a dielectric withstand test. Section 25 - Spark Test and Dielectric Withstand Test Alternatives for Class 2 Cables of that standard allows either a spark test or dielectric test as alternative methods of qualification. The spark test specifies either a 2500 vdc or 1750 vac limit without failure. The dielectric withstand test is an option for nonintegral cable with a 1250 vdc or 900 vac limit for 2 seconds without failure. The methods for performing these tests are found in UL 1581 Reference Standard for Electrical Wires, Cables and Flexible Cords.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

EGESDAL: Article 725 has never required a voltage rating on Class 2 cable. In the definition of a Class 2 Circuit, Article 725 states, "Due to its power limitations, a Class 2 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock. Proposal 16-93 provided no substantiation that included evidence of fire initiation or shock from Class 2 circuits; such as from open frame transformers with exposed terminals. Article 725 presently requires Class 2 cable to be resistant to the spread of fire - no voltage rating. Inclusion of the 150 volt requirement on Class 2 cable without sufficient substantiation appears to be a barrier to trade. Additionally, Article 725 requires a Class 2 power source to be listed. According to sources at UL, UL permits listing of Class 2 power sources with a maximum output of 30 vac and 60 vdc. There seems to be no technical reason to require conductor insulation 5 times in excess of the presently UL Listed 30 vac Class 2 power sources.

(Log #4266)

16- 94 - (725-71(g), Exception (New)): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Add an Exception as follows:

Exception: Conductors not listed as Type CL3 shall be permitted to be used for Class 3 circuits where run within recognized cable and raceway wiring methods covered in Chapter 3.

SUBSTANTIATION: This proposal unwinds the preposterous result in the last code cycle, where a No. 14 THHN conductor can't be used for a Class 3 circuit run in EMT, but the same conductor can be used in the same raceway for general building wire purposes at far higher power levels.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-62(a). The revised text meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

ARTICLE 727 — INSTRUMENTATION TRAY CABLE: TYPE ITC

(Log #1111)

16- 95 - (727): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise Article 727 as follows:

727-6 - change "No. 22 through No. 12" to "22 through 12 AWG"

727-8 - change "No. 22" to "22 AWG"

727-9 - change "Nos. 20" to "20 AWG" and "No. 22" to "22 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4267)

16- 96 - (727): Reject

Note: See the Technical Correlating Committee Action on Proposal 16-56.

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Delete this Article 727.

SUBSTANTIATION: This is a companion proposal to another on Section 725-27 which brings the essential requirements of Article 727 into Article 725, and a third proposal to add certain material as a new Section 725-23 Exception No. 4. The principal substantiation is on the proposal for the new Section 725-27(c). Please refer to that proposal for more information.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to panel action on Proposal 16-56. Since the requirements in Article 727 have not been incorporated into Article 725, Article 727 must remain in place.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #2299)

16- 97 - (727-2(6)): Reject

SUBMITTER: David Wechsler, Union Carbide Corp.

RECOMMENDATION: Delete "control rooms" and revise the text as follows:

(6) Under raised floors and in rack rooms where arranged to prevent damage to the cable.

SUBSTANTIATION: The term "control room" is not defined in Article 727 or within the NEC and thus the application of this specific section has come under much debate. It was the intent that ITC cable be permitted to be run under raised floors. Whether the raised floor is within a section of a building, a room within a building, or even in an entire building, does not alter the permitted use of using ITC under the raised floor. While one solution might be to provide a definition of a control room, this is not very easy and a more workable solution is to simply delete "control room".

PANEL ACTION: Reject.

PANEL STATEMENT: The industry has general understanding of what constitutes a "control room." The submitter's revised wording allowing the use of ITC Cable under a raised floor anywhere in a building was never the intent. The panel has assumed that the reference was to 727-4(7).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1867)

16- 98 - (727-4): Reject
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise as follows:
727-4. Uses Permitted. Type ITC cable shall be permitted to be used in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons will service the installation.
(1) In cable trays.
(2) In raceways.
(3) In hazardous locations as permitted in Articles 501, 502, 503, 504, and 505
(4) As open wiring where ~~equipped with~~ enclosed in a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armor applied over the nonmetallic sheath in accordance with Section 727-6. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).
(5) As open wiring between cable tray and equipment in lengths not to exceed 50 ft (15.24 m), where the cable is supported and protected against physical damage using mechanical protection, such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).
~~Exception No. 1: Type ITC cable without a metallic sheath or armor shall be permitted to be installed as open wiring between cable tray and equipment in lengths not to exceed 50 ft (15.24 m), where the cable is supported and protected against physical damage using mechanical protection, such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).~~
~~Exception No. 2: Type ITC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring between the cable tray and the equipment in lengths not to exceed 50 ft (15.24 m). The cable shall be supported and secured at intervals not exceeding 6 ft (1.83 m).~~
(6)~~(5)~~ As aerial cable on a messenger.
(7) ~~(6)~~ Direct buried where identified for the use.
(8) ~~(7)~~ Under raised floors in control rooms and rack rooms where arranged to prevent damage to the cable.
SUBSTANTIATION: The two exceptions have been rewritten into positive language in accordance with Section 3.1.4 and Annex A of the 1999 National Electrical Code Style Manual.
The positive language in the new (5) permits the use of cables specified in both exceptions.
Exception No. 1 already permitted ITC cable to be installed as open wiring in lengths not to exceed 50 ft without meeting the crush and impact requirements of Type MC cable and being identified for the use, so Exception No. 2 is not needed.
Exception No. 1 required that open wiring be "supported and protected against physical damage using mechanical protection, such as dedicated struts, angles, or channels." Section 300-4 already requires conductors to be adequately protected and the phrase "such as dedicated struts, angles, or channels" provides additional clarity.
PANEL ACTION: Reject.
PANEL STATEMENT: It was the submitter's intent to rewrite the exceptions into positive language. However in doing so the current allowance in Exception No. 2 is not retained.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2143)

16- 99 - (727-4 Exception No. 1): Reject
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: The new Exception to 725(a)(2) will read:
"Where new or existing control panels utilize a larger listed power supply which is fused multiple times to supply multiple circuits as long as each circuit meets the power requirements of a Class 2 or 3 listed power supply."
SUBSTANTIATION: The demand in the industry is for small control panels. The change in this article last year resulted in the exclusion of large power supplies feeding multiple control circuits. It now requires that only items in 725-41(a)(1) through (5) be acceptable as power sources. In the Minneapolis/St. Paul area, the panel shops are building control panels with listed power supplies that meet the requirements of Class 2 or 3 but are not specifically designated as Class 2 or 3 or are fused to meet the Class 2 or 3 requirement. Of the 27 vendors polled across the nation, three manufacturers have taken this change to heart and produced listed power supplies specifically designated as Class 2 or 3. But, at this time, they only have 24 volt, 4 amp supplies and 8 amp are not available. There are, however, many listed 10 and 15 amp 24 volt power supplies available. The installation in thousands of control panels across the United States were safe before the 1993 code, and new installations after that date are still safe even after 1996 and 1999 code made them illegal. It is not the intent of the National Electrical Code to be ignored. The rule must instead be modified to fit what reality is. An example of what this new rule has done to process machine control is that of a new machine that was built for 3M. To meet the requirement of the NEC, the panel manufacturer had to install 16 separate 4.2 amp power supplies, when in the past 1/2 to 1/4 of that many larger power supplies correctly fused would have sufficed. Because of this 3M incurred higher cost in the engineering and construction of that machine to the tune of more pages of elementrys, a larger panel, more internal equipment and more wiring on the machine and larger conduit to accommodate this wiring. It will also impact 3M in the future maintenance of that machine as there is now far more complexity, equipment and wiring that can go wrong.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: The wording does not match the Section number.
Overcurrent protection alone can not be used to create a Class 2, or Class 3 power source. Refer to the listing requirements in Chapter 9 Table 11(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
COMMENT ON AFFIRMATIVE:
HUGHES: The text of this proposal and substantiation obviously does not apply to the referenced article and section. A more appropriate recommendation for the wording of 727-4 Exception No. 1 would be as follows:
727-4 Exception No. 1 will read: Type ITC cable without a metallic sheath or armor shall be permitted to be installed as open wiring between cable tray and equipment in lengths not to exceed 50 ft. (15.24m), where the cable is supported and protected against physical damage using mechanical protection, such as ~~dedicated~~ struts, angles or channels. The cable shall be supported and secured at intervals not exceeding 6 ft (1.83m).
Substantiation:
The examples cited for mechanical protection could already be part of the building or equipment infrastructure, and if so, are not solely dedicated for the purpose of protection of a wiring system. This change will clarify the exception, avoid the interpretation that the mechanical protection means can only be used for that purpose, and continue to provide protection of the wiring system as intended.

(Log #1868)

16- 100 - (727-4(3)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise as follows:
(3) In hazardous locations as permitted in 501-4, 502-4, 503-3, 504-20, 504-30, 504-80, and 505-15. ~~Articles 501, 502, 503, 504, and 505.~~
SUBSTANTIATION: Section 4.1.1 of the 1999 National electrical Code Style Manual stipulates that "References shall not be made to an entire article... unless additional conditions are specified."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #494)

16- 101 - (727-4(4)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 727-4(4) - revise as follows:
"The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft) ~~6 ft (1.83 m).~~
Exception No. 1: Type ITC cable without a metallic sheath or armor shall be permitted to be installed as open wiring between cable tray and equipment in lengths not to exceed 15 m (50 ft) ~~50 ft (15.24 m),~~ where the cable is supported and protected against physical damage using mechanical protection, such as dedicated struts, angles, or channels. The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft) ~~6 ft (1.83 m).~~
Exception No. 2: Type ITC cable that complies with the crush and impact requirements of Type MC cable and is identified for such use shall be permitted as open wiring between the cable tray and the equipment in lengths not to exceed 15 m (50 ft) ~~50 ft (15.24 m).~~ The cable shall be supported and secured at intervals not exceeding 1.8 m (6 ft) ~~6 ft (1.83 m).~~"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2124)

16- 102 - (727-4(8) (New)):
Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" to correlate with the action of Code-Making Panel 12 in Rejecting Proposal 12-105. The Technical Correlating Committee directs that this Proposal be forwarded to Code-Making Panel 12 for information.
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Add the following new subparagraph:
(8) Under raised floors in information technology equipment rooms in accordance with Section 645-5(d)(5)(c).
SUBSTANTIATION: This proposal is complementary to a CMA proposal submitted for adding ITC to Section 645-5(d)(5)(c). Cable type ITC was added to the 1996 NEC and inadvertently left out of Article 645. ITC cable is being used in information technology equipment rooms as a safe application. Cable type PLTC is acceptable under raised floors in information technology rooms and construction of ITC and PLTC is similar as to their characteristics which are applicable to this application.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1869)

16- 103 - (727-6): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise last paragraph as follows:
"Where a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armor is applied over the nonmetallic sheath, an overall nonmetallic jacket shall ~~be permitted to be applied, but shall~~ not be required."
SUBSTANTIATION: Make the text consistent with that used in 725-71(e). A nonmetallic sheath or jacket over the metallic sheath or armor would still be permitted.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2267a)

16- 104 - (727-6): Reject
SUBMITTER: Kenneth E. Bow, The Dow Chemical Co.
RECOMMENDATION: Insert: A metallic shield or metalized foil shield with drain wire(s) shall be permitted to be applied either over the cable core, over groups of conductors or both into 340-3 and 727-6. Note: this insertion has been extracted from Article 725-71(e) of the 1999 NEC.
SUBSTANTIATION: This proposal will clarify the use of shielding in tray cable (Type TC), instrument tray cable (Type ITC), and power limited tray cable (Type PLTC). Shielding is often important to satisfactory operations of such cables. There is confusion on the part of users relative to the permitted use of shields for these three types of tray cable. Therefore, the wording of 725-71(e) should be added to Articles 340-3 and 727-6 to eliminate the confusion. Shielding of tray cables is covered in UL 13, Section 10, UL 1277, Section 10.4, but not in UL 2250. Therefore, a section such as in UL 13 or UL 1277 also needs to be added to UL 2250.
PANEL ACTION: Reject.
PANEL STATEMENT: Shielding is already allowed by the last sentence of the first paragraph of 727-6.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1870)

16- 105 - (727-7): Reject
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Delete 727-7. Marking. in its entirety.
SUBSTANTIATION: Section 4.1 of the 1999 NEC Style Manual states "Do not use a reference if the requirement is already covered by 90-3." 90-3 states that Chapters 1, 2, 3, and 4 apply generally.
PANEL ACTION: Reject.
PANEL STATEMENT: The reference to 310-11 is needed because action of Proposal 16-106 modified the requirements of 310-11.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #4054)

16- 106 - (727-7): Accept
SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.
RECOMMENDATION: Add the following sentence at the end of 727.7 to read:
"Voltage ratings shall not be marked on the cable."
SUBSTANTIATION: Currently 727.7 says the marking are to be to Section 310.11. Section 310.11(a)(1) says "The maximum rated voltage for which the conductor was listed" is to be marked on the surface of the cable. The conductors are rated for 300 volts, therefore, the UL standard for ITC (UL-2250) says the voltage rating of "300 volts" or "300 V" is to be surface marked on the cable. See UL-2250, paragraph 39.1(f). NEC Section 727-1 is very specific for the use of ITC cables. "...circuits operating at 150 volts or less." This seems to cause some confusion with the user. Not allowing any voltage rating to be marked on the cable will eliminate this problem.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

ARTICLE 760 — FIRE ALARM SYSTEMS

(Log #495)

16- 107 - (760): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 760-30(a)(1) - change "7 ft (2.13 m)" to "2.1 m (7 ft)" and change "18 in. (457 mm)" to "450 mm (18 in.)"
760-30(a)(2) - change "7 ft (2.13 m)" to "2.1 m (7 ft)"
760-51 Exception - change "12 in. (305 mm)" to "300 mm (12 in.)"
760-52(b)(1) - change "7 ft (2.13 m)" to "2.1 m (7 ft)" and change "18 in. (457 mm)" to "450 mm (18 in.)"
760-52(b)(2) - change "7 ft (2.13 m)" to "2.1 m (7 ft)"
760-54(a)(3) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
760-61(c), Exception No. 2 - change "10 ft (3.05 m)" to "3.0 m (10 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1112)

16- 108 - (760): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Article 760 as follows:
760-23 - change:
"No. 14" to "14 AWG"
"No. 18" to "18 AWG"
"No. 16" to "16 AWG"
760-27(a) - change: No. 18 conductors and No. 16 conductors" to "Size 18 and 16 AWG conductors"
"No. 16" to "16 AWG"
760-27(b) - change:
"No. 16" to "16 AWG"
"No. 18 and 16" to "18 and 16 AWG"
760-31(a) - change "No. 18" to "18 AWG"
760-31(b) - change: "No. 14" to "14 AWG"
"No. 18 and No. 16" to "18 and 16 AWG"
760-51, Exception - change:
"No. 14" to "14 AWG"
"No. 18" to "18 AWG"
760-54(d) - change:
"No. 26" to "26 AWG" in three places
"No. 26 to No. 24" to "26 to 24 AWG"
"No. 18" to "18 AWG"
760-71(b) - change:
"No. 26" to "26 AWG"
"No. 18" to "18 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #4040)

16- 109 - (760-2-Abandoned Cable (New)): Accept
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add a new definition to read as follows:
Abandoned Cable. Cable that is neither terminated at both ends, at a connector or other equipment, nor identified for future use with a tag.
SUBSTANTIATION: The definition of abandoned cable is needed to accompany the proposals that require removal of abandoned cable. This definition reflects industry practices.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
DORNA: The definition of "Abandoned Cable" should be the same here as what we accepted in Proposal 16-273. It should be "Cable that is neither terminated at ~~both ends, at a connector or other~~ equipment, nor identified for future use with a tag." (This is the same wording as Proposal 16-273.)
The reason we took out the reference to connectors in Proposal 16-273 is because CATV cable usually has connectors attached. It was our concern that CATV cables would have connectors attached and then would not fall under the proposed original definition and therefore would not have to be removed if abandoned. I believe this also could be the case with cables in this Article 760. These cables could also have connectors attached, and therefore would not fall under the definition the panel had accepted in principal. If we make the definition the same as I have suggested above (the same as 16-273) then it will make it irrelevant on whether the cable has connectors or not. I can foresee someone using the fact that the cable has a connector on it, therefore it does not fall under "abandoned cable" and does not need to be removed.
COMMENT ON AFFIRMATIVE:
BRUNSSEN: See my Comment on Affirmative Vote on Proposal 16-32.
JOHNSON: See my Comment on Affirmative Vote on Proposal 16-80.
KAHN: See my Comment on Affirmative on Proposal 16-32.
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #4045)

16- 110 - (760-2- Excessive Accumulation of Abandoned Cables (New)): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add a new definition to read as follows:
Excessive Accumulation of Abandoned Cables. When the number of abandoned cables is greater than 1 / 3 of the total number of cables within a fire-containment zone.
SUBSTANTIATION: After the concept of plenum cables was introduced into the 1975 NEC, Underwriters Laboratories initially listed plenum cables by comparing the smoke production of plenum cables with the smoke production of conventional cables of the same physical design (but not plenum grade materials) in conduit. Plenum cables (not in conduit) were tested and compared with an equal number of conventional cables in conduit. It was assumed that the plenum cables were a replacement for conventional cables and that in case of a fire the amount of smoke would be reduced because of the lower smoke production of plenum cables. It was not anticipated that plenum cables would be abandoned. Since conventional cables in conduit were deemed to be acceptable the smoke from these cables is the benchmark for comparison and a fire involving an excessive amount of abandoned cables could emit excessive amount of smoke. Until research better defines what amount of abandoned cable might be excessive, allowing up to 1 / 3 excess of abandoned cables is prudent.
PANEL ACTION: Reject.
PANEL STATEMENT: The term is not used. The proposal that introduced this term was modified to eliminate the term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1132)

16- 111 - (760-3(a)): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 760-3(a) as follows:
(a) Spread of Fire or Products of Combustion. See Sections 300-21 and 725-54(e).
SUBSTANTIATION: This proposal correlates with my proposal for Section 760-54(e).
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter's recommendation for 760-54(e) was accepted in principle. Hence this correlating proposal is not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1658)

16- 112 - (760-5): Accept in Principal
Note: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting of a similar Proposal 16-192. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to the use of the unenforceable terms "practicable" and "impracticable". This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise 760-5 as follows:
760-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to equipment shall not be denied by an excess accumulation of conductors and cables ~~that prevents~~ sufficient to prevent the removal of panels, including suspended ceiling panels.
SUBSTANTIATION: Section 760-5 may be misinterpreted to mean that conductors and cables may not be placed directly on suspended ceilings. While the 1999 National Electrical Code Handbook emphasizes "excess accumulation" in the interpretive text, Figures 760-3 and 760-4 lead the reader to conclude that no conductors or cables are permitted to rest directly on the suspended ceiling. This was not the intent of CMP 16 when 760-5 was introduced into the 1993 NEC. At that time, CMP 16 stated in response to a similar proposal to Article 725 (1992 TCD, Comment 16-18) that the proposed requirement "... would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." The proposed revision emphasizes that it is an excessive accumulation of conductors and cable that is of concern. A limited amount of cabling laid directly on a suspended ceiling is permitted, will not deny access to equipment, and does not present an unsafe working environment. This is a companion proposal and is intended to correlate with 725-5, 770-7, 800-5, 820-5 and 830-6.
PANEL ACTION: Accept in Principle.
Revise 760-5 to read as follows:
"760-5. Access to Electrical Equipment Behind Panels Designed to Allow Access
Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cabling systems.
Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.
1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.
2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."
PANEL STATEMENT: The revised text satisfies the intent of the original recommendation in that it allows some cabling of a limited quantity above ceiling tile but not an excessive amount, which would interfere with accessibility.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
EGEDSAL: See my Explanation of Negative Vote on Proposal 16-192.
COMMENT ON AFFIRMATIVE:
BRUNSSEN: I concur with the panel action in providing relief for a limited amount of after-construction fire alarm wiring and cables to be placed directly on the suspended ceiling tiles. However, proposed Section 760-5(b)(2), as presently written, is confusing and could be interpreted as permitting a total of only three unsupported cables. The intent of the panel was that up to a maximum of three unsupported cables may be routed across each and every ceiling tile. Revising 760-5(b)(2) to state: "...permissible to install a maximum of three unsupported cables on top of ~~any one~~ each ceiling tile, i.e., up to three cables are permitted to lay on a ceiling tile." would clarify the intent. Note that the word "of" is inserted and is missing in the original text.

(Log #CP1610)

16- 112a - (760-7): Accept
SUBMITTER: CMP 16
RECOMMENDATION: Revise 760-7 to read as follows:
"Fire Alarm Circuits Extending Beyond One Building. Power-limited fire alarm circuits that extend beyond one building and run outdoors shall either meet the installation requirements of Parts B, C, and D of Article 800, or shall meet the installation requirements of Part A of Article 300. Nonpower-limited fire alarm circuits that extend beyond one building and run outdoors shall meet the installation requirements of Part A of Article 300 and the applicable sections of Part A of Article 225.
SUBSTANTIATION: Fire alarm circuits are neither branch nor feeder circuits and referring to the complete Article 225 is inappropriate. Adding the reference to Part A of Article 300 provides the methods and materials for both power-limited and nonpower-limited fire alarm circuits that run outdoors.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #4268)

16- 113 - (760-7): Accept in Principle
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise as follows:
"…or shall meet the installation requirements in Part A of Article 225….".
SUBSTANTIATION: The 1999 NEC rewrite of this section inadvertently brought in the entire panoply of Article 225 requirements for outside circuits, including building disconnects. Based on several conversations with panel members, this doesn't appear to have been intended, at least for power-limited applications. This proposal is limited to the power-limited part of this section, but if the panel intends a similar recognition for nonpower-limited applications, it can and should take this opportunity to clarify that issue as well.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action on Proposal 16-112a which includes the submitter's recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1803)

16- 114 - (760-7, Exception): Accept in Principle
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Add new Exception to read as follows:
"Exception: Disconnecting means shall not be required on fire alarm circuits."
SUBSTANTIATION: Disconnecting means are required on outside branch circuits and feeders running from one building and another. Such disconnects are not appropriate for fire alarm circuits and may introduce a significant risk if provided. I believe such disconnects should be prohibited, but as I cannot contemplate all possible installations, the proposal is simply to exclude the requirement for disconnects.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action on Proposal 16-112a which includes the submitter's recommendation. It is not necessary to add an exception.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3101)

16- 115 - (760-8): Accept in Principle
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Revise text to read as follows:
"Mechanical Execution of Work. Fire alarm circuits shall be installed in a neat and workmanlike manner. Exposed ~~C~~cables and conductors shall be supported by ~~the~~ structural components of the building ~~structure~~ in such a manner that the cable or conductors will not be damaged by normal building use. Exposed cables and conductors shall be attached to structural components at intervals not exceeding 5 ft (1.52 m) and within 12 in. (305 mm) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable or conductors. The installation shall also conform with Section 300-4(d)."
Also, delete the Fine Print Note.
SUBSTANTIATION: Systems continue to be installed by "tossing" exposed cables and conductors across lay-in ceiling tiles and routed through open joist construction with no regard for proper support of the cables and conductors as just one example. The intent is that these exposed cables and conductors are supported by structural components of the building, such as; beams, joists, columns or walls. Too often, the sole means of support is by laying these cables and conductors n removable ceiling panels or attaching them to a ceiling support system (T-bars or wires) which is prohibited by the National Electrical Code.
Another common observation is seeing them "strung" through open joist construction with little or no means of support other than occasionally being wrapped around a portion of the joist to keep them from sagging. The addition and use of "exposed" was carefully chosen to avoid conflict with acceptable methods within the section of installing "concealed" cables and conductors, which typically are not going to be subjected to physical damage. The reference to 300-4(d) is to protect concealed cables and conductors when appropriate.
The new text has been taken partially from, and with, Sections 330-12, 333-7 and 336-18 in mind which also deal with exposed cable systems. These changes will ensure that cables and conductors are supported properly as well as provided with strain relief when entering electrical enclosures for connections, splicing and termination's.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation to read as follows:
Revise text to read as follows:
"Mechanical Execution of Work. Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike manner. Cables and conductors installed exposed on the surface of ceiling and sidewalls shall be supported by ~~the~~ structural components of the building ~~structure~~ in such a manner that the cable or conductors will not be damaged by normal building use. Such cables and conductors shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable or conductors. The installation shall also conform with Section 300-4(d).
Also, delete the Fine Print Note.
PANEL STATEMENT: The revised text conforms to the definitions in Article 100, and satisfies the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation of Negative Vote on Proposal 16-2a.

(Log #3664)

16- 116 - (760-8): Accept
SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.
RECOMMENDATION: Delete the FPN associated with this section.
SUBSTANTIATION: Problem: The standards listed contain insufficient information to determine accepted industry practice for systems and equipment included in Article 760.
Substantiation: A detailed review of ANSI/EIA/TIA/568A-1995, ANSI/EIA/TIA/569-1990 , and ANSI/EIA/TIA/570-1991 was completed by the submitter and no significant information, guidance, or directives were found, that would be helpful to a user of this Article of the Code. These standards were developed by the telecom and computer industries. They provide the details covering telecommunication infrastructure such as cable pathways, equipment spaces, telephone grounding/bonding, and telecommunication administration. They are excellent standards but they do not address typical cabling installation issues such as:
(a) how to properly pull wire(s) above a lay ceiling.
(b) when and where to support the wire in a building structure.
(c) how to dress various types of audio signal wires coming into and within an equipment cabinet.
(d) how and where to set up wire reels for riser cables in tall structures.
(e) how and where to dress audio speaker wire along a steel beam in a gymnasium or factory.
(f) what to watch out for when pulling a cable into a raceway.
These standards are purported to be the concept standards for guiding the users of the Code in determining appropriate mechanical execution of work and determination of acceptable industry practices. However, such is not the intent of the standards. For those who do not have a set of the standard available, the submitter has provided an Appendix that summarizes each section of each standard. The appendix will give you an overview of the contents of each section of each standard and enable you to gain a better understanding of what the standards cover.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
PANEL STATEMENT: The proposed recommendation has been incorporated by the panel action on Proposal 16-115.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
LANNI: After reviewing the NECA index No. 5037, I realized that there are very useful National Electrical Installation Standards available and a Fine Print Note is the appropriate way to guide the code user. I also feel that the panel did satisfy the original submitter when the Fine Print Note was incorporated into the code. Improving the references, instead of removing the Fine Print Note, would improve our original work. Installation documents are being produced all the time partially in response to our note in the code. The panel could only answer one of the Submitter's concerns, namely, "when and where to support the wire in a building structure." Other issues are left unanswered. Good workmanship is an important component of a safe installation, but the code cannot address all these issues and other documents are more suited for the purpose.
ROMLEIN: See my Explanation of Negative Vote on Proposal 16-3.

(Log #3753)

16- 117 - (760-8): Accept in Principle
SUBMITTER: Douglas R. Erb, Construction Insp. Dept., Ocean County, NJ
RECOMMENDATION: Add a second paragraph to read as follows:
"Type PLFA Cables shall be secured by staples, cable ties, straps or similar fittings designed and installed as not to damage the cable. Cables shall be secured at intervals not exceeding 6 ft and within 12 in. from every cabinet, box, or device.
Exception No. 1: For concealed work in finished buildings where such support is impracticable, it shall be permissible to fish cable between access points."
SUBSTANTIATION: The absence of a definitive support requirement for PLFA cables which is provided for other wiring method throughout this code is needed. Without a definite support requirement enforcement of the general requirements of 760-8 provide no consistency. With the increased presence of PLFA cables especially in drop ceilings damage to these cables and the integrity of their systems has increased with the lack of proper support. Lack of support for these cables creates an unsafe work area for others attempting work in these spaces.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 16-115 and 16-116. The revised text meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation of Negative Vote on Proposal 16-2a.

(Log #4022)

16- 118 - (760-8, FPN): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Revise the FPN to read: "One way to determine accepted industry practice is to refer to nationally recognized standards such as Commercial Building Telecommunications Cabling Standard, ANSI / EIA / TIA 568-A-1995; Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI / TIA / EIA 569-A-1997; and Residential ~~and Light Commercial~~ Telecommunications Cabling ~~Wiring~~ Standard, ~~ANSI / EIA / TIA 570-1991~~ ANSI / EIA / TIA 570-A-1999, ANSI / NECA / BICSI 568 or other ANSI-approved installation standards."
SUBSTANTIATION: A revision to the standard number and the title for residential cabling has been updated. Another standard is currently under review that will be focused at the installation of telecommunications cabling and connectors and will become an ANSI standard within the next year.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 760-8 has been revised to remove the FPN and provide specific installation requirements. A FPN is no longer necessary. Refer to the panel action and statement on Proposal 16-115.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
LANNI: After reviewing the NECA index No. 5037, I realized that there are very useful National Electrical Installation Standards available and a Fine Print Note is the appropriate way to guide the code user. I also feel that the panel did satisfy the original submitter when the Fine Print Note was incorporated into the code. Improving the references, instead of removing the Fine Print Note, would improve our original work. Installation documents are being produced all the time partially in response to our note in the code. The panel could only answer one of the Submitter's concerns, namely, "when and where to support the wire in a building structure." Other issues are left unanswered. Good workmanship is an important component of a safe installation, but the code cannot address all these issues and other documents are more suited for the purpose.

(Log #1002)

16- 119 - (760-10): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Fire alarm circuits shall be durably and permanently identified at terminal and junction locations in a manner that will ~~prevent~~ minimize the unintentional interference with the signaling circuit(s) during testing or servicing.
SUBSTANTIATION: "Durably and permanently" should be required, as is specified in other sections. Identification cannot literally prevent unintentional interference, only aid in minimizing the likelihood.
PANEL ACTION: Reject.
PANEL STATEMENT: The intention of the code is clear. The recommended changes introduce language which is unenforceable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2749)

16- 120 - (760-10): Reject
SUBMITTER: Joseph N. Fiorello, Sr., Fiorello Electric Inc.
RECOMMENDATION: Add new text as follows:
(In line voltage smoke detector systems conductors of the smoke detector system shall not be installed in the same raceway or junction box as any other building system.)
SUBSTANTIATION: While inspecting one job, the contractor had installed a junction box where other building wiring was installed. The smoke detector system was not working due to the fact of wires from a switch were confused with the detector system.
PANEL ACTION: Reject.
PANEL STATEMENT: 760-10 relates to the identification of fire alarm circuits. The proposed recommendation addresses an issue of installation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #4269)

16- 121 - (760-21): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc. / Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Add a second sentence and fine print note as follows:
"These circuits shall not be supplied through ground-fault circuit-interrupters.
(FPN): See Section 210-8(a)(5) Exception No. 3 for receptacles in dwelling-unit unfinished basements that supply power for fire alarm systems."
SUBSTANTIATION: This is a companion proposal to one submitted to allow non-GFCI protected receptacles for fire alarm system power supplies in dwelling unit basements. Acceptance of this proposal would assist installers in meeting the performance requirements of the rewritten household fire warning chapter in the 1999 NFPA 72. In the prior cycle CMP 16 objected to this proposal on the basis that it invaded the performance requirements of NFPA 72. Actually, all it does is provide some headroom in the electrical design so an installer has the best opportunity to meet the performance requirements in the new edition of NFPA 72 for these systems.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2775)

16- 122 - (760-25(b)): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Add new text to read as follows:
Raceways or Cable trays containing fire alarm circuits shall not contain any pipe, tube, or equal for steam, water, air, gas, drainage, or any service other than electrical.
SUBSTANTIATION: There presently is no reference in Article 760 that prohibits this practice.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 16-70. This proposal deals with the same issues as Proposal 16-70 and is rejected for the same reasons.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1004)

16- 123 - (760-28(a), (b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a) NPLFA Circuits and Class 1 Circuits. Where only nonpower-limited fire alarm circuits and Class 1 circuit conductors are in a raceway or cable, the number of conductors in a raceway shall be determined in accordance with Section 300-17. (remainder unchanged).
(b) Power-Supply Conductors and Fire Alarm Circuit Conductors. Where power-supply conductors and fire alarm conductors are permitted in a raceway or cable in accordance with Section 760-26, the number of conductors in a raceway shall be determined in accordance with Section 300-17. (remainder unchanged).
SUBSTANTIATION: Editorial. Although the second sentences of (a) and (b) do not literally preclude application of Section 310-15(b)(2)(a) to cables, the provisions of this section re: derating may suggest the modifications only apply to conductors in a raceway, since cables are not mentioned. The proposal continues to indicate the number of conductor in a raceway but more clearly indicates the derating modifications apply also to cables.
PANEL ACTION: Reject.
PANEL STATEMENT: The section explicitly deals with the number of conductors permitted in a raceway. Inserting the word "cable" causes confusion and raises a question as to the number of nonpower-limited circuit conductors that are permitted in a cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3208)

16- 124 - (760-30(a)(1), (2), and (3)): Accept
SUBMITTER: S. E. Egesdal, Honeywell Inc.
RECOMMENDATION: Add titles to existing Section 760-30(a) subparagraph as follows:
(1) Add "Exposed or Fished in Concealed Spaces."
(2) Add "Passing through a Floor or Wall."
(3) Add "In Hoistways."
SUBSTANTIATION: The Style Manual requires titles for subparagraphs.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2986)

16- 125 - (760-30(a)(3)): Accept
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:
(3) In rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible nonmetallic tubing, or electrical metallic tubing where installed in hoistways.
SUBSTANTIATION: This proposal adds Liquidtight Flexible Nonmetallic Conduit (LFNC) as an approved wiring method for Fire Alarm Systems. LFNC is currently allowed to be used for power conductors per Article 351, Part B. LFNC will provide the required protection for Fire Alarm Systems in a hoistway.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1682)

16- 126 - (760-30(b)(1)): Accept
SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.
RECOMMENDATION: a) Delete the last sentence. See Section 300-22(b).
b) Add a fine print note:
FPN: See Section 300-22(b).
SUBSTANTIATION: New Style Manual Section 3.1 requires that all general references to other code sections be in fine print notes. (NFPA staff will change the numbering to the new format.)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #4137)

16- 127 - (760-30(b)(2)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH Int'l, Inc./Rep. Plenum Cable Assn.
RECOMMENDATION: Revise as follows:
760-30. Multiconductor NPLFA Cables. Multiconductor nonpower-limited fire alarm cables that meet the requirements of Section 760-31 shall be permitted to be used on fire alarm circuits operating at 150 volts or less and shall be installed in accordance with (a) through (b) below.
(b) Applications of Listed NPLFA Cables. The use of nonpower-limited fire alarm circuit cables shall comply with (1) through (4).
(2) Other Spaces Used for Environmental Air. Cables installed in other spaces used for environmental air shall be Type NPLFP. Abandoned cables, not intended for future use, shall not be permitted to remain.
Exception No. 1: Types NPLFR and NPLF cables installed in compliance with Section 300-22(c).
Exception No. 2: Other wiring methods in accordance with Section 300-22(c) and conductors in compliance with Section 760-27(c).
SUBSTANTIATION: There is a significant amount of information indicating that the amount of cables installed in plenums, and other air-handling spaces, is increasing rapidly. An understanding of cabling practices indicates that the most common way in which cable installation is carried out is by disconnecting existing cable and leaving it abandoned in place, while introducing the cable needed to perform the additional functions. See Log #43136. There is, as yet, no indication that the additional cables in plenums causes an added fire hazard, and the fire record of cables in concealed spaces, both above ceilings and below floors, remains excellent. In fact, plenum cables, which meet the fire test requirements of NFPA 262, have been shown to have extremely good fire performance and to spread flame only very slowly, if at all. However, this type of preventive measure is worthwhile.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-144.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #496)

16- 128 - (760-31(c), FPN; 760-31(e), FPN; 760-71(d),FPN; 760-71(f), FPN): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: 760-31(c) FPN - change "5 ft (1.52 m)" to "1.52 m (5 ft)"

760-31(e) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"

760-71(d) FPN - change "5 ft (1.52 m)" to "1.52 m (5 ft)"

760-71(f) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

The SI units are not rounded since the values specify a minimum safety level.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1517)

16- 129 - (760-31(c), FPN): Accept

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Change NFPA 262-1994 to NFPA 262-1999.

SUBSTANTIATION: NFPA 262 has been revised.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #4270)

16- 130 - (760-41): Accept

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Designate the existing fine print note as (FPN No. 1). Add a second sentence and second fine print note as follows:

"These circuits shall not be supplied through ground-fault circuit-interrupters.

(FPN No. 2): See Section 210-8(a)(5) Exception No. 3 for receptacles in dwelling-unit unfinished basements that supply power for fire alarm systems.]"

SUBSTANTIATION: This is a companion proposal to one submitted to allow non-GFCI protected receptacles for fire alarm system power supplies in dwelling unit basements. Acceptance of this proposal would assist installers in meeting the performance requirements of the rewritten household fire warning chapter in the 1999 NFPA 72. In the prior cycle CMP 16 objected to this proposal on the basis that it invaded the performance requirements of NFPA 72. Actually, all it does is provide some headroom in the electrical design so an installer has the best opportunity to meet the performance requirements in the new edition of NFPA 72 for these systems.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #4145)

16- 131 - (760-41(d) (New)): Reject

SUBMITTER: William Keezer, Bose Corp./Rep. Nat'l Systems Contractors Assn. (NSCA)

RECOMMENDATION: Add a new paragrph 760-41(d), as follows:

(d) Audio Amplifiers. Audio amplifiers meeting the listing requirements of Section 640-9(c) and permitted to employ Class 2 or Class 3 wiring and wiring methods in accorance with Article 725, shall be considered a power source for PLFA circuits when used in a voice/alarm or combination system in accordance with NFPA 72, 1999 National Fire Alarm Code. PLFA audio amplifier output circuits shall be installed in accordance with Sections 760-42, 760-52, 760-54, 760-61, and 760-71 as applicable.

SUBSTANTIATION: 1) The methods for determining the safety of PLFA Circuits as defined in Tables 12(a) and 12(b) in Chapter 9 are inappropriate for determining the safety of audio amplifier output circuits. Recent developments in the area of voice/alarm performance requirements in NFPA 72, 1999 suggest that some voice/alarm performance requirements would be best met through the use of commercial audio system components suitably listed for fire alarm use. This proposal would permit the use of PLFA wiring methods for audio amplifier output circuits when the audio amplifier output circuit has been found to be of equivalent safety to a Class 2 or Class 3 circuit as defined in Article 725. The sections of Article 760 that would be applicable to amplifier output wiring materials and methods are clearly specified to avoid confusion.

2) When an amplifier is used in a voice/alarm or combination system in accordance with NFPA 72, 1999 National Fire Alarm Code, the safety concerns for appropriately wiring such systems should be equivalent to those concerns for the installation of a nonemergency audio systems. Since Article 760 clearly considers PLFA circuits to be of equivalent safety to a Class 3 circuit as defined in Article 725, then an audio amplifier output circuit listed as permitting Class 2 or Class 3 wiring methods is clearly safe enough to employ PLFA wiring methods. This proposal would allow the listing standard to specify that the use of PLFA wiring methods is permitted when an amplifier meets the Class 2 or Class 3 listing requirements of Section 640-9(c).

Not only are the methods for determining the safety of PLFA Circuits as defined in Tables 12(a) and 12(b) in Chapter 9 inappropriate for determining the safety of audio amplifier output circuits, but a similar limitation may be found in Tables 11(a) and 11(b) when one attempts to apply them to audio amplifiers used for nonemergency purposes. It is for this reason that Section 640-9(c) was written in a manner which recognizes the unique power and voltage characteristics of an audio signal when determining whether Class 2 or Class 3 wiring methods can be employed.

An audio amplifier is clearly neither a Class 2 or Class 3 transformer or power supply, yet listing test methods have been devised to define when an audio amplifier's output characteristics represent a power source of equivalent safety. It is clear from 760-41(a) and 760-41(b), that sources of energy equal to that of Class 3 circuits as defined in Article 725 are considered of equivalent safety to PLFA circuits. If so, an amplifier entitled to employ Class 2 or Class 3 wiring methods should also be considered of equivalent or superior safety to a PLFA source of power.

It is recognized that, should this proposal be adopted, audio amplifiers listed for use with Class 2 or Class 3 in accordance with Section 640-9(c) would be recognized as clearly meeting the circuit safety concerns for PLFA circuits. This does not mean that such amplifiers should be used in fire alarm audio system unless the amplifier also meets certain additional performance criteria such as is found in Amplifiers for Fire Protective Signaling Systems ANSI/UL 1711-1994. It is anticipated that listing requirements consequent to this proposal will be addressed by UL through appropriate revision of UL 1711 or other applicable listing standards.

Note to Correlating Committee: While this proposal could be independently adopted, it is suggested that a companion proposal by the same submitter to change Section 640-9(c) be correlated with this one. That proposal similarly addresses the same issue, and refers back to Article 760 to establish reciprocity between the two articles.

PANEL ACTION: Reject.

PANEL STATEMENT: Notification appliance circuits are under the purview of NFPA 72 which requires equipment to be listed for the purpose (fire alarm) being installed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #3209)

16- 132 - (760-52(b)(1), (2), and (3)): Accept

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: Add titles to existing Section 760-52(b) subparagraph as follows:

(1) Add "Exposed or Fished in Concealed Spaces."

(2) Add "Passing through a Floor or Wall."

(3) Add "In Hoistways."

SUBSTANTIATION: The Style Manual requires titles for subparagraphs.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1024)

16- 133 - (760-54): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise 760-54 as shown:

760-54. Installation of Conductors and Equipment

(a) Separation from Electric Light, Power, Class 1, NPLFA, ~~and~~ Medium and High Power Network-Powered Broadband Communications Circuit Conductors.

(1) In Cables, Compartments, Enclosures, Outlet Boxes, or Raceways. Power-limited circuit cables and conductors shall not be placed in any cable, cable tray, compartment, enclosure, outlet box, raceway, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm circuit conductors, ~~or~~ medium or high power network-powered broadband communications circuits.

Exception No. 1: Where the conductors of the electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductors are separated by a barrier from the power-limited fire alarm circuits. In enclosures, power-limited fire alarm circuits shall be permitted to be installed in a raceway within the enclosure to separate them from Class 1, electric light, power, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuits.

Exception No. 2: Conductors in compartments, enclosures, device boxes, outlet boxes, or similar fittings, where electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuit conductors are introduced solely to connect to the equipment connected to power-limited circuits to which the other conductors are connected, and

a. The electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductors are routed to maintain a minimum of 0.25 in. (6.35 mm) separation from the conductors and cables of power-limited fire alarm circuits, or

b. The circuit conductors operate at 150 volts or less to ground and also comply with one of the following.

1. The fire alarm power-limited circuits are installed using Types FPL, FPLR, FPLP or permitted substitute cables, provided these power-limited cable conductors extending beyond the jacket are separated by a minimum of 0.25 in. (6.35 mm) or by a nonconductive sleeve or nonconductive barrier from all other conductors, or

2. The fire alarm power-limited circuit conductors are installed as nonpower-limited fire alarm circuits in accordance with Section 760-25.

Exception No. 3: Conductors entering compartments, enclosures, device boxes, outlet boxes, or similar fittings, where electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuit conductors are introduced solely to connect to the equipment connected to power-limited fire alarm circuits or to other circuits controlled by the fire alarm system to which the other conductors in the enclosure are connected. If the conductors must enter an enclosure that is provided with a single opening, they shall be permitted to enter through a single fitting (such as a tee) provided the conductors are separated from the conductors of the other circuits by a continuous and firmly fixed nonconductor, such as flexible tubing.

(2) In Hoistways. Power-limited fire alarm circuit conductors shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing in hoistways.
Exception: As provided for in Section 620-21 for elevators and similar equipment.

(3) Other Applications. Power-limited fire alarm circuit conductors shall be separated at least 2 in. (50.8 mm) from conductors of any electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits.

Exception No. 1: Where either (1) all of the electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductors or (2) all of the power-limited fire alarm circuit conductors are in raceway or in metal-sheathed, metal-clad, nonmetallic-sheathed, or Type UF cables.

Exception No. 2: Where all of the electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuit conductors are permanently separated from all of the power-limited fire alarm circuit conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing in addition to the insulation on the wire.

(b) Conductors of Different PLFA Circuits, Class 2, Class 3, and Communications Circuits in Same Cable, Enclosure, or Raceway.

(1) Two or More PLFA Circuits. Cable and conductors of two or more power-limited fire alarm circuits, communications circuits, or Class 3 circuits shall be permitted in the same cable, enclosure, or raceway.

(2) Class 2 Circuits with PLFA Circuits. Conductors of one or more Class 2 circuits shall be permitted within the same cable, enclosure, or raceway with conductors of power-limited fire alarm circuits, provided that the insulation of the Class 2 circuit conductors in the cable, enclosure, or raceway is at least that required by the power-limited fire alarm circuits.

(3) Low Power Network-Powered Broadband Communications Cables and PLFA Cables. Low power network-powered broadband communications circuits shall be permitted in the same enclosure or raceway with PLFA cables.

(c) Support of Conductors. Power-limited fire alarm circuit conductors shall not be strapped, taped, or attached by any means to the exterior of any conduit or other raceway as a means of support.

(d) Conductor Size. Conductors of No. 26 shall only be permitted where spliced with a connector listed as suitable for No. 26 to No. 24 or larger conductors that are terminated on equipment or where the No. 26 conductors are terminated on equipment listed as suitable for No. 26 conductors. Single conductors shall not be smaller than No. 18.

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. This proposal amends the separation rules between circuits to provide appropriate separation from these new high-power communications circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3248)

16- 134 - (760-54(a) Exception No. 1): Accept
SUBMITTER: Robert L. Hughes, Chattanooga, TN
RECOMMENDATION: Revise text to read as follows:

(a) Separation from Electric Light, Power, Class 1, NPLFA, and Medium Power Network-Powered Broadband Communications Circuit Conductors.

(1) In Cables, Compartments, Enclosures, Outlet Boxes, or Raceways. Power-limited circuit cables and conductors shall not be placed in any cable, cable tray, compartment, enclosure, outlet box, raceway, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm circuit conductors, or medium power network-powered broadband communications circuits.

Exception No. 1: Where the conductors of the electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuit conductors are separated by a barrier from the power-limtied fire alarm circuits. In enclosures or cable tray, power-limited fire alarm circuits shall be permitted to be installed in a raceway or in a continuous nonconductor, such as a porcelain tube or flexible tubing within the enclosure or cable tray to separate them from Class 1, electric light, power, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits.

SUBSTANTIATION: Cable tray was added to 760-54(a) in the 1999 NEC. Making this revision to Exception No. 1 will better align Section (1) and Section (3) and still maintain the intent of adding cable tray to the Article.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #497)

16- 135 - (760-54(a)(1) Exception No. 2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 760-54(a)(1) Exception No. 2(a) - change "0.25 in. (6.35 mm" to "6.35 mm (0.25 in.)."
760-54(a)(1) Exception No. 2(b)(1) - change "0.25 in. (6.35 mm)" to "6.35 mm (0.25 in.)"
The CMP should consider rounding to "6 mm (0.25 in.)" in both instances if safety would not be compromised.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since the dimensions specify minimum values for safety.
PANEL ACTION: Accept in Principle.
In the submitter's recommended text revise "6.35 mm (0.25 in.)" to "6 mm (0.25 in.)."
PANEL STATEMENT: The Panel has accepted the TCC suggestion to round to "6 mm (0.25 in.)" and has included in the panel action text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2776)

16- 136 - (760-54(a)(4)): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Add new text as follows:
Raceways or cable trays containing fire alarm circuits shall not contain any pipe, tube, or equal for steam, water, air, gas drainage, or any service other than electrical.
SUBSTANTIATION: There presently is no reference in Article 760 that prohibits this practice.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 16-70. This proposal deals with the same issues as Proposal 16-70 and is rejected for the same reasons.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #643)

16- 137 - (760-54(b)(3)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Renumber 760-54(b)(3) to 760-54(b)(5) and add:
(3) Communications Circuits with PLFA Cables. Communications circuits shall be permitted in the same enclosure or raceway with PLFA cables.
(4) Community antenna television and radio distribution circuits with PLFA Cables. Community antenna television and radio distribution systems shall be permitted in the same enclosure or raceway with PLFA cables.
SUBSTANTIATION: The title of 760-54(b) includes communications circuits. Apparently they were left out in error.
PANEL ACTION: Accept in Principle.
Revise and renumber 760-54(b)(3) to 760-54(b)(5) and add:
(3) Communications Circuits with PLFA Circuits. Communications circuits shall be permitted in the same enclosure or raceway with PLFA circuits.
(4) Community antenna television and radio distribution circuits with PLFA Circuits. Community antenna television and radio distribution cables shall be permitted in the same enclosure or raceway with PLFA circuits."
In addition revise the new section (5) to replace the word "cables" with "circuits."
PANEL STATEMENT: The wording changes have been made for consistency and clarity.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1003)

16- 138 - (760-54(c)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Power-limited fire alarm circuit conductors shall not be strapped, taped, or attached by any means to the exterior of any ~~conduit or other~~ raceway or cable as ~~a~~ the required means of support.
Exception: Where installed in accordance with 760-6 attachment to an approved service mast in accordance with Exception No. 2 for Section 800-10(b) shall be permitted.
SUBSTANTIATION: Editorial. "Conduit" is superfluous. Cables such as Types AC, MC, MI, NM, SE, etc., should be included. The proposal would not bar bundling or strapping together where it is incidental but not prime support. The exception would correlate Section 760-7 and 800-10(b), Exception No. 2 and remove a perceived conflict.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed exception references 760-6, "Fire Alarm Circuit and Equipment Grounding" and is an inappropriate reference for attachments to a service mast.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1131)

16- 139 - (760-54(e) (New)): Accept in Principle in Part
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Insert a new Section 760-54(e) as follows:
(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed.
Exception: Type FPLP-50 cables shall not be required to be removed.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: See my proposal for Section 800-52(b).
PANEL ACTION: Accept in Principle in Part.
The part being rejected is the recommendation to add the exception. The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the exception. There is inadequate justification to leave any debris (e.g. abandoned cable).
The remaining part of the proposal is accepted in principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-144.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1

EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3210)

16- 140 - (760-54(e) (New)): Accept in Principle in Part
SUBMITTER: S. E. Egesdal, Honeywell Inc.
RECOMMENDATION: Insert a new Section 760-54(e) as follows:
(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to acccumulate. Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed.
Exception: Type FPLP-50 cables shall not be required to be removed.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with Section 300-21.
The proposed Fine Print No.1 Note was copied from the first sentence of the Fine Print Note in Section 300-21. It assists installers in locating fire stop information.
Cables installed in plenums (other space used for environmental air) are often abandoned, rather than removed, when no longer in use. Consequently, there may exist layer upon layer of abandoned cable in a hung ceiling as communications systems are changed and modernized. Some of this abandoned cable may be nonplenum cable that was installed before plenum cable requirements were in place. These accumulations of abandoned cables serve no useful purpose and unnecessarily increase the potential fire load. The wording of the proposed prohibition on allowing abandoned cables to accumulate is based on NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment, Section 4-2.4 that states "Abandoned cables shall not be allowed to accumulate. Cables not identified for future use shall be removed."
This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only accumulations of abandoned cable, thus avoiding a burdensome requirement, which would require the removal of insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cable that is in place, plenum cable as well as nonplenum cable that was installed before the plenum cable requirements were in the code. The proposed second sentence, Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed, deals with already abandoned cable. The NEC requirements for plenum cable were first promulgated in the 1975 NEC, consequently, abandoned cables in older buildings often include unlisted cable along with listed plenum cable.
Other sections of the NEC require the removal of abandoned wiring.
Article 354 — Underfloor Raceways, Section 354-7. Discontinued Outlets.
Article 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets.
Article 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets.
Article 305 — Temporary Wiring, Section 305-3(d). Time Constraints.
(d) Removal.
Exempting Type FPLP-50, which is a plenum cable that is also listed as limited combustible with a smoke developed rating of less than 50, correlates with NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. Correlating with NFPA 90A acknowledges that the NFPA Standards Council has assigned primary responsibility for fire protection of plenums to NFPA 90A. The basic requirement for materials in a plenum in NFPA 90A is that the materials either be noncombustible or limited combustible with a smoke developed rating of less than 50.
PANEL ACTION: Accept in Principle in Part.
The part being rejected is the recommendation to add the exception. The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the exception. There is inadequate justification to leave any debris (e.g. abandoned cable).
The remaining part of the proposal is accepted in principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-144.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3230)

16- 141 - (760-54(e) (New)): Accept in Principle
SUBMITTER: Hallie Smith-Petee, The Geon Co.
RECOMMENDATION: Insert a new Section 760-54(e) as follows:
(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts,plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.
SUBSTANTIATION: See Substantiation for Section 800-52(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-144.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3625)

16- 142 - (760-54(e) (New)): Accept in Principle
SUBMITTER: David B. Kiddoo, AlphaGary Corp.
RECOMMENDATION: Insert a new Section 760-54(e) as follows:
(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, ventilation ducts or air-handling plenums shall be made so that the possible spread of fire or fire resistant-rated walls, partitions, floors or ceilings shall be firestopped using approved methods to maintain the fire resistant rating. Abandoned cables in these spaces, shafts, ducts and plenums shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in these spaces, shafts, ducts, plenums, and other space used for environmental air, shall be removed.
FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
FPN No. 2: Definition of acceptable cable fire performance in various applications are described in Section 760-71.
SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned

cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-144 which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3966)

16- 143 - (760-54(e) (New)): Accept in Principle
SUBMITTER: Hallie Smith-Petee, The Geon Co.
RECOMMENDATION: Insert a new Section 760-54(e) to read as follows:
(e) Spread of Fire or Products of Combustion: Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be so made that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts, plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.
SUBSTANTIATION: See Substantiation for Section 800-52(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-144.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #4051)

16- 144 - (760-54(e)): Accept in Principle
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Revise Section 760-54(e) as follows:
(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.
Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed where practicable.
FPN : Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: BICSI members have been extensively involved with the design and installation of telecommunications cabling. Technology changes have resulted in newer high performance cabling being installed in support of those technologies. We have observed excessive accumulations of abandoned cabling adding to the fuel loading within plenum spaces. This proposal is offered to the NFPA to help reduce the fuel load within these plenum areas.
Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with section 300-21.
The proposed fine print No. 1 note was copied from the first sentence of the fine print note in section 300-21. It assists installers in locating firestop information.
Acceptance of this proposal will result in cable removal being included in the scope of the installation of a new communications and data system. The contractor will remove the old cable before installing the new system.
Acceptance of this proposal will result in many BICSI members specifying abandoned cable removal within the scope of the installation of new communications and data systems.
In two separate proposals, we have offered definitions for "abandoned cable" and "excessive accumulation of abandoned cables".
This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only excessive accumulations of abandoned cable, thus avoiding a burdensome requirement of removing insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cable that is in place, plenum cable as well as non-plenum cable that was installed before the plenum cable requirements were in the Code. The proposed second sentence, Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed, where practicable, deals with already abandoned cable. The wording of "where practicable" aid the situations where cable may be intertwined and cannot be removed without disruption of active services. The NEC requirements for plenum cable were first promulgated in the 1975 NEC, consequently, abandoned cables in older buildings often include unlisted cable along with listed plenum cable.
Other sections of the NEC require the removal of abandoned wiring.
ARTICLE 354 — Underfloor Raceways, Section 354-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.
ARTICLE 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.
ARTICLE 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case of abandoned outlets on loop wiring, shall be allowed in raceways.
ARTICLE 305 — Temporary Wiring, Section 305-3(d). Time Constraints, (d) Removal. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.
PANEL ACTION: Accept in Principle.
Revise 760-3(a) to read as follows:
"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables not intended for future use shall not be permitted to remain."
PANEL STATEMENT: The revision meets the intent of the submitter. It is more appropriate to place the requirement in 760-3(a) which addresses the subject.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:
BRUNSSEN: See my Comment on Affirmative Vote on Proposal 16-80.
DORNA: The revised wording for 760-3(a) should read as follows:
"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall not be permitted to remain."
The use of the phrase "not intended for future use" is redundant. The definition of "abandoned cable" has this phrase in the definition. To restate this phrase would be grammatically incorrect.
JOHNSON: See my Comment on Affirmative on Proposal 16-80.
KAHN: See my Comment on Affirmative on Proposal 16-80.
WIERENGA: The revised wording for 760-3(a) should read as follows:
"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall ~~not~~ be removed.
The use of the phrase "not intended for future use" is redundant because it is already included in the definition of "abandoned cable". The deletion of the words "not" and "permitted to remain" can be readily stated by use of positive code language using the word "removed".
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1218)

16- 145 - (Table 760-61): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Table 760-61. Cable Uses and Permitted Substitutions as shown on the next page:

Table 760-61. Cable Uses and Permitted Substitutions

			Permitted Substitutions	
Cable Type	**Use**	**References**	**Multiconductor**	**Coaxial**
FPLP	Power-limited fire alarm plenum cable	760-61(a)	CMP-50, CMP	MPP-50, MPP
FPLR	Power-limited fire alarm riser cable	760-61(b)	CMP-50, CMP, FPLP-50, FPLP, CMR	MPP-50, MPP, MPR
FPL	Power-limited fire alarm cable	760-61(c)	CMP-50, CMP, FPLP-50, FPLP,CMR, FPLR, CMG, CM	MPP-50, MPP, MPR, MPG, MP

SUBSTANTIATION: If my proposal to establish a new section 760-71(e) is accepted, a new section is added and the sections will be renumbered. The new section creates a new cable type, Type FPLP-50. This proposal correlates Table 760-61 with those proposed changes.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation as follows:
Strike all references to MPP-50 proposed Table 760-61.
PANEL STATEMENT: The revision is made to reflect the panel action on Proposal 16-232.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:
KAUFMAN: In addition to revising Table 760-61, Figure 760-61 should be revised in order to illustrate the changes in Table 760-61.

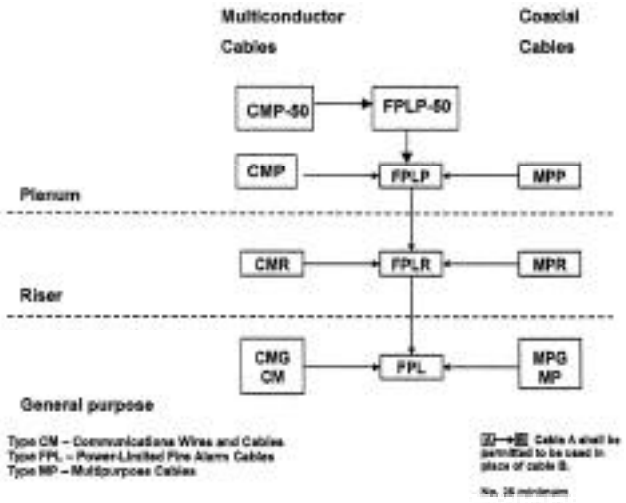


Figure 760-61. Cable Substitution Hierarchy

EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1813)

16- 146 - (760-61(a), Exception): Accept
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: Delete "FPLP".
SUBSTANTIATION: Though technically correct, including "FPLP" in the Exception has caused confusion.
The Panel has been inconsistent in its wording for this Exception in other Articles under its jurisdiction. In 725-61(a), the Exception applies to all listed wires and cables. In 770-53(a), the Exception omits reference to "OFNP" cables, which is consistent with the recommendation in this Proposal. If the Panel intends for these requirements to be different, an explanation is needed to clarify the rationale for the user.
This Proposal is being submitted at the request of an AHJ. After comparing the wording in all the related Articles, he concluded that the intent in this Article was to have all cables (including plenum cable) installed in ducts, plenums, and other spaces used for environmental air be installed in compliance with Section 300-22.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1769)

16- 147 - (760-61(d), FPN, Figure 760-61, Table 760-61): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: In 760-61(d) FPN, delete "...multipurpose cables (Types MPP, MPR, MPG, MP) and....".
In Figure 760-61, delete all entries in Coaxial cables column and horizontal arrows directed toward FPL type cables, and revise the headers for both the CM and FPL columns to read "Multiconductor and Coaxial cables." Delete the line "Type MP-Multipurpose cables (coaxial cables only)."
In Table 760-61, delete all of the "Coaxial" column under Permitted Substitutions and add "and Coaxial" to the heading of the "Multiconductor" column under Permitted Substitutions.
SUBSTANTIATION: See substantiation for my Propsal for 800-51(g), et al.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 16-223.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3632)

16- 148 - (760-71): Reject
SUBMITTER: David B. Kiddoo, AlphaGary Corp.
RECOMMENDATION: With regards to Section 760-71, "Limited Combustion Cable" or "Permanent Plenum Cable" should not be accepted as an additional Listing based on the lack of testing definition, the absence of cable Listing capability, and the proven adequacy of an integrated and enhanced NFPA 262 test method. NFPA 262 differentiates cables as to their fire performance to provide acceptable values for smoke generation and flame travel distance.
Propoents of "Limited Combustible Cable" or "Permanent Plenum Cable" have been actively soliciting support from cable market trade organizations, Code-Making Panel 16 Members or Alternates, cable manufacturers, etc. for a proposal to include a new paragraph in the Section to provide for a new Type of cable based on the definitions of "limited combustibility" and "smoke developed index" per the definitions in NFPA 90A. These definitions ONLY govern construction products for the installation of air conditioning and ventilating systems. The NFPA 255 and NFPA 259 fire test methods being promoted are NOT applicable to evaluate the fire hazard nor the geometries and material synergies in cables as they pertain to fire performance.
As these proposals have been made public through this solicitation for support, I wish to respond at this time to say that there is no safety record or fire performance issue necessitating any additional cable

type of ruse in plenum cable applications. The inclusion of this new Type of cable is partially as a means to provide for an Exception from the proposed requirement in Section 800-52 to remove accumulations of abandoned cable. "Limited Combustible Cable" or "Permanent Plenum Cable" definitions seen in these proposals for a new cable Type are NOT based on any test method incorporating an actual cable fire hazard evaluation. Without adequate test methods and with the current status of the NFPRF "Permanent Plenum Cable Project", NO cables have been shown to meet the requirements proposed. The data generated in this Project have NOT been related to any appropriate fire hazard evaluation and should NOT be used to establish ANY relative cable fire performance comparisons.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop

proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259 / NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not conform to section 4-3.3(c) of the Regulations Governing Committee Projects. The submitter has made other proposals on this subject that meet the Regulations Governing Committee Projects. The issues raised in this proposal were addressed when the other proposals were considered.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3211)

16- 149 - (760-71(b) (New)): Accept

Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA 90A Technical Committee on Air Conditioning for Comment.

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: Renumber sections as follows:

Existing section	Renumbered section
760-71(e)	760-71(f)
760-71(f)	760-71(g)
760-71(g)	760-71(h)
760-71(h)	760-71(i)
760-71(i)	760-71(j)

Add a new Section 760-71(e):

(e) Limited Combustible Cable. Type FPLP cables that are also listed as being limited combustible and having a maximum smoke developed index of 50 shall be permitted to be listed and marked as Type FPLP-50.

FPN No. 1: See NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems for a definition of limited combustible. See NFPA 255-2000, Standard Method of Test of Surface Burning Characteristics of Building Materials for a definition of the smoke developed index.

FPN No. 2: For further information on the requirements for materials in ceiling cavity and raised floor plenums, see NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems, Sections 2-3.10.1 Ceiling Cavity Plenum and 2-3.10.5 Raised Floor Plenum.

SUBSTANTIATION: The NFPA Standards Council has assigned primary responsibility for the fire protection of plenums to the Technical Committee on Air Conditioning. That technical committee is responsible for NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. The NFPA 90A (1996) requirements for ceiling cavity and raised floor plenums for electrical wires and cables are shown below:

2-3.10 Plenums.

2-3.10.1 Ceiling Cavity Plenum. The space between the top of the finished ceiling and the underside of the floor or roof above shall be permitted to be used to supply air to, or return or exhaust air from, the occupied area, provided that the following conditions are met:

(a) All materials exposed to the airflow shall be noncombustible or limited combustible and have a maximum smoke developed index of 50.

Exception No. 1: The following materials shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft (1.5 m) or less when tested in accordance with the specified test method:

(a) Electrical wires and cables. NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables.

2-3.10.5 Raised Floor Plenum. The space between the top of the finished floor and the underside of a raised floor shall be permitted to be used to supply air to, or return exhaust air from, or return and exhaust air from, the occupied area, provided that the following conditions are met:

(a) All materials exposed to the airflow shall be noncombustible or limited combustible and shall have a maximum smoke developed index of 50.

Exception No. 1: The following materials shall be permitted in the raised floor plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft (1.5 m) or less when tested in accordance with the specified test method:

(a) Electrical wires and cables. NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables.

Establishing Types CL2P-50 and CL3P-50 cables is a step toward correlating NFPA 70, the National Electrical Code and NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. Types CL2P-50 and CL3P-50 cables qualify for use by meeting the basic rule for plenum materials, i.e., limited combustible and a smoke developed rating below 50, and meeting the flame spread and smoke requirements of the NFPA 90A Exception which are identical to those in the NEC fine print notes.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1518)

16- 150 - (760-71(d), FPN): Accept

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Change NFPA 262-1994 to NFPA 262-1999.

SUBSTANTIATION: NFPA 262 has been revised.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1216)

16- 151 - (760-71(e)): Accept in Principle

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Renumber sections as follows:

Existing section Renumbered section

760-71(e) 760-71(f)

760-71(f) 760-71(g)

760-71(g) 760-71(h)

760-71(h) 760-71(i)

760-71(i) 760-71(j)

Add a new section 760-71(e).

(e) Limited Combustible Cable. Type FPLP cables that are also listed as being limited combustible and having a maximum smoke developed index of 50 shall be permitted to be listed and marked as Type FPLP–50.

FPN No. 1: See NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems for a definition of limited combustible. See NFPA 255-2000, Standard Method of Test of Surface Burning Characteristics of Building Materials for a definition of the smoke developed index.

FPN No. 2: For further information on the requirements for materials in ceiling cavity and raised floor plenums, see NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems, Sections 2-3.10.1 Ceiling Cavity Plenum and 2-3.10.5 Raised Floor Plenum.

SUBSTANTIATION: See my proposal for section 800-51(h) to establish limited combustible cables.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-149.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1217)

16- 152 - (Table 760-71(i)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Table 760-71(i). Cable Markings as follows:

Table 760-71(i). Cable Markings

Cable Marking	Type	Listing References
FPLP	Power-limited fire alarm plenum cable	760-71(d) and (i)
FPLP-50	Limited combustible power-limited fire alarm plenum cable	760-71(e) and (j)
FPLR	Power-limited fire alarm riser cable	760-71(f) and (j)
FPL	Power-limited fire alarm cable	760-71(g) and (j)

The note and fine print note are unchanged.
SUBSTANTIATION: If my proposal to establish a new section 760-71(e) is accepted, a new section is added and the sections will be renumbered. The new section creates a new cable type, Type FPLP-50. This proposal correlates Table 760-61 with those proposed changes.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation as follows:
"Change the order in Table 760-71(i) to show the row for FPLP-50 cable at the top row of the table."
PANEL STATEMENT: The most fire-resistant cable should be shown on the top.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

ARTICLE 770 — OPTICAL FIBER CABLES AND RACEWAYS

(Log #1523)

16- 168 - (770): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Renumber Article 770 to Article 870.
SUBSTANTIATION: Optical fiber cable installations are predominantly communications installations, hence this article belongs in Chapter 8.
PANEL ACTION: Reject.
PANEL STATEMENT: There are applications other than communications. In accordance with 90-3, special applications involving occupancies, equipment and conditions belong in Chapters 5, 6 and 7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2987)

16- 153 - (770-2): Accept in Principle
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:
Optical Fiber Raceway. A raceway designed for enclosing and routing nonconductive <u>and conductive</u> optical fiber cable.
SUBSTANTIATION: This proposal revises the aforementioned sections to all Conductive Optical Fiber Cables to be used in Optical Fiber Raceways. Conductive cables are cables containing noncurrent-carrying conductive members [see 770-5(b)]. Optical Fiber/Communication Raceways are listed raceways used in plenum, riser, and general purpose areas of a building per Articles 770 and 800. These listed raceways are used in Article 800 with communication cables. The communication cables may have a conductive sheathing that cover the conductor assembly that may include one or more metallic members, strength members, or jackets. Conductive cables, per Article 800, have been used in Optical Fiber/Communication Raceways satisfactorily and without incident. In addition, per Article 770-53(c), General Purpose Raceways are currently allowed to used with conductive general-purpose cabling.
See companion proposal 770-53(a) and (b).
PANEL ACTION: Accept in Principle.
Change the definition to read:
"Optical Fiber Raceway. A raceway designed for enclosing and routing listed optical fiber cables."
PANEL STATEMENT: Optical fiber raceway is intended for use with optical fiber building cable. It is not intended for use with unlisted (non-fire-resistant) outside plant cable. The panel agrees with the submitter that optical fiber raceway should be permitted to be used with conductive optical fiber cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #4041)

16- 154 - (770-2-Abandoned Cable (New)): Accept
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add a new definition to read as follows:
<u>Abandoned Cable. Cable that is neither terminated at both ends, at a connector or other equipment, nor identified for future use with a tag.</u>
SUBSTANTIATION: The definition of abandoned cable is needed to accompany the proposals that require removal of abandoned cable. This definition reflects industry practices.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
DORNA: The definition of "Abandoned Cable" should be the same here as what we accepted in Proposal 16-273. It should be "Cable that is neither terminated at ~~both ends, at a connector or other~~ equipment, nor identified for future use with a tag." (This is the same wording as Proposal 16-273.)
The reason we took out the reference to connectors in Proposal 16-273 is because CATV cable usually has connectors attached. It was our concern that CATV cables would have connectors attached and then would not fall under the proposed original definition and therefore would not have to be removed if abandoned. I believe this also could be the case with cables in this Article 770. These cables could also have connectors attached, and therefore would not fall under the definition the panel had accepted in principal. If we make the definition the same as I have suggested above (the same as 16-273) then it will make it irrelevant on whether the cable has connectors or not. I can foresee someone using the fact that the cable has a connector on it, therefore it does not fall under "abandoned cable" and does not need to be removed.
JOHNSON: The provision for allowing cables with connectors still attached to be considered abandoned may not meet with the proposal's intent. Wording used in Proposal 16-273 is a more acceptable choice. I am in agreement with Mr. Dorna's comments on this proposal.
COMMENT ON AFFIRMATIVE:
BRUNSSEN: See my Comment on Affirmative Vote on Proposal 16-32.
KAHN: See my Comment on Affirmative on Proposal 16-32.

(Log #4046)

16- 155 - (770-2- Excessive Accumulation of Abandoned Cables (New)): Reject

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add a new definition to read as follows:

Excessive Accumulation of Abandoned Cables. When the number of abandoned cables is greater than 1/3 of the total number of cables within a fire-containment zone.

SUBSTANTIATION: After the concept of plenum cables was introduced into the 1975 NEC, Underwriters Laboratories initially listed plenum cables by comparing the smoke production of plenum cables with the smoke production of conventional cables of the same physical design (but not plenum grade materials) in conduit. Plenum cables (not in conduit) were tested and compared with an equal number of conventional cables in conduit. It was assumed that the plenum cables were a replacement for conventional cables and that in case of a fire the amount of smoke would be reduced because of the lower smoke production of plenum cables. It was not anticipated that plenum cables would be abandoned. Since conventional cables in conduit were deemed to be acceptable the smoke from these cables is the benchmark for comparison and a fire involving an excessive amount of abandoned cables could emit excessive amount of smoke. Until research better defines what amount of abandoned cable might be excessive, allowing up to 1/3 excess of abandoned cables is prudent.

PANEL ACTION: Reject.

PANEL STATEMENT: The term is not used. The proposal that introduced this term was modified to eliminate the term.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1524)

16- 156 - (770-3): Accept in Principle in Part

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Delete Section 770-3.

SUBSTANTIATION: Section 770-3 violates the scope of Article 770. Article 770 scope states "The provisions of this article apply to the installation of optical fiber cables and raceways. This article does not cover the construction of optical fiber cables and raceways." Section 770-3 covers "circuits and equipment."

Section 770-3(a) refers to Section 300-21 which covers "electrical installations." Article 770 does not cover electrical installations. Acceptance of my proposal for Section 770-52(d) (new) will apply the equivalent requirements.

Section 770-3(b) is redundant. Section 770-53(a) has the same requirements.

PANEL ACTION: Accept in Principle in Part.

In 770-3 of the code delete the words "Circuits and equipment" and replace them with "Optical fiber cables and raceways."

PANEL STATEMENT: The part to delete 770-3 is rejected. This section is still needed and was amended in Proposal 16-176.

The part accepted in principle is to correct the language of 770-3 in accordance with the submitter's substantiation.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1130)

16- 157 - (770-3(a)): Reject

Note: The Technical Correlating Committee understands that the reference to "770-54(e)" in the Panel Statement should be to "770-52(d)."

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Revise Section 770-3(a) as follows:

(a) Spread of Fire or Products of Combustion. See Sections 300-21 and 770-52(d).

SUBSTANTIATION: This proposal correlates with my proposal for Section 770-52(d).

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter's recommendation for 770-54(e) was accepted in principle. Hence this correlating proposal is not needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #3047)

16- 158 - (770-6): Reject

SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit

RECOMMENDATION: Revise text as follows:

Raceways for Optical Fiber Cables. The raceway shall be either:

(a) A ~~of a~~ type permitted in Chapter 3 and installed in accordance with Chapter 3, or ~~.~~

(b) A listed nonmetallic optical fiber raceway and associated fittings both of which comply with Sections 770-51(e), (f), or (g) and 770-53(a) or (b), as applicable, installed in accordance with Article 331.

Exception No. 1: The thermal barrier required in Section 331-3(2) shall not be required for plenum-rated optical fiber raceway.

Exception No. 2: Unlisted underground or outside plant construction plastic innerduct shall be terminated at the point of entrance.

~~Listed nonmetallic optical fiber raceway identified as general purpose, riser, or plenum optical fiber raceway in accordance with Section 770-51 and installed in accordance with Sections 331-7 through 331-14, where the requirements applicable to electrical nonmetallic tubing shall apply. Unlisted underground or outside plant construction plastic innerduct shall be terminated at the point of entrance.~~

~~FPN: For information on listing requirements for optical fiber raceways, see Standard for Optical Fiber Raceways, UL 2024.~~ (Move this FPN to Section 770-51 – after (g) to apply to (e), (f), and (g).)

(The last two paragraphs of the section to remain unchanged.)

SUBSTANTIATION: The revised text in the main paragraph clarifies the requirements for use of optical fiber raceway, moves it from an exception, and is more user-friendly. Article 331 in total should apply to this raceway. An exception has been made for the plenum-rated type until such time that the NFPA 90A Committee and others resolve how much of these plenum-rated products is too much. Fittings for the nonmetallic raceways need to meet the same test requirements as the raceway. This is a companion proposal to changes suggested for 770-51 and 770-53 to provide more user-friendly text and to better correlate with the actual requirements of Section 300-22. The FPN has been moved to Section 770-51 as it contains listing requirements and is a more appropriate location.

PANEL ACTION: Reject.

PANEL STATEMENT: The submitter has provided no substantiation why all the requirements of Article 331 should apply.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1539)

16- 159 - (770-7): Accept in Principal

Note: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting of a similar proposal 16-192. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable." This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Revise 770-7 as follows:

770-7. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to equipment shall not be denied by an excess accumulation of cables ~~that prevents~~ sufficient to prevent the removal of panels, including suspended ceiling panels.

SUBSTANTIATION: Section 770-7 may be misinterpreted to mean that cables may not be placed directly on suspended ceilings. While the 1999 National Electrical Code Handbook reference to the commentary following Section 725-5 emphasizes "excess accumulation" in the interpretive text, Figures 725-2 and 725-3 lead the reader to conclude that no cables are permitted to rest directly on the suspended ceiling. This was not the intent of CMP 16 when 770-7 was introduced into the 1993 NEC. At that time CMP 16 stated in response to a similar proposal to Article 725 (1992 TCD, Comment 16-18) that the proposed requirement"... would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." The proposed revision emphasizes that it is an excessive accumulation of cable that is of concern. A limited amount of cabling laid directly on a suspended ceiling is permitted, will not deny access to equipment, and does not present an unsafe working environment. This is a companion proposal and is intended to correlate with 725-5, 760-5, 800-5, 820-5 and 830-6.

PANEL ACTION: Accept in Principle.

Revise 770-7 to read as follows:

"770-7. Access to Electrical Equipment Behind Panels Designed to Allow Access

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems.

Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1.In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2.In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."

PANEL STATEMENT: The revised text satisfies the intent of the original recommendation in that it allows some cabling of a limited quantity above ceiling tile but not an excessive amount, which would interfere with accessibility.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

EGEDSAL: See my Explanation of Negative Vote on Proposal 16-192.

COMMENT ON AFFIRMATIVE:

BRUNSSEN: I concur with the panel action in providing relief for a limited amount of after-construction optical fiber cables to be placed directly on the suspended ceiling tiles. However, proposed Section 770-7(b)(2), as presently written, is confusing and could be interpreted as permitting a total of only three unsupported cables. The intent of the panel was that up to a maximum of three unsupported cables may be routed across each and every ceiling tile. Revising 770-7(b)(2) to state: "...permissible to install a maximum <u>of</u> three unsupported cables on top of ~~any one~~ <u>each</u> ceiling tile, <u>i.e., up to three cables are permitted to lay on a ceiling tile.</u>" would clarify the intent. Note that the word "of" is inserted and is missing in the original text.

(Log #CP1604)

16- 159a - (770-8): Accept

SUBMITTER: CMP 16

RECOMMENDATION: Revise text to read as follows:

"Mechanical Execution of Work. Optical fiber cables shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceiling and sidewalls shall be supported by the structural components of the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d)."

Also, delete the Fine Print Note.

SUBSTANTIATION: This proposal provides additional rules for the mechanical execution of the work. Since there are additional rules, the fine print note is not necessary. This provides parallel requirements to those used in Articles 640, 725, 760, 800, 820, and 830.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

JOHNSON: See my Explanation of Negative Vote on Proposal 16-2a.

(Log #3048)

16- 160 - (770-8): Reject

SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit

RECOMMENDATION: Revise to read as follows:

770-8. Mechanical Execution of Work. Optical fiber cables <u>and raceways</u> shall be installed in a neat and workmanlike manner. Cables shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. <u>Cable and raceway installations shall comply with Sections 300-11(a)(1) and (2).</u>

The FPN remains unchanged.

SUBSTANTIATION: Raceways need to be included in this section. Also, it should be clear that optical fiber cables and raceways are not to be supported by the ceiling or ceiling grid as detailed in Section 300-11.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 770-6 provides installation rules for raceways.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4023)

16- 161 - (770-8, FPN): Reject

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Revise the FPN to read: "One way to determine accepted industry practice is to refer to nationally recognized standards such as Commercial Building Telecommunications Cabling Standard, ANSI/EIA/TIA 568-A-1995; Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA/EIA 569-A-1997; and Residential ~~and Light Commercial~~ Telecommunications Cabling ~~Wiring~~ Standard, ~~ANSI/EIA/TIA 570-1991~~ ANSI/EIA/TIA 570-A-1999, <u>ANSI/NECA/BICSI 568</u> or other ANSI-approved installation standards."

SUBSTANTIATION: A revision to the standard number and the title for residential cabling has been updated. Another standard is currently under review that will be focused at the installation of telecommunications cabling and connectors and will become an ANSI standard within the next year.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 770-8 has been revised to remove the FPN and provide specific installation requirements. A FPN is no longer necessary. Refer to the panel action and statement on Proposal 16-159(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1209)

16- 162 - (Table 770-50): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Table 770-50. Cable Marking as follows:

Table 770-50. Cable Markings

Cable Marking	Type	Reference
OFNP-50	Limited combustible nonconductive optical fiber plenum cable	770-51(b) and 770-53(a)
OFNP	Nonconductive optical fiber plenum cable	770-51(a) and 770-53(a)
OFCP-50	Limited combustible conductive optical fiber plenum cable	770-51(b) and 770-53(a)
OFCP	Conductive optical fiber plenum cable	770-51(a) and 770-53(a)
OFNR	Nonconductive optical fiber riser cable	770-51(c) and 770-53(b)
OFCR	Conductive optical fiber riser cable	770-51(c) and 770-53(b)
OFNG	Nonconductive optical fiber general-purpose cable	770-51(d) and 770-53(c)
OFCG	Conductive optical fiber general-purpose cable	770-51(d) and 770-53(c)
OFN	Nonconductive optical fiber general-purpose cable	770-51(e) and 770-53(c)
OFC	Conductive optical fiber general-purpose cable	770-51(e) and 770-53(c)

The fine print notes are unchanged.
SUBSTANTIATION: If my proposal to establish a new section 770-51(b) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type OFNP-50 and Type OFCP-50. This proposal correlates section 770-51 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #499)

16- 163 - (770-50 Exception No. 1): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 770-50 Exception No. 1 - change "50 ft (15.2 m)" to "15 m (50 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1208)

16- 164 - (770-51): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise section 770-51 as follows:
Optical fiber cables shall be listed in accordance with (a) through (e), and optical fiber raceways shall be listed in accordance with (f) through (h).
SUBSTANTIATION: If my proposal to establish a new section 770-51(b) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type OFNP-50 and Type OFCP-50. This proposal correlates section 770-51 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3970)

16- 165 - (770-51): Reject
SUBMITTER: David B. Kiddoo, AlphaGary Corp.
RECOMMENDATION: With regards to Section 770-51, "Limited Combustion Cable" or "Permanent Plenum Cable" should not be accepted as an additional Listing based on the lack of testing definition, the absence of cable Listing capability, and the proven adequacy of an integrated and enhanced NFPA 262 test method. NFPA 262 differentiates cables as to their fire performance to provide acceptable values for smoke generation and flame travel distance.
Proponents of "Limited Combustible Cable" or "Permanent Plenum Cable" have been actively soliciting support form cable market trade organizations, Code-Making Panel 16 Members or Alternates, cable manufacturers, etc. for a proposal to include a new paragraph in this section to provide for a new type of cable based on the definitions of "limited combustibility" and "smoke developed index" per the definitions in NFPA 90A. These definitions ONLY govern construction products for the installation of air conditioning and ventilating systems. The NFPA 255 and NFPA 259 fire test methods being promoted are NOT applicable to evaluate the fire hazard nor the geometry's and material synergy's in cables as they pertain to fire performance.
As these proposals have been made public through this solicitation for support, I wish to respond at this time to say that there is no safety record or fire performance issue necessitating any additional cable type for use in plenum cable applications. The inclusion of this new Type of cable is partially as a means to provide for an Exception from the proposed requirement in Section 770-52 to remove accumulations of abandoned cable. "Limited Combustible Cable" or "Permanent Plenum Cable" definitions seen in this proposals for a new cable type are NOT based on any test incorporating an actual cable fire hazard evaluation. Without adequate test methods and with the current status of the NFPRF "Permanent Plenum Cable Project", NO cables have been shown to meet the requirements proposed. The data generated in the Project have NOT been related to any appropriate fire hazard evaluation and should NOT be used to establish ANY relative cable fire performance comparisons.
SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents of the provisions for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments form the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing ruse of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in factor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TCs approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure, that as the TC undertakes to fully and fairly address these issues going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum

This proposal addressed the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function — except perhaps to serve as fuel for some future conflagration.

This proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standard Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Interlek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability for cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometry's and materials/conductor or fiber synergy's as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is partially why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than material tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A, Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulation's will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220 Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirement to removal ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not conform to section 4-3.3(c) of the Regulations Governing Committee Projects. The submitter has made other proposals on this subject that meet the Regulations Governing Committee Projects. The issues raised in this proposal were addressed when the other proposals were considered.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #498)

16- 166 - (770-51(a), FPN;770-51(c), FPN; 770-51(d), FPN): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 770-51(a) FPN - change "5 ft (1.52 m)" to "1.52 m (5 ft)"
770-51(c) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
770-51(d) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since the values specify a minimum safety level.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1519)

16- 167 - (770-51(a), FPN): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Change NFPA 262-1994 to NFPA 262-1999.
SUBSTANTIATION: NFPA 262 has been revised.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1207)

16- 169 - (770-51(b)): Accept
Note: The Technical Correlating Committee directs that this Proposal be refered to the NFPA 90A Technical Committee on Air Conditioning for Comment.
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Renumber sections as follows:
Existing section Renumbered section
770-51(b) 770-51(c)
770-51(c) 770-51(d)
770-51(d) 770-51(e)
770-51(e) 770-51(f)
770-51(f) 770-51(g)
770-51(g) 770-51(h)
Add a new section 770-51(b).
(b) Limited Combustible Cable. Types OFNP and Types OFCP cables that are also listed as being limited combustible and having a maximum smoke developed index of 50 shall be permitted to be listed and marked as Types OFNP–50 and Types OFCP–50 respectively.
FPN No. 1: See NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems for a definition of limited combustible. See NFPA 255-2000, Standard Method of Test of Surface Burning Characteristics of Building Materials for a definition of the smoke developed index.
FPN No. 2: For further information on the requirements for materials in ceiling cavity and raised floor plenums, see NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems, Sections 2-3.10.1 Ceiling Cavity Plenum and 2-3.10.5 Raised Floor Plenum.
SUBSTANTIATION: See my proposal for section 800-51(h) to establish limited combustible cables.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3049)

16- 170 - (770-51(e), (f), and (g)): Reject
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise to read as follows:
(e) Plenum-Rated Optical Fiber Raceway. Plenum-rated optical fiber raceways shall be listed as having adequate fire-resistant and low smoke-producing characteristics.
(f) Riser Optical Fiber Raceway. Riser optical fiber raceways shall be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.
(g) General-Purpose Optical Fiber Cable Raceway. General-purpose optical fiber cable raceway shall be listed as being resistant to the spread of fire.
FPN: For information on listing requirements for optical fiber raceways, see Standard for Optical Fiber Raceways, UL 2024.
SUBSTANTIATION: In the absolute these raceways should be termed plenum-rated, as they are not actually to be used in plenums (see 300-22(b), but rather only in other spaces used for environmental air (in accordance with Section 300-22(c). The FPN was moved from 770-6 as this appears to be a more appropriate location.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "rated" is not required. It does not add to the clarity of the requirement.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1025)

16- 171 - (770-52): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise 770-52 as shown:
770-52. Installation of Optical Fibers and Electrical Conductors
(a) With Conductors for Electric Light, Power, Class 1, Nonpower-Limited Fire Alarm, ~~or~~ Medium or High Power Network-Powered Broadband Communications Circuits. Optical fibers shall be permitted within the same composite cable for electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits operating at 600 volts or less only where the functions of the optical fibers and the electrical conductors are associated.
Nonconductive optical fiber cables shall be permitted to occupy the same cable tray or raceway with conductors for electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits operating at 600 volts or less. Conductive optical fiber cables shall not be permitted to occupy the same cable tray or raceway with conductors for electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits.
Composite optical fiber cables containing only current-carrying conductors for electric light, power, Class 1 circuits rated 600 volts or less shall be permitted to occupy the same cabinet, cable tray, outlet box, panel, raceway, or other termination enclosure with conductors for electric light, power, or Class 1 circuits operating at 600 volts or less.
Nonconductive optical fiber cables shall not be permitted to occupy the same cabinet, outlet box, panel, or similar enclosure housing the electrical terminations of an electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuit.
Exception No. 1: Occupancy of the same cabinet, outlet box, panel, or similar enclosure shall be permitted where nonconductive optical fiber cable is functionally associated with the electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuit.
Exception No. 2: Occupancy of the same cabinet, outlet box, panel, or similar enclosure shall be permitted where nonconductive optical fiber cables are installed in factory- or field-assembled control centers.
Exception No. 3: In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installation, nonconductive optical fiber cables shall be permitted with circuits exceeding 600 volts.

Exception No. 4: In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons will service the installation, composite optical fiber cables shall be permitted to contain current-carrying conductors operating over 600 volts.

Installations in raceway shall comply with Section 300-17.

(b) With Other Conductors. Optical fibers shall be permitted in the same cable, and conductive and nonconductive optical fiber cables shall be permitted in the same cable tray, enclosure, or raceway with conductors of any of the following:

1. Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725
2. Power-limited fire alarm systems in compliance with Article 760
3. Communications circuits in compliance with Article 800
4. Community antenna television and radio distribution systems in compliance with Article 820
5. Low power network-powered broadband communications circuits in compliance with Article 830

(c) Grounding. Noncurrent-carrying conductive members of optical fiber cables shall be grounded in accordance with Article 250.

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. This proposal amends the separation rules between circuits to provide appropriate separation from these new high-power communications circuits.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #2777)

16- 172 - (770-52(a)(2)): Reject

SUBMITTER: Gregory P. Bierals, Electrical Design Inst.

RECOMMENDATION: Add new text as follows:

Raceways or cable trays containing optical fiber cables shall not contain any pipe, tube, or equal for steam, water, air, gas, drainage, or any service other than electrical.

SUBSTANTIATION: There presently is no reference in Article 770 that prohibits this practice.

PANEL ACTION: Reject.

PANEL STATEMENT: Refer to the panel action and statement on Proposal 16-70. This proposal deals with the same issues as Proposal 16-70 and is rejected for the same reasons.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

COMMENT ON AFFIRMATIVE:

JOHNSON: By definition, fiber optic communication is an optical signal rather than an electrical signal. This proposal, as written, would not allow raceways containing fiber optic cables to carry fiber optic cables.

(Log #1129)

16- 173 - (770-52(d) (New)): Accept in Principle in Part

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Insert a new Section 770-52(d) as follows:

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed.

Exception: Type OFNP-50 and Type OFCP-50 cables shall not be required to be removed.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: See my proposal for Section 800-52(b).

PANEL ACTION: Accept in Principle in Part.

The part being rejected is the recommendation to add the exception. The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the exception. There is inadequate justification to leave any debris (e.g. abandoned cable).

The remaining part of the proposal is accepted in principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-176.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3256)

16- 174 - (770-52(d)): Accept in Principle in Part

SUBMITTER: Allen C. Weidman, Society of the Plastics Industry/Rep. Fluoropolymers Division of The Society of the Plastics Industry

RECOMMENDATION: Insert a new Section 725-54(e) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods to maintain the fire resistance rating. Cables in ducts, plenums, and other spaces used for environmental air, which are not intended for future use shall be removed. Cables marked type CL2PP and type CL3PP are not required to be removed.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: 1. First two (2) sentences were copied from Article 300.21.

2. Fine print note was copied from Article 300.21s fine print note.

3. Cables installed in plenums and other space used for environmental air are very often left in these spaces after they have been removed from service. Therefore, many generations of unused cables can exist in the ceiling voids from previous systems which are no longer in service or intended for future use. There may also be cables, which are over 20 years old, which are not plenum rated cables. These unused cables increase the potential fuel load in plenums and other space used for environmental air.

This concept of removing unused cables, which will not be used in the future, is not a new concept. Other articles of the NEC have similar requirements. See the following Articles:

(a) 305, (b) 354, (c) 356, (d) 358

Also note NFPA 75 has a similar requirement.

Note: Underwriter Laboratories and Intertek (ETL), both are in a position to start listing this new type of plenum cable having of "Limited Combustibility" requirement, also potentially known as "permanent plenum cable, e.g., CL2PP, CL3PP, OFCPP, OFNPP, CMPP, and MPPP. There is a research program in place at FPRF to establish the protocol to list PP cables.

PANEL ACTION: Accept in Principle in Part.

The part being rejected is the recommendation to add the last sentence before the FPN.

PANEL STATEMENT: The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the last sentence before the FPN. There is inadequate justification to leave any debris (e.g. abandoned cable).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3626)

16- 175 - (770-52(d) (New)): Accept in Principle

SUBMITTER: David B. Kiddoo, AlphaGary Corp.

RECOMMENDATION: Insert a new Section 770-52(d) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, ventilation ducts or air-handling plenums shall be made so that the possible spread of fire or fire resistant-rated walls, partitions, floors or ceilings shall be firestopped using approved methods to maintain the fire resistant rating. Abandoned cables in these spaces, shafts, ducts and plenums shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in these spaces, shafts, ducts, plenums, and other space used for environmental air, shall be removed.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

FPN No. 2: Definition of acceptable cable fire performance in various applications are described in Section 770-51.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance

Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-176 which meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #4050)

16- 176 - (770-52(d)): Accept in Principle

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Revise Section 770-52(d) as follows:

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed where practicable.

FPN : Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: BICSI members have been extensively involved with the design and installation of telecommunications cabling. Technology changes have resulted in newer high performance cabling being installed in support of those technologies. We have observed excessive accumulations of abandoned cabling adding to the fuel loading within plenum spaces. This proposal is offered to the NFPA to help reduce the fuel load within these plenum areas.

Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with section 300-21.

The proposed fine print No. 1 note was copied from the first sentence of the fine print note in section 300-21. It assists installers in locating firestop information.

Acceptance of this proposal will result in cable removal being included in the scope of the installation of a new communications and data system. The contractor will remove the old cable before installing the new system.

Acceptance of this proposal will result in many BICSI members specifying abandoned cable removal within the scope of the installation of new communications and data systems.

In two separate proposals, we have offered definitions for "abandoned cable" and "excessive accumulation of abandoned cables".

This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only excessive accumulations of abandoned cable, thus avoiding a burdensome requirement of removing insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cable that is in place, plenum cable as well as non-plenum cable that was installed before the plenum cable requirements were in the Code. The proposed second sentence, Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed, where practicable, deals with already abandoned cable. The wording of "where practicable" aid the situations where cable may be intertwined and cannot be removed without disruption of active services. The NEC requirements for plenum cable were first promulgated in the 1975 NEC, consequently, abandoned cables in older buildings often include unlisted cable along with listed plenum cable.

Other sections of the NEC require the removal of abandoned wiring.

ARTICLE 354 — Underfloor Raceways, Section 354-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case of abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 305 — Temporary Wiring, Section305-3(d). Time Constraints, (d) Removal. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

PANEL ACTION: Accept in Principle.

Revise 770-3(a) to read as follows:

"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables not intended for future use shall not be permitted to remain."

PANEL STATEMENT: The revision meets the intent of the submitter. It is more appropriate to place the requirement in 770-3(a) which addresses the subject.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

COMMENT ON AFFIRMATIVE:

BRUNSSEN: See my Comment on Affirmative Vote on Proposal 16-80.

DORNA: The revised wording for 770-3(a) should read as follows:

"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall not be permitted to remain."

The use of the phrase "not intended for future use" is redundant. The definition of "abandoned cable" has this phrase in the definition. To restate this phrase would be grammatically incorrect.

JOHNSON: See my Comment on Affirmative on Proposal 16-80.

KAHN: See my Comment on Affirmative on Proposal 16-80.

WIERENGA: The revised wording for 770-3(a) should read as follows:

"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall ~~not~~ be removed."

The use of the phrase "not intended for future use" is redundant because it is already included in the definition of "abandoned cable". The deletion of the words "not" and "permitted to remain" can be readily stated by use of positive code language using the word "removed".

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1210)

16- 177 - (Table 770-53): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Table 770-53. Cable Substitutions as follows:

Table 770-53. Cable Substitutions

Cable Type	Permitted Substitutions
OFNP	OFNP-50
OFCP	OFNP-50, OFNP, OFCP-50
OFNR	OFNP-50, OFNP
OFCR	OFNP-50, OFNP, OFCP-50, OFCP, OFNR
OFNG, OFN	OFNP-50, OFNP, OFNR
OFCG, OFC	OFNP-50, OFNP, OFCP-50, OFCP, OFNR, OFCR, OFNG, OFN

SUBSTANTIATION: If my proposal to establish a new section 770-51(b) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type OFNP-50 and Type OFCP-50. This proposal correlates section 770-51 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:
KAUFMAN: In addition to revising Table 770-53, Figure 770-53 should be revised in order to illustrate the changes in Table 770-53.

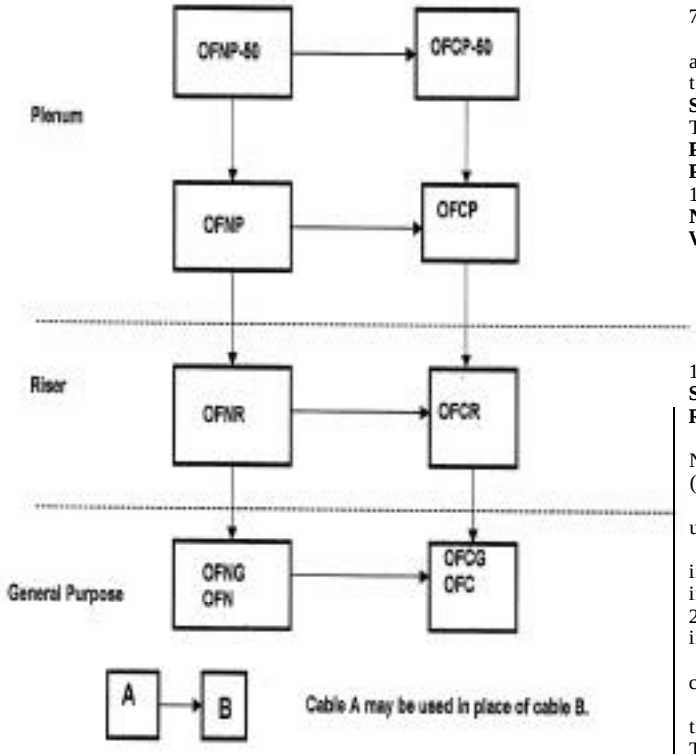


Figure 770-53 Cable substitution hierarchy.

EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1909)

16- 178 - (Table 770-53): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: For Cable Type OFCP, delete OFNP and replace with "None" as Permitted Substitutions.
For Cable Type OFCR, delete OFNP and OFNR as Permitted Substitutions.
For Cable Types OFCG and OFC, delete OFNP, OFNR, OFNG and OFN as Permitted Substitutions.
SUBSTANTIATION: Where a system designer has specified the use of OFC type cables because he has determined that the application required the use of metallic strength members, metallic vapor barriers, or metallic armor or sheath, an installer should not be allowed to substitute OFN type cables as now permitted by the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: The substitution table considers safety only. It does not include engineering considerations. Section 90-1(c) states "This Code is not intended as a design specification nor an instruction manual for untrained persons."
Design specifications should not be confused with code requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1908)

16- 179 - (Figure 770-53): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: Either:
1. Delete Figure 770-53 because, with the simplification of Table 770-53, it is no longer needed, or
2. Delete the three horizontal arrows between the Nonconductive and Conductive columns and the bottom line of the Table explaining the meaning of the horizontal arrows.
SUBSTANTIATION: See substantiation for my related Proposal for Table 770-53.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 16-178.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2988)

16- 180 - (770-53(a) and (b)): Accept
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:
770-53. Applications of Listed Optical Fiber Cables and Raceways. Nonconductive and conductive optical fiber cables shall comply with (a) through (f) as applicable.
(a) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP.
Also, listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in Section 300-22(b) and in other space used for environmental air as described in Section 300-22(c). Only Type OFNP and OFCP cables shall be permitted to be installed in these raceways.
Exception: Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with Section 300-22.
(b) Riser. Cables installed in vertical runs and penetrating more than one floor or cables installed in vertical runs in a shaft shall be Types OFNR or OFCR. Floor penetrations requiring Types OFNR or OFCR shall contain only cables suitable for riser or plenum use.
Also, listed riser optical fiber raceways shall be permitted to be installed in vertical runs in a shaft or from floor to floor. Only Types OFNR, OFCR, ~~and~~ OFNP, and OFCP cables shall be permitted to be installed in these raceways.
Exception No. 1: Where Types OFNG, OFN, OFCG, and OFC cables are encased in metal raceway or are located in a fireproof shaft having firestops at each floor.
Exception No. 2: Type OFNG, OFN, OFCG, or OFC cable in one- and two-family dwellings.

FPN: See Section 300-21 for firestop requirements for floor penetrations.

(c) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in (a) and (b) shall be Type OFNG, OFN, OFCG, or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways.

SUBSTANTIATION: This proposal revises the aforementioned sections to all Conductive Optical Fiber Cables to be used in Optical Fiber Raceways. Conductive cables are cables containing noncurrent-carrying conductive members [see 770-5(b)]. Optical Fiber/Communication Raceways are listed raceways used in plenum, riser, and general purpose areas of a building per Articles 770 and 800. These listed raceways are used in Article 800 with communication cables. The communication cables may have a conductive sheathing that cover the conductor assembly that may include one or more metallic members, strength members, or jackets. Conductive cables, per Article 800, have been used in Optical Fiber/Communication Raceways satisfactorily and without incident. In addition, per Article 770-53(c), General Purpose Raceways are currently allowed to used with conductive general-purpose cabling.

See companion proposal 770-2.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #3051)

16- 181 - (770-53(a)): Reject

SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit

RECOMMENDATION: Revise this section to read as follows:

(a) ~~Plenum.~~ Ducts, Plenums, and Other Environmental Air Spaces. Optical fiber ~~C~~ cables shall not be installed in ducts or plenums as covered in Sections 300-22(a) and (b). Open runs of optical fiber cables installed in ~~, and~~ other spaces used for environmental air covered in Section 300-22(c) shall be Type OFNP or OFCP. Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with Section 300-22(c)(1) shall be permitted in other spaces used for environmental air.

~~Also, t~~ Listed plenum optical fiber raceways shall be permitted to be installed in ~~ducts and plenums as described in Section 300-22(b) and in~~ other space used for environmental air as described in Section 300-22(c). Only Type OFNP cable shall be permitted to be installed in these raceways.

~~Exception: Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with Section 300-22.~~

SUBSTANTIATION: Section 300-22(a) does not permit any wiring. Section 300-22(b) does not permit plenum-rated wiring methods. The exception has been moved to the first paragraph to make it part of the main text and to clarify that cables that cannot meet the requirements for "plenum" rated must be enclosed in metal.

PANEL ACTION: Reject.

PANEL STATEMENT: No technical substantiation has been submitted to provide for the removal of allowing plenum optical fiber cables from being installed in ducts or plenums.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4138)

16- 182 - (770-53(a)): Accept in Principle

SUBMITTER: Marcelo M. Hirschler, GBH Int'l, Inc./Rep. Plenum Cable Assn.

RECOMMENDATION: Revise as follows:

770-53. Applications of Listed Optical Fiber Cables and Raceways. Nonconductive and conductive optical fiber cables shall comply with (a) through (f) as applicable.

(a) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP.

Also, listed plenum optical fiber raceways shall be permitted to be installed in ducts and plenums as described in Section 300-22(b) and in other space used for environmental air as described in Section 300-22(c). Only Type OFNP cable shall be permitted to be installed in these raceways. Abandoned cables, not intended for future use, shall not be permitted to remain.

Exception: Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables installed in compliance with Section 300-22.

SUBSTANTIATION: There is a significant amount of information indicating that the amount of cables installed in plenums, and other air-handling spaces, is increasing rapidly. An understanding of cabling practices indicates that the most common way in which cable installation is carried out is by disconnecting existing cable and leaving it abandoned in place, while introducing the cable needed to perform the additional functions. See Log #4136. There is, as yet, no indication that the additional cables in plenums causes an added fire hazard, and the fire record of cables in concealed spaces, both above ceilings and below floors, remains excellent. In fact, plenum cables, which meet the fire test requirements of NFPA 262, have been shown to have extremely good fire performance and to spread flame only very slowly, if at all. However, this type of preventive measure is worthwhile.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-176.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #2989)

16- 183 - (770-53(c)): Reject

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions

RECOMMENDATION: Revise text as follows:

(c) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in (a) and (b) shall be Type OFNG, OFN, OFCG, ~~or~~ OFC, OFNP, OFCP, OFNR, or OFCR. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways.

SUBSTANTIATION: This proposal clarifies that Plenum and Riser Types of cables are allowed to be used in General-Purpose areas within a building.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 770-53(f) allows cable substitutions. Consequently, it is not necessary to list all the cable substitutions each time a cable type is mentioned in this Article.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #2990)

16- 184 - (770-53(e)): Accept

SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions

RECOMMENDATION: Revise text as follows:

(e) Cable Trays. Optical fiber cables of the types listed in Table 770-50, and Optical Fiber Raceways as described in 770-51, shall be permitted to be installed in cable trays.

FPN: It is not the intent to require that these optical fiber cables or raceways be listed specifically for use in cable trays.

SUBSTANTIATION: Optical Fiber/Communication Raceways are listed raceways used in plenum, riser and general purpose areas of a building. These listed raceways are commonly used in cable trays. Optical Fiber/Communication Raceways are used to separate the Optical Fiber Cable and/or Telecommunications Cable from the other wiring methods found in the cable tray. These raceways are made of the same materials as the cable jacket and are used as a cable management system.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #3231)

16- 185 - (770-54(e) (New)): Accept in Principle
SUBMITTER: Hallie Smith-Petee, The Geon Co.
RECOMMENDATION: Insert a new Section 770-54(e) as follows:
(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts,plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.
SUBSTANTIATION: See Substantiation for Section 800-52(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-176.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3967)

16- 186 - (770-54(e) (New)): Accept in Principle
SUBMITTER: Hallie Smith-Petee, The Geon Co.
RECOMMENDATION: Insert a new Section 770-54(e) to read as follows:
(e) Spread of Fire or Products of Combustion: Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be so made that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts, plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.
SUBSTANTIATION: See Substantiation for Section 800-52(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-176.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

ARTICLE 780 — CLOSED-LOOP AND PROGRAMMED POWER DISTRIBUTION

(Log #4271)

10- 88 - (780-3): Accept
Note: At the recommendation of Code-Making Panel 10, the Technical Correlating Committee is recommending that Article 780 be deleted from the 2002 NEC and invites Public Comment. The Technical Correlating Committee directs that this Proposal be forwarded to Code-Making Panel 7 for information.
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Delete the phrase "of a closed-loop power distribution system" from Section 780-3(a) and the phrase "in a closed-loop power distribution system" from Section 780-3(b)(1).
SUBSTANTIATION: This is a resubmittal of a 1999 proposal. This wording went into the 1996 NEC to create a distinction between programmed power systems which are not closed-loop and "smart-house" systems that are. They are indeed distinct, as distinct as day and night. The problem is that they are so distinct that programmed power systems are outside of the scope of Article 780. This change created the wholly unwarranted inference that Article 780 protects programmed power systems running on "smart-house" cabling (Type NMS) from other restrictions in the Code that assume true closed-loop power. Barring a change in the scope of this article that inference is false and needs to be corrected.
The 1999 Panel rejection statement failed to address the article scope issue, and the TCC should direct acceptance of this proposal on that basis alone. The subject it did address, the suitability of NMS cable, is outside of its responsibilities. In fact, Article 336 does restrict this cable to closed loop purposes. Section 336-30(b), third paragraph, requires the signaling conductors to comply with Section 780-5. That can't happen if those signaling conductors are being used beyond the scope of the article, and that brings us back to square one.
There is a much more fundamental issue here. In the 1987 code cycle, closed-loop allowances went all over the code book. Section 240-20(c) and Section 300-15(m) are just two examples. Every Code Making Panel that was inserting these allowances thought they were addressing closed loop systems. If the scope of Article 780 gets effectively broadened in this way, it will threaten to unravel code rules that have been fought over and perfected throughout the history of the NEC. It could allow an end run around system separation rules in Article 725, for example. All the system installer would have to say is that they're not using a Class 2 signaling system, they're an Article 780 system instead.
I'm sorry that true closed-loop distributions appear to have failed in the market, and that less sophisticated systems are filling the niche. I wish them well. However, they belong in Article 725 and not Article 780. Perhaps the TCC might organize a small task group between CMP 7 and CMP 16 to squarely address correlation issues around Type NMS cable.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1113)

10- 89 - (780-6): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 24" to "24 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: No clarity is added for U.S. and some other locations, where the meaning of "No. 14" and "14 AWG" are universally known and interchangeable; further, the Code is generally consistent in listing "xx AWG" in the tables and "No. xx" in the text. However, this proposal adds considerable clarity for international locations that might accept the NEC, where common U.S. trade sizes are less well known.
The panel suggests that the Technical Correlating Committee ensures that all final actions on similar proposals are consistent throughout the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

ARTICLE 800 — COMMUNICATIONS CIRCUITS

(Log #294)

16- 187 - (800): Reject
SUBMITTER: J. H. Walling, Insulated Cables Engineers Assn./Rep. Communications Cable Section of ICEA (Insulated Cable Engineers Assn.)
RECOMMENDATION: In response to the proposal to roll Article 800 into the main body of the NEC, it is herewith proposed to leave Article 800 as is and not to roll it into the main body of the NEC.
SUBSTANTIATION: ICEA represents the position of the cable manufacturers with respect to codes and standards.

At our last meeting on March 8-12, 1999 in Atlanta, Georgia, we discussed an eventual change of NEC Article 800, i.e., specifically if this article should remain a separate article or should be rolled into the main body of the NEC.

After discussing the subject in detail, it was the overwhelming opinion of all representatives of cable manufacturers, that the Article 800 should remain as it is. I have been mandated by the ICEA Communications Cable Section to contact NFPA, to express the concern of the cable manufacturers with respect to an eventual change of Article 800 by rolling it into the main body of the NEC. In fact, it was the unanimous decision of the representatives of the cable manufacturers to recommend to leave Article 800 as it is.

This decision has been taken also in view of the very complexity of the task to roll in Article 800 into the main body of the NEC. This task from a time and effort point of view does not seem to be justified at all, if compared to the "questionable gain" of having the issues of Article 800 covered in the main body of the NEC.

PANEL ACTION: Reject.

PANEL STATEMENT: Proposal provides no recommended wording and therefore does not conform to Section 4-3.3 (c) of the NFPA Regulations Governing Committee Projects.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

COMMENT ON AFFIRMATIVE:

JOHNSON: I agree with the submitter's position that Article 800 (and all of Chapter 8) should remain independent. The submitter proposed no recommended text and therefore there was no other action the Panel could take but to reject.

(Log #294a)

1- 314 - (800): Reject

SUBMITTER: J. H. Walling, Insulated Cables Engineers Assn./Rep. Communications Cable Section of ICEA (Insulated Cable Engineers Assn.)

RECOMMENDATION: In response to the proposal to roll Article 800 into the main body of the NEC, it is herewith proposed to leave Article 800 as is and not to roll it into the main body of the NEC.

SUBSTANTIATION: ICEA represents the position of the cable manufacturers with respect to codes and standards.

At our last meeting on March 8-12, 1999 in Atlanta, Georgia, we discussed an eventual change of NEC Article 800, i.e., specifically if this article should remain a separate article or should be rolled into the main body of the NEC.

After discussing the subject in detail, it was the overwhelming opinion of all representatives of cable manufacturers, that the Article 800 should remain as it is. I have been mandated by the ICEA Communications Cable Section to contact NFPA, to express the concern of the cable manufacturers with respect to an eventual change of Article 800 by rolling it into the main body of the NEC. In fact, it was the unanimous decision of the representatives of the cable manufacturers to recommend to leave Article 800 as it is.

This decision has been taken also in view of the very complexity of the task to roll in Article 800 into the main body of the NEC. This task from a time and effort point of view does not seem to be justified at all, if compared to the "questionable gain" of having the issues of Article 800 covered in the main body of the NEC.

PANEL ACTION: Reject.

PANEL STATEMENT: This proposal appears to address Section 90-3. The proposal does not contain recommended text as required by Section 4-3.3(c) of the Regulations Governing Committee Projects.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 12

NOT RETURNED: 1 Macias

(Log #1114)

16- 188 - (800): Accept

SUBMITTER: James M. Daly, BICC General

RECOMMENDATION: Revise Article 800 as follows:

800-40(a)(3) - change "No. 14" to "14 AWG"

800-40(d) - change "No. 6" to "6 AWG"

800-41(b) - change "No. 12" to "12 AWG".

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4042)

16- 189 - (800-2-Abandoned Cable (New)): Accept

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add a new definition to read as follows:

Abandoned Cable. Cable that is neither terminated at both ends, at a connector or other equipment, nor identified for future use with a tag.

SUBSTANTIATION: The definition of abandoned cable is needed to accompany the proposals that require removal of abandoned cable. This definition reflects industry practices.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

DORNA: The definition of "Abandoned Cable" should be the same here as what we accepted in Proposal 16-273. It should be "Cable that is neither terminated at ~~both ends, at a connector or other~~ equipment, nor identified for future use with a tag." (This is the same wording as Proposal 16-273.)

The reason we took out the reference to connectors in Proposal 16-273 is because CATV cable usually has connectors attached. It was our concern that CATV cables would have connectors attached and then would not fall under the proposed original definition and therefore would not have to be removed if abandoned. I believe this also could be the case with cables in this Article 800. These cables could also have connectors attached, and therefore would not fall under the definition the panel had accepted in principal. If we make the definition the same as I have suggested above (the same as 16-273) then it will make it irrelevant on whether the cable has connectors or not. I can foresee someone using the fact that the cable has a connector on it, therefore it does not fall under "abandoned cable" and does not need to be removed.

JOHNSON: See my Explanation of Negative Vote on Proposal 16-154.

COMMENT ON AFFIRMATIVE:

BRUNSSEN: See my Comment on Affirmative Vote on Proposal 16-32.

KAHN: See my Comment on Affirmative on Proposal 16-32.

(Log #4047)

16- 190 - (800-2- Excessive Accumulation of Abandoned Cables (New)): Reject

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add a new definition to read as follows:

Excessive Accumulation of Abandoned Cables. When the number of abandoned cables is greater than 1/3 of the total number of cables within a fire-containment zone.

SUBSTANTIATION: After the concept of plenum cables was introduced into the 1975 NEC, Underwriters Laboratories initially listed plenum cables by comparing the smoke production of plenum cables with the smoke production of conventional cables of the same physical design (but not plenum grade materials) in conduit. Plenum cables (not in conduit) were tested and compared with an equal number of conventional cables in conduit. It was assumed that the plenum cables were a replacement for conventional cables and that in case of a fire the amount of smoke would be reduced because of the

lower smoke production of plenum cables. It was not anticipated that plenum cables would be abandoned. Since conventional cables in conduit were deemed to be acceptable the smoke from these cables is the benchmark for comparison and a fire involving an excessive amount of abandoned cables could emit excessive amount of smoke. Until research better defines what amount of abandoned cable might be excessive, allowing up to 1/3 excess of abandoned cables is prudent.

PANEL ACTION: Reject.

PANEL STATEMENT: The term is not used. The proposal that introduced this term was modified to eliminate the term.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1199)

16- 191 - (800-3, FPN): Accept in Principle

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Change 800-5(i) to 800-51(j).

SUBSTANTIATION: If my proposal to establish a new Section 800-51(h) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type CMP-50 and Type MPP-50. This proposal correlates Section 800-3 with those proposed changes.

PANEL ACTION: Accept in Principle.

Change 800-51(i) to 800-51(j).

PANEL STATEMENT: The revised text corrects the Section number.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1665)

16- 192 - (800-5): Accept in Principle

Note: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideraton be given to the comments expressed in the voting. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable." This action will be considered by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Revise 800-5 as follows:

800-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to equipment shall not be denied by an excess accumulation of wires and cables ~~that prevents~~ sufficient to prevent the removal of panels, including suspended ceiling panels.

SUBSTANTIATION: Section 800-5 has been misinterpreted to mean that wires and cables may not be placed directly on suspended ceilings. While the 1999 National Electrical Code Handbook emphasizes "excess accumulation" in the interpretive text, Figures 800-1 and 800-2 lead the reader to conclude that no wires or cables are permitted to rest directly on the suspended ceiling. This was not the intent of CMP 16 when 800-5 was introduced into the 1993 NEC. At that time, CMP 16 stated in response to a similar proposal to Article 725 (1992 TCD, Comment 16-18) that the proposed requirement "... would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." The proposed revision emphasizes that it is an excessive accumulation of wire and cable that is of concern. A limited amount of wiring or cabling laid directly on a suspended ceiling is permitted, will not deny access to equipment, and does not present an unsafe working environment. This is a companion proposal and is intended to correlate with 725-5, 760-5, 770-7, 820-5 and 830-6.

PANEL ACTION: Accept in Principle.

Revise 800-5 to read as follows:

"800-5. Access to Electrical Equipment Behind Panels Designed to Allow Access

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems.

Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."

PANEL STATEMENT: The revised text satisfies the intent of the original recommendation in that it allows some cabling of a limited quantity above ceiling tile but not an excessive amount, which would interfere with accessibility.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

EGEDSAL: A suspended ceiling is not intended to support electrical wires or cables.

SPEER: The panel's action on this proposal greatly reduces the effectiveness of the previous changes in the code which eliminated any unsupported cable laying on suspended ceilings. The panel's statement indicates that the revised language limits the quantity of cable laying on suspended ceilings and "not an excessive amount, which would interfere with accessibility" would be allowed.

Unfortunately, by allowing some cable on each tile, a condition which would limit accessibility has been created. Not to mention, the extra weight added to each tile in the suspended ceiling system. By making the ceiling grid a support system for loose cable, have we changed the engineering requirements for the ceiling? What will be the practical effect of this action, as normal operation of the building takes place and multiple cables are laid on the same tiles?

I strongly believe this change is a mistake and should not take place.

COMMENT ON AFFIRMATIVE:

BRUNSSEN: I concur with the panel action in providing relief for a limited amount of after-construction telecommunications wire and cable to be placed directly on the suspended ceiling tiles. However, proposed Section 800-5(b)(2), as presently written, is confusing and could be interpreted as permitting a total of only three unsupported wires and cables. The intent of the panel was that up to a maximum of three unsupported wires and cables may be routed across each and every ceiling tile. Revising 800-5(b)(2) to state: "...permissible to install a maximum of three unsupported wires and cables on top of ~~any one~~ each ceiling tile, i.e., up to three wires and cables are permitted to lay on a ceiling tile." would clarify the intent. Note that the word "of" is inserted and is missing in the original text.

(Log #CP1605)

16- 192a - (800-6): Accept

SUBMITTER: CMP 16

RECOMMENDATION: Revise text to read as follows:

"Mechanical Execution of Work. Communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceiling and sidewalls shall be supported by the structural components of the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar

fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d)."
Also, delete the Fine Print Note.
SUBSTANTIATION: This proposal provides additional rules for the mechanical execution of the work. Since there are additional rules, the fine print note is not necessary. This provides parallel requirements to those used in Articles 640, 725, 760, 770, 820, and 830.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation for Negative Vote on Proposal 16-2a.

(Log #3755)

16- 193 - (800-6): Accept in Principle
SUBMITTER: Douglas R. Erb, Construction Insp. Dept., Ocean County, NJ
RECOMMENDATION: Add a second paragraph to read as follows:
"Cables shall be secured by staples, cable ties, straps, or similar fittings designed and installed as not to damage the cable. Cables shall be secured at intervals not exceeding 6 ft and within 12 in. from every cabinet, box or device.
Exception No. 1: For concealed work in finished buildings where such support is impracticable, it shall be permissible to fish cable between access points."
SUBSTANTIATION: The absence of a definitive support requirement for these cables which is provided for other wiring methods throughout this code is needed. Without a definite support requirement enforcement of the general requirements of 800-6 provide no consistency. With the increased presence of PLFA cables especially in drop ceilings damage to these cables and the integrity of their systems has increased with the lack of proper support. Lack of support for these cables creates an unsafe work area for others attempting work in these spaces.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action, substantiation, and statement on Proposals 16-192(a) and 16-192. The revised text meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation for Negative Vote on Proposal 16-2a.

(Log #4024)

16- 194 - (800-6, FPN): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Revise the FPN to read: "One way to determine accepted industry practice is to refer to nationally recognized standards such as Commercial Building Telecommunications Cabling Standard, ANSI/EIA/TIA 568-A-1995; Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA/EIA 569-A-1997; and Residential ~~and Light Commercial~~ Telecommunications Cabling ~~Wiring~~ Standard, ~~ANSI/EIA/TIA 570-1991~~ ANSI/EIA/TIA 570-A-1999, ANSI/NECA/BICSI 568 or other ANSI-approved installation standards."
SUBSTANTIATION: A revision to the standard number and the title for residential cabling has been updated. Another standard is currently under review that will be focused at the installation of telecommunications cabling and connectors and will become an ANSI standard within the next year.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 800-6 has been revised to remove the FPN and provide specific installation requirements. A FPN is no longer necessary. Refer to the panel action and statement on Proposal 16-192(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #606)

16- 195 - (800-10): Reject
SUBMITTER: William Lenz, POE Enterprises, Inc.
RECOMMENDATION: Revise as follows:
800-10. Overhead Communications Wires and Cables.
...shall comply with (a) through (c).
SUBSTANTIATION: Section 800-10 has no (c) to comply with. Should (c) point of entry, found in Section 800-10 be also included under 800-10?
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed wording does not change the current wording. The proposer does not include the wording to be used. Refer to panel action on Proposal 16-196 where the reference to 800-10(c) is removed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1535)

16- 196 - (800-10): Accept
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise 800-10 as follows:
800-10. Overhead Communications Wires and Cables. Overhead communications wires and cables entering buildings shall comply with (a) ~~through (c)~~ and (b).
SUBSTANTIATION: Item (c) no longer exists as it was removed by floor action at the 1998 NFPA Annual Meeting.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2377)

16- 197 - (800-10): Reject
SUBMITTER: Rodney Parker, GTE North/Rep. Network Design
RECOMMENDATION: Part (c) is missing. Language should be similar to Point of Entry in Section 800-11(c).
SUBSTANTIATION: 800-10 Overhead Communications Wire and Cables should be treated no differently than those cables and wires in 800-11 Underground Circuits Entering Buildings. No matter what type of installation is done it still has to contend with "Point of Entry".
PANEL ACTION: Reject.
PANEL STATEMENT: Section 800-10(c) was removed by floor action at the 1998 NFPA Annual Meeting. TIA-608 seeks to remove 800-11(c) and will likely be approved by the Standards Council. Further, the critical issue is not the separation of power and communications entrances, but the length of the primary protector grounding conductor. See panel action on Proposals 16-196 and 16-212.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #4028)

16- 198 - (800-10, FPN (New)): Accept
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add a fine print note to read as follows:
FPN: For additional information regarding overhead wires and cables, see National Electric Safety Code, ANSI C2-1997, Part 2 Safety Rules For Overhead Lines.

SUBSTANTIATION: The primary focus of this recommendation is to promote parity between the two codes in an effort to eliminate confusion and multiple interpretations of codes contained in two separate volumes that are attempting to safely address the same issue. Due to the deregulation of cabling on the customer premises and electrical power distribution, adherence to the NESC is required.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #500)

16- 199 - (800-10(a)(4)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 800-10(a)(4) - change "12 in. (30.48 cm)" to "300 mm (12 in.)" and change "40 in. (1.02 m" to "1.0 m (40 in.)"
800-10(b) - change "8 ft (2.44 m)" to "2.5 m (8 ft)"
800-10(b) Exception No. 2 - change "18 in. (457 mm)" to "450 mm (18 in.)" and change "4 ft (1.22 m)" to "1.2 m (4 ft)"
800-10(b) Exception No. 3 - revise as follows:
"Exception No. 3: Where the roof has a slope of not less than 100 mm (4 in.) ~~4 in. (102 mm)~~ in 300 mm (12 in.) ~~12 in. (305 mm),~~ a reduction in clearance to not less than 900 mm (3 ft) ~~3 ft (914 mm)~~ shall be permitted."
800-11(c) - change "20 ft (7.0 m) to "6.0 m (20 ft)"
800-12(b) - change "4 in. (102 mm)" to "100 mm (4 in.)"
800-13 - change "6 ft (1.83 m)" to "1.8 m (6 ft)"
800-30(a) FPN No. 2 (2) - change "140 ft (42.7 m)" to "42 m (140 ft)"
800-30(b) - change "30 ft (9.14 m)" to "9.0 m (30 ft)" in two places
80-30(b)(3) - change "5 ft (1.52 m) to "1.5 m (5 ft)"; change "1/2 in. (12.7 mm) to "12.7 mm (1/2 in.)"; change "6 ft (1.83 m)" to "1.8 m (6 ft)"
800-41(a) - change "30 ft (9.14 m)" to "9.0 m (30 ft)"
800-50 Exception No. 3 - change "50 ft (15.2 m)" to "15 m (50 ft)"
800-50 Exception No. 3 FPN No. 2 - change "50 ft (15.2 m)" to "15 m (50 ft" in three places.
800-52(a)(2) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
In 800-11(c), 7.0 m was corrected to 6 m.
In 800-40(b)(3), the SI units for 1/2 in. cannot be rounded since it specifies a minimum trade size.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1005)

16- 200 - (800-10(a)(4), (b) Exception No. 2): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(a)(4) Separation. ~~Clearance. Supply service drops of 0-750 volts running above and parallel to communications~~ Communications circuit service drops running parallel to electric light or power service-drops shall have a minimum separation of 12 in. (30.48 cm) at any point in the span, including the point of ~~and at their~~ attachment to the building, provided the ~~nongrounded~~ electric light or power conductors are insulated and that a clearance separation of not less than 40 in. (1.02 m) is maintained between the ~~two services~~ communications circuit service-drop conductors and the electric light or power service-drop conductors at the pole.
(b) Exception No. 2: A reduction in clearance above only the overhanging portion of the roof to not less than 18 in. (457 mm) shall be permitted if (1) not more than ~~4 ft (1.22 m)~~ 6 ft (1.83 m) of communications circuit service-drop conductors, 4 ft (1.22 m) horizontally, pass above the roof overhang and (2) they are terminated at ~~a through or~~ an above-the-roof approved raceway mast or other approved support.
SUBSTANTIATION: Editorial. The proposal for (a)(4) addresses the rule to the communication service-drop conductors instead of the electric power system service-drop conductors which are under the purview of panel 4. The present rule literally doesn't apply where the electric service-drop is not above the communication service-drop. The common code term for conductors not connected to ground is "ungrounded"; however, I believe separation should include grounded conductors as they may be subject to above-ground voltage due to various causes and are often bare.
There could be more than two services supplying service drops.
In (b) Exception No. 2 "Through" (the roof) is superfluous, and a raceway (any type?) could be through the roof but not a mast. The raceway should be designated as an approved mast type.
The 6 ft length (4 ft horizontal) would allow for a slope in the service-drop while maintaining the 4 ft requirement. This is similar to Section 230-24, Exception No. 3.
The voltage designation of electric service-drops is deleted, as it infers separation requirements do not apply for higher voltages and doesn't indicate clearance may be required by other standards or codes.
PANEL ACTION: Reject.
PANEL STATEMENT: The wording changes are not editorial, and no substantiation has been provided for the changes. The current text is clear and accurate. The service mast can go through the roof. The rules for power service drops are in Article 230.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #327)

16- 201 - (800-10(c) (New)): Reject
NOTE: In accordance with 4-6.2(c) of the Regulations Governing Committee Projects, the following Proposal 16-164 and Comment 16-88 were returned to Committee at the 1998 Annual Meeting, and now are being processed as a Proposal for this revision.
SUBMITTER: Roger Witt, State Farm Ins. Co.
RECOMMENDATION: The Proposal 16-164:
RECOMMENDATION: Add new Section 800-10(c) to read as follows:
(c) Point of Entry Where practicable, the point of entry for communications wiring and cables shall be within 5 feet of the electrical service entry point.
(FPN) The distance to the electrical system grounding electrode has a direct relationship to the potential difference between the communications circuits and the power circuits.
SUBSTANTIATION: It has been observed that when the communication circuit's point of entry is located remote from the electric service point, proper bonding is not provided. When power and communications service entry points are remote and the systems are bonded, then L di/dt losses come into play and the equalization of potential is not achieved.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: As worded, this proposed requirement would be very difficult, if not impossible to enforce. There would seldom be agreement between installers and inspectors as to whether meeting this requirement was practical.
The Comment 16-88:
SUBMITTER: Roger Witt, State Farm Ins. Co.
COMMENT ON PROPOSAL NO.: 16-164
RECOMMENDATION: Add new Section 800-10(c) to read as follows:
(c) Point of Entry. The point of entry for communications wiring and cables shall be within 5 feet of the electrical service entry point.
(FPN): The distance to the electrical system, grounding electrode has a direct relationship to the potential difference between the communications circuits and the power circuits.
Exception: Where it is not practicable to install the communications and electrical service in this manner, a separate grounding electrode, installed in compliance with 250-83 (c), shall be installed for the communications systems and the grounding electrodes for the electrical and communications systems shall be connected with a bare or insulated #4 copper conductor. The conductor shall not be

exposed to mechanical injury, and when buried, shall be buried to a depth of 24 inches

SUBSTANTIATION: Change in proposed text as recommended by one of the panel members and shown in the ROP.

By requiring a specific point of entry, the requirement becomes enforceable. Single point grounding for all communications services and power services is needed to provide equal potential between the systems.

There is evidence that when communications services are installed remote from the power system service, separate ground rods are installed and not bonded to the electrical service grounding electrode. By specifying a service entrance location adjacent to the power system service entrance a better chance of single point grounding is presented.

PANEL ACTION: Accept in Principle.

Add new Section 800-10(c) to read as follows:

(c) Point of Entry. The point of entry for communications wiring and cables shall be within 20 feet of the electrical service entry point.

Exception: Where it is not practicable to install the communications service in this manner, a separate grounding electrode, installed in compliance with 800-40(b)(3) and bonded in accordance with 800-40(c) and 800-40(d).

(FPN): Under certain conditions, the length of the bonding conductor has a direct relationship to the difference in potential between the communications and the power circuits.

PANEL STATEMENT: The Panel believes these changes meet the concerns of the submitter and add clarity to the text.

SUBSTANTIATION: (See the Recomendation field above that includes substantiation for 1998 edition Proposal 16-164 and 1998 edition Comment 16-88.)

NOTE: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: See panel action on Proposal 16-212. The submitter is concerned with voltage differences between the telephone and power service on the premises because of excessive telephone grounding conductor length. Locating the power and telephone entrances within 5 feet of each other as the submitter proposes will not necessarily ensure a short telephone grounding conductor. Proposal 16-212 addresses that issue directly and ensures that this conductor shall be a maximum of 20 feet in length, thereby minimizing potential differences.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1673)

16- 202 - (800-10(c) (New)): Reject

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Add new Section 800-10(c) as follows:

(c) On Masts. Communications wires and cables shall be permitted to be attached to a service mast that is listed for the purpose of accepting multiple attachments.

SUBSTANTIATION: This is a companion proposal to the proposal adding a new exception to Section 230-28. The proposed Section 230-28, Exception, would permit communications service drop attachments to a power service mast that is listed for the purpose of supporting multiple attachments. Presently, Section 800-10 does not address the issue of communications attachments to power service masts. However, such attachments can be made to a single mast in a safe and cost effective manner when the service mast is designed and listed for such application. It is unnecessarily costly to the building owner and aesthetically unsightly when two service masts must be provided, one for power and another for communications service. The safety of craft personnel is not an issue since they are trained to work in close proximity to power conductors. Section 800-10(a)(4) permits a minimum separation of 12 inches between power-service drops and communications drops at their point of attachment to the building, provided that the nongrounded power conductors are insulated and that a clearance of 40 inches between the two services is maintained at the pole.

This issue was not previously addressed in Article 800. However, for reasons of correlation with the proposed addition of Section 230-28, Exception and consistency with Section 820-10(c), it now becomes necessary that Section 800-10 address the issue of multiple attachments to the power service mast.

PANEL ACTION: Reject.

PANEL STATEMENT: Although requirements for the power service mast are specified in Article 230, the detailed design and installation requirements are not defined. The electric service company specifies the type, size and height of mast to be used and the manner in which it is to be installed. The NEC can not dictate to the utility the specific installation requirements. Code Panel 4, which has jurisdiction over service masts, has consistently rejected this concept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

BRUNSSEN: This proposal was developed as a companion proposal to the proposal to revise Section 230-28. The proposal to revise Section 230-28 to permit communications wires and cables to be attached to a service mast that is listed for the purpose of accepting multiple attachments should be accepted. There is no reason to force a homeowner to install a separate mast to accommodate communications (telephone, CATV) service drops when the service mast can be listed to do so. The panel acknowledged that detailed design and installation requirements are not defined. This is the purpose of listing the service mast. The listing is only valid when the listed product is installed properly for its intended use.

JOHNSON: An arbitrary prohibition of attaching to electrical masts is not reasonable. Where the mast can be shown to support additional attachments without creating a safety hazard, these attachments should be allowed. Reasonable qualifications would include: the ability to support the weight (with ice loading) and not damage the mast or structure, ability to maintain proper clearance, etc.

(Log #4273)

16- 203 - (800-10(c) (New)): Reject

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Add a new (c) as follows:

(c) Overhead (aerial) spans of communications cables or wires shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such conductors.

SUBSTANTIATION: This is Section 800-52(e) Exception, properly located where it covers overhead outdoor spans. This was the original substantiation. The 1999 result is almost unusable; how many applications could possible exist of communications circuits attaching to masts and running across a large open shop floor, for example? Nevertheless, that's the only application literally allowed under the 1999 revision.

PANEL ACTION: Reject.

PANEL STATEMENT: 800-52(e) already allows strapping of these type circuits to a communications raceway whether inside or out. Refer to 800-52 main rule.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1662)

16- 204 - (800-11(c)): Accept

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Delete Section 800-11(c), including the exception and fine print note (FPN).

Revise the text of 800-11 as follows:

Underground communications wires and cables entering buildings shall comply with (a) ~~through (c)~~ and (b).

SUBSTANTIATION: This is a companion proposal and is intended to correlate Section 800-11 with the proposed revision to Section 800-40(a)(4)(New). During the 1999 code cycle, a number of proposals and comments were submitted to limit the separation of power and communications entrances to the building. The intent of these proposals and comments was to limit the potential difference between power and communications circuits during lightning events.

This potential difference is generally a function of conductor inductance (L), which increases in direct proportion to conductor length, and the rate of rise of the current (di/dt). These proposals and comments were generally rejected as they did not address the real issue, the length of the communications primary protector grounding conductor. However, through oversight, one appearance of the separations limit between power and communications entrances to the building was overlooked and remains in Section 800-11(c). The companion proposal indicated above addresses the issue of potential difference between power and communications by limiting the length of the primary grounding conductor and eliminates the need to specify a separation distance between power and communications entrances to the building. If 800-11(c) is deleted, then the text of 800-11 must be revised to indicate that there are now only two subsections, (a) and (b).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2798)

16- 205 - (800-11(c)): Accept
SUBMITTER: Melvin J. Anna, Prescott, AZ
RECOMMENDATION: Delete Section 800-11(c) in its entirety.
SUBSTANTIATION: The exception to Section 800-11(c) is an incomplete sentence that cannot be interpreted, used, or enforced as code. When the exception is deleted, the main rule must also be deleted because the remedy intended by the exception to cover "impracticable" installation situations will not be available.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #4274)

16- 206 - (800-11(c)): Accept
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee
RECOMMENDATION: Delete this subsection.
SUBSTANTIATION: During the 1998 NFPA Annual Meeting, all but one of a series of changes that set a maximum distance between a Chapter 8 wiring entry and the electrical service entry point of 20 ft came to the floor for action. A consensus emerged that the proposals would be impracticable, particularly in cases where the communications entry arrived first. No one seriously believes, for example, that a telephone drop would influence the location of a 2000A service switchboard. The rule does contain an exception for a bond between separated electrodes, but that is already in the Code.
The floor motions affected proposed Section 800-10(c) on overhead telephone drops, Section 810-55 on antenna lead-in conductors (which had already been rejected by the panel), Section 820-11(c) for CATV, and Section 830-10(j) and Section 830-11(c) for network-powered broadband communications systems. The submitter of the successful floor motions, a member of CMP 16 and the Correlating Committee, plainly overlooked this section on underground entries for communications circuits. This proposal is simply to correlate with the other actions. By this proposal, the Advisory Committee expresses its support of making the TIA in process on this point permanent code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1690)

16- 207 - (800-30(b)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Delete "for purposes of this section, the point at which the exposed cable enters shall be considered to be the point of emergence through an exterior wall, a concrete floor slab, or from a rigid or intermediate metal conduit grounded to an electrode in accordance with Section 800-40(b)."
SUBSTANTIATION: Point of entrance is defined in Section 800-2.
PANEL ACTION: Accept in Principle.
Revise 800-30(b) of the code as follows:
1) Delete the second paragraph.
2) Change wording of the first paragraph to read as follows:
"The primary protector shall be located in, on, or immediately adjacent to the structure or building served and as close as practicable to the point of entrance."
3) Add a new FPN after the first paragraph to read as follows:
"FPN: See 800-2 for the definition of the point of entrance."
PANEL STATEMENT: Adding the "point of entrance" to the first paragraph correlates with the definition in Section 800-2.
Adding a FPN alerts the readers to the definition.
The deleted paragraph is not needed due to wording change in the first paragraph.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1804)

16- 208 - (800-30(b)): Accept
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Delete the second paragraph.
SUBSTANTIATION: Point of Entrance is defined in Section 800-2. The language in this section is identical to the definition in Section 800-2 and therefore redundant, unnecessary, and perhaps confusing.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1805)

16- 209 - (800-33): Accept in Principle
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Delete the second paragraph.
SUBSTANTIATION: Point of Entrance is defined in Section 800-2. The language in this section is identical to the definition in Section 800-2 and therefore redundant, unnecessary, and perhaps confusing.
PANEL ACTION: Accept in Principle.
Add to the submitter's recommendation a new FPN to read as follows:
"FPN: See 800-2 for the definition of the point of entrance."
PANEL STATEMENT: The addition of the FPN is to correlate with the panel action on Proposal 16-207.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #3366)

16- 210 - (800-40(a)(1)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise as follows:
(a) Grounding Conductor.
(1) Insulation. The grounding conductor shall be insulated and shall be identified as being suitable for wet locations as stated in Table 310-13 ~~listed as suitable for the purpose.~~
SUBSTANTIATION: I do not believe that conductors are listed as suitable for grounding.
PANEL ACTION: Reject.
PANEL STATEMENT: The original text states: "…. listed as suitable for the purpose." Inherent in the listing process is the assurance that the item or product will perform safely in its intended application. Since the grounding conductor can be applied in wet locations, this is taken into consideration in the listing of the conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #3369)

16- 211 - (800-40(a)(1)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise as follows:
(a) Grounding Conductor.
(1) Insulation. The grounding conductor shall be insulated and shall be identified as being suitable for wet locations as stated in Table 310-13 ~~listed as suitable for the purpose.~~
SUBSTANTIATION: I do not believe that conductors are listed as suitable for grounding.
PANEL ACTION: Reject.
PANEL STATEMENT: The original text states: "…. listed as suitable for the purpose." Inherent in the listing process is the assurance that the item or product will perform safely in its intended application. Since the grounding conductor can be applied in wet locations, this is taken into consideration in the listing of the conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1668)

16- 212 - (800-40(a)(4) and Exception (New)): Accept
Note: The Technical Correlating Committee directs the Panel to change "residences" to "dwellings."
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Insert new 800-40(a)(4) and Exception as follows. Renumber existing 800-40(a)(4) and 800-40(a)(5) as 800-40(a)(5) and 800-40(a)(6), respectively.
(4) Length. The primary protector grounding conductor shall be as short as practicable. In one and two-family residences, the primary protector grounding conductor shall be as short as practicable, not to exceed 20 ft (6.0 m) in length.
Exception: In one- and two-family residences where it is not practicable to achieve an overall maximum primary protector grounding conductor length of 20 ft (6.0 m), a separate communications ground rod meeting the minimum dimensional criteria of Section 800-40(b)(3) shall be driven, the primary protector shall be grounded to the communications ground rod in accordance with Section 800-40(c) and the communications ground rod bonded to the power grounding electrode system in accordance with Section 800-40(d).
SUBSTANTIATION: During the 1999 Code cycle, a number of proposals and comments were submitted to limit the separation of power and communications entrances to the building. The intent of these proposals and comments was to limit the potential difference between power and communications circuits during lightning events. That potential difference is generally a function of conductor inductance (L), which increases in direct proportion to conductor length, and the rate of rise of the current (di/dt). These proposals and comments were generally rejected as they did not address the real issue, the length of the communications primary protector grounding conductor. This proposal addresses that issue, encourages short primary protector grounding conductors, provides guidance as to a reasonable maximum length, and provides an alternative where it is not practicable to meet the maximum length (20 ft) restriction. The proposed length restriction is limited to one- and two-family residences as it is such installations that are more likely to have diverse power and communications entrances and experience lightning-related problems. (urban/suburban environment with fewer elevated structures and extensive buried metallic objects). This is a companion proposal and is intended to correlate Section 800-40(a)(4)(New) with similar changes proposed for Sections 820-40(a)(4)(New) and 830-40(a)(4)(New).
PANEL ACTION: Accept.
PANEL STATEMENT: Editorially change "20 ft (6.0 m)" to "6.0 m (20 ft)" in both places of the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: Keeping grounding conductors as short as practicable has always been the rule. There is no technical substantiation for the 20 ft specification, however. The 20 ft rule is often not practical to maintain and would result in a huge backlash from homeowners whenever an additional electrode is to be placed and 6AWG wire to be used to bond it to the existing electrode system. The substantiation provided is not supported by sufficient data about safety problems.

(Log #1404)

16- 213 - (800-40(a)(5), (d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add to (a)(5):
Underground installations shall be installed to meet the minimum cover requirements of Table 300-5, except where the conductor rises for termination or transition to aboveground installation.
Revise (d) to read as follows:
~~Bonding of Electrodes. A bonding jumper not smaller than No. 6 copper or equivalent shall be connected between the communications grounding electrode and the power grounding electrode at the building or structure served where separate electrodes are used. Bonding together of all separate electrodes shall be permitted.~~
Supplementary Grounding Electrodes. Supplementary grounding electrodes shall be permitted to be connected to the grounding conductor specified in (a) above, but the earth shall not be used as the sole grounding conductor. Bonding together of all separate electrodes shall be permitted...
SUBSTANTIATION: Section 800-40(a) requires a minimum No. 14 grounding conductor run to the building or structure grounding electrode specified in (b). If a separate electrode is installed, it does not abrogate that section. If a No. 14 grounding conductor is so installed, but a shorter or more direct run to a nonrequired electrode is desired for additional safety, the wording of this section requires a minimum No. 6 copper as a bonding conductor between the driven electrode(s) and the electrodes of (b). Since the No. 14 grounding conductor alone complies with Code, the No. 6 requirement would, for economic reasons, deter the installation of a separate electrode, which diminishes any additional safety provided by such an electrode. Section 250-54, for other type installations permits the equipment grounding conductor to serve as a "bonding" conductor from supplementary electrodes.
In (a)(5), the proposal provides for buried conductor cover requirements. While burial depth may not relate to shock hazard, it does relate to physical damage. While section 800-48 may invoke Table 300-5 for raceways, it is limited to within buildings only, per the heading.
PANEL ACTION: Reject.
PANEL STATEMENT: The depth of burial requirements of Table 300-5 are specific to service conductors and are concerned with possible shock hazard. Section 800-40 deals with the grounding of the telecommunications primary protector, and bonding (800-40(d)) of spearate communications and power grounding electrodes. These conductors do not carry power, and in the case of bonding of separate electrodes, the conductor is a minimum of 6 AWG and is unlikely to be damaged by general yard maintenance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2210)

16- 214 - (800-40(b)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise text as follows:
(b) Electrode. The grounding conductor shall be connected as follows:
1. In Buildings or Structures With Grounding Means. To the nearest accessible location on the following:
a. The building or structure grounding electrode system as covered in Section 250-50
b. The grounded interior metal water piping system as covered in Section 250-104(a)
c. The power service accessible means external to enclosures as covered in Section 250-92(b)
d. The metallic power service raceway
e. The service equipment enclosure

f. The grounding electrode conductor or the grounding electrode conductor metal enclosure; or

g. To the grounding conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in Section 250-32.

For purposes of this section, the mobile home service equipment or the mobile home disconnecting means, as described in Section 800-30(b), shall be considered accessible.

2. In Buildings or Structures Without Grounding Means. If the building or structure served has no grounding means, as described in (b)(1):

a. To any one of the individual electrodes described in Section 250-50; or,

b. If the building or structure served has no grounding means, as described in (b)(1) or (b)(2)(a), to an effectively grounded metal structure or to a ground rod or pipe not less than 5 ft (1.52 m) in length and 1/2 in. (12.7 mm) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in Section 800-13 and at least 6 ft (1.83 m) from electrodes of other systems. Steam or hot water pipes or lightning-rod conductors shall not be employed as electrodes for protectors

SUBSTANTIATION: The new style manual requires titles for this section.

PANEL ACTION: Accept in Principle.

Revise the submitter's recommendation as follows:

Change 800-40(b)(1)(b) to read as follows:

"(b) The grounded interior metal water piping system, within 5 ft (1.52 m) from its point of entrance to the building, as covered in Section ~~250-104(a)~~ 250-50."

In the last sentence, replace the term "lightning-rod conductors" with "air terminal conductors (lightning-rod conductors)."

The remainder of the recommendation is unchanged.

PANEL STATEMENT: The change incorporates Proposals 16-215 and 16-216.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

COMMENT ON AFFIRMATIVE:

WIERENGA: After further research into NFPA 780 I believe the Panel should revise its action to replace the term "lightning-rod conductors" with the term "air terminal grounding conductors". This terminology would provide words that are clearly understandable and would remove the confusion that is present with the existing text ("lightning-rod conductors"). I think that a conductor that is installed on the outside of a building, to connect the air terminal of a lightning strike to the point of ground potential, could be best described as an "air terminal grounding conductor".

(Log #1671)

16- 215 - (800-40(b)(1)(b)): Accept

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Revise the text of 800-40(b)(1)(b) as follows:

(b) The grounded interior metal water piping system, within 5 ft (1.52 m) from its point of entrance to the building, as covered in Section ~~250-104(a)~~ 250-50.

SUBSTANTIATION: Section 250-50 (formerly Section 250-81) was revised in the 1993 NEC to eliminate the use of the interior metal water piping system as a grounding (bonding) conductor. This was done because of the increased use of nonconductive piping for repair and maintenance rendering the interior metallic water piping system electrically discontinuous. Section 800-40(b)(1)(b) has not been revised to reflect this change. This proposed revision underscores that the interior metal water pipe may no longer be used as an intersystem bonding conductor to interconnect communications and power, and correlates Section 800-40(b)(1)(b) with Section 250-50. Further, Section 250-104(a) concerns bonding of piping systems and building steel. Since connections to the interior metallic water piping systems are now permitted only within the first 5 feet of the pipe's entrance to the building, the more appropriate reference is Section 250-50. This is a companion proposal and is intended to correlate Section 820-40(b)(1)(b) with similar changes proposed for Sections 810-21(f)(1)(b), 820-40(b)(1)(b) and 830-40(b)(1)(b).

PANEL ACTION: Accept.

PANEL STATEMENT: The final text is in Proposal 16-214.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1806)

16- 216 - (800-40(b)(3)): Accept in Principle

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: In the last sentence, replace the term "lightning -rod conductors" with "air terminal conductors."

SUBSTANTIATION: Similar changes were made in Section 250-60 in the 1999 NEC. The use of the term "lightning rod" is inaccurate and inconsistent with the language of NFPA 780. In fact, in the context of NFPA 780, "down conductors," "main conductors," or "secondary conductors" would be more accurate, but "air terminal conductors" is sufficiently descriptive and is consistent with other language in the NEC.

(See Section 250-60.)

PANEL ACTION: Accept in Principle.

Revise the submitter's recommendation as follows:

In the last sentence, replace the term "lightning-rod conductors" with "air terminal conductors (lightning-rod conductors)."

PANEL STATEMENT: The parenthetical phrase was added to aid in the transition in terminology. The final text is shown in Proposal 16-214.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 18

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

DORNA: The revised wording to add "air terminal conductors" to me is more confusing then the current wording which is "lightning-rod conductors". The submitter's substantiation says: "The use of the term "lightning rod" is inaccurate…". I don't know about anybody else, but it sure describes exactly what it means, as far as I'm concerned. What is an "air terminal"? I, like some other panel member, thought it was a place where I caught my plane to go some where. So I guess an "air terminal conductor" is a conductor in the air terminal? Is that United's or Delta's terminal? In addition the panel statement said, "The parenthetical phrase was added to aid in the transition in terminology." If the term "air terminal conductor" is so accurate of a description and understood by everybody(except me), then why do we need the parenthetical? Because it is confusing and I believe the wording should stay as currently written.

SPEER: By adding the revised text "air terminal conductors" the code is made more confusing. Users of this code have a long standing and accepted understanding of the term "lightning rod and lightning rod conductors". Such industry terminology exists in the code today and we should refrain from making technical changes without improving the use or application of the code.

COMMENT ON AFFIRMATIVE:

WIERENGA: The revised wording for 820-3(a) should read as follows:

Adopt the use of the term air terminal (lightning rod) in 800-40(b)(3) for the following reasons:

1. The term "air terminal" has been used by NFPA 780 for many years.

2. NFPA 780-97 has included the term "air terminal" in its definitions.

3. Currently the NEC uses the term "air terminals" in Section 250-52, Section 250-60, Section 250-60 FPN No. 1, and Section 250-106.

4. Currently the NEC uses the term "air terminals (lightning rods)" in Section 800-40(d) FPN No. 1, and in Section 820-40 FPN No. 1.

(Log #1006)

16- 217 - (800-40(d), 810-21(j), 820-40(d), 830-40(d)): Reject

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise sections:

A bonding jumper not smaller than No. 6 copper ~~or equivalent,~~ or No. 4 aluminum or copper-clad aluminum shall be connected between the (communications) (radio and television equipment)

(antenna systems) grounding electrode system and the electric power grounding electrode system at the building or structure served, where separate electrodes are used. The bonding jumper shall be installed in accordance with Section 250-64. The points of attachment of the bonding jumper shall be accessible.

(Words in parenthesis to be applied to applicable article.)

SUBSTANTIATION: The phrase "or equivalent" is ambiguous; does it mean size, material, or both? Assuming the jumper is a safety-related requirement, other requirements of Section 250-64 relating to aluminum and earth, protection, splicing, enclosures, should apply, also requirements for accessible points of attachment as is required for other bonding jumpers.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 250-64 is specific to the grounding electrode conductor, that conductor intended to provide the service-to-grounding electrode connection at the building or structure. The referenced sections adequately address the grounding conductor, and that the text "or equivalent" is clear and in reference to the AWG. Further, the proposal does not follow the Rules Governing Committee Projects in that a single proposal was presented to cover multiple Sections.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4019)

16- 218 - (800-40(d), FPN No. 3 (New)): Reject

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add:

FPN No. 3: See Section 250-58 for additional common grounding electrode principles.

SUBSTANTIATION: This reference to 250-58 is needed in 800-40(d) so that the principles established for the common grounding electrodes can be safely implemented.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposed FPN is not accurate. Section 800-40(b) presently and adequately covers the connection of the grounding conductor to the building or structure grounding electrode system, and specifically references Section 250-50. There is typically only one intersystem grounding (bonding) conductor from the communications primary protector to the grounding electrode system and its connection to the building or structure grounding electrode system is already covered in Section 800-40 (b) and (c). Section 250-58 is specific to ac power grounding, grounding of conductor enclosures and equipment, and use of the same grounding electrode for grounding separate services, and is inappropriate for communications.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #3043)

16- 219 - (800-48): Accept in Principle in Part

SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit

RECOMMENDATION: Revise text as follows:

800-48. Raceways for Communications Wires and Cables. Where communications wire and cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3, or a listed nonmetallic raceway complying with Sections 800-51(j), (k), or (l), as applicable.

~~Exception: Listed nonmetallic communications raceway identified as general purpose, riser, or plenum in accordance with Section 800-51 and installed in accordance with Sections 331-7 through 331-14, where the requirements applicable to electrical nonmetallic tubing shall apply.~~

SUBSTANTIATION: This is a positive statement which eliminates an exception. The requirements of Article 331 have been included in a companion proposal to Section 800-51(j). The companion proposal makes the Code more user-friendly.

Other companion proposals are suggested for Sections 800-51(k) and (l), and Section 800-53(a).

PANEL ACTION: Accept in Principle in Part.

Revise text as follows:

"800-48. Raceways for Communications Wires and Cables. Where communications wires and cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3, or a listed nonmetallic raceway complying with Sections 800-51(j), (k), or (l), as applicable, and installed in accordance with Sections 331-7 through 331-14, where the requirements applicable to electrical nonmetallic tubing shall apply."

PANEL STATEMENT: The panel rejects the intent to include all the requirements of Article 331 for this requirement as stated in the substantiation. For example, the inclusion of 331-6 would impose requirements for conductor fill that are not appropriate to the application.

The panel accepts in principle the concept of converting exception into positive code language and has added revisions to the recommendation to more effectively convert the exception.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4038)

16- 220 - (800-48): Accept

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add text to read as follows:

Metal raceways and enclosures shall be grounded as required by 250-86.

SUBSTANTIATION: This provision brings metal raceways and enclosures for telecommunications cabling into conformance with the other sections of the code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #2466)

16- 221 - (800-48, Exception (New)): Accept in Principle

SUBMITTER: Dann M. Strube, Lanesville, IN

RECOMMENDATION: Add an exception to read as follows:

Exception No. XX: The conduit fill restrictions from Chapter 9, Table 1 shall not apply.

SUBSTANTIATION: There is no reason to restrict fill in this application, safety is not a factor. See Section 90-1.

PANEL ACTION: Accept in Principle.

Add an exception to read as follows:

Exception No. 2: Conduit fill restrictions shall not apply.

PANEL STATEMENT: There is no need to refer to the specific location in the code. The revised text meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #2797)

16- 222 - (800-48, Exception): Accept

SUBMITTER: Melvin J. Anna, Prescott, AZ

RECOMMENDATION: In Section 800-48, Exception, fourth word from the end, change "nonmeallic" to "nonmetallic."

SUBSTANTIATION: The word "nonmetallic" is misspelled.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1907)

16- 223 - (800-50, 800-51, 800-52, and 800-53): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: The purpose of this Proposal is to discontinue the use of all MP type cables for new installations, and after July 1, 2002 for adding to existing installations.
In Table 800-50, delete all information for MPP, MPR, MPG, and MP cables, and in FPN No.1 delete everything after "...fire resistance rating" on second line.
Delete 800-51(g) and renumber the subsections that follow.
In 800-52(d), delete "Types MPP, MPR, MPG, and MP multipurpose cables and" and renumber the subsections that follow.
In Table 800-53:
1. for Cable Type CMP, delete MPP as permitted substitution and replace with "None".
2. for Cable Type CMR, delete MPP and MPR.
3. for Cable Types CMG, CM, delete MPP, MPR, MPG, and MP.
4. for Cable Type CMX, delete MPP, MPR, MPG, and MP.

In Figure 800-53:
either delete the Figure as no longer being neccessary, or
delete the MP column, the horizontal arrows to the CM column, the line reading "Type MP-Multipurpose cable", and the two lines explaining the meaning of the horizontal arrows.
SUBSTANTIATION: As the original proposer of multipurpose cables, I think that it is appropriate for me to be the one that recommends that they be discontinued. Though there is still a need for multipurpose cables, that need has been filled in the marketplace by CM cables. Existing inventories of MP cables should be permitted to be used until the supply is exhausted.
Also see related Proposals for 760-61(d), Figure 760-61, Table 760-61, and Table 830-58.
PANEL ACTION: Reject.
PANEL STATEMENT: Although there are a few differences between multiconductor MP cable and CM cable, coaxial MP cable has a unique requirement. Consequently MP cable should be retained. Furthermore, if the listing of MP cable were to be eliminated, provisions for the reuse of these cables would need to be provided.
There was no wording to allow the continued use of Type MP Cable after July 1, 2002.
Removal of this type of cable while it is still being listed could lead to a problem.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1220)

16- 224 - (Table 800-50): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Table 800-50. Cable Markings as shown:
The fine print notes are unchanged.

Table 800-50. Cable Markings

Cable Marking	Type	Reference
MPP-50	Limited combustible multipurpose plenum cable	800-51(g), 800-53(a) and 800-51(h)
MPP	Multipurpose plenum cable	800-51(g) and 800-53(a)
CMP-50	Limited combustibille communications plenum cable	800-51(a), 800-53(a) and 800-51(h)
CMP	Communications plenum cable	800-51(a) and 800-53(a)
MPR	Multipurpose riser cable	800-51(g) and 800-53(b)
CMR	Communications riser cable	800-51(b) and 800-53(b)
MPG	Multipurpose general-purpose cable	800-51(g) and 800-53(d)
CMG	Communications general-purpose cable	800-51(c) and 800-53(d)
MP	Multipurpose general-purpose cable	800-51(g) and 800-53(d)
CM	Communications general-purpose cable	800-51(d) and 800-53(d)
CMX	Communications cable, limited use	800-51(e) and 800-53(d), Exception Nos. 1, 2, 3, and 4
CMUC	Under-carpet communications wire and cable	800-51(f) and 800-53(d), Exception No. 5

SUBSTANTIATION: If my proposal to establish a new section 800-51(h) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type CMP-50 and Type MPP-50. This proposal correlates Table 800-50 with those proposed changes.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation to delete the table row for MPP-50 cable and correct the spelling of combustible.
PANEL STATEMENT: Refer to panel action on Proposal 16-232 where references to MPP-50 cable were deleted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #2149)

16- 225 - (800-50 Exception No. 4): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: Delete Exception No. 4, if my Proposal for 800-51(g) is accepted.
SUBSTANTIATION: See substantiation for my Proposal for 800-51(g).
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 16-223.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1200)

16- 226 - (800-51): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise section 800-51 as follows:
Communications wires and cables shall have a voltage rating of not less than 300 volts and shall be listed in accordance with (a) through (j), and communications raceways shall be listed in accordance with (k) through (m). Conductors in communications cables, other than in a coaxial cable, shall be copper.
SUBSTANTIATION: If my proposal to establish a new section 800-51(h) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type CMP-50 and Type MPP-50. This proposal correlates section 800-51 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #3629)

16- 227 - (800-51): Reject
SUBMITTER: David B. Kiddoo, AlphaGary Corp.
RECOMMENDATION: With regards to Section 800-51, "Limited Combustion Cable" or "Permanent Plenum Cable" should not be accepted as an additional Listing based on the lack of testing definition, the absence of cable Listing capability, and the proven adequacy of an integrated and enhanced NFPA 262 test method.

NFPA 262 differentiates cables as to their fire performance to provide acceptable values for smoke generation and flame travel distance.

Proponents of "Limited Combustible Cable" or "Permanent Plenum Cable" have been actively soliciting support from cable market trade organizations, Code-Making Panel 16 Members or Alternates, cable manufacturers, etc. for a proposal to include a new paragraph in the Section to provide for a new Type of cable based on the definitions of "limited combustibility" and "smoke developed index" per the definitions in NFPA 90A. These definitions ONLY govern construction products for the installation of air conditioning and ventilating systems. The NFPA 255 and NFPA 259 fire test methods being promoted are NOT applicable to evaluate the fire hazard nor the geometries and material synergies in cables as they pertain to fire performance.

As these proposals have been made public through this solicitation for support, I wish to respond at this time to say that there is no safety record or fire performance issue necessitating any additional cable type of ruse in plenum cable applications. The inclusion of this new Type of cable is partially as a means to provide for an Exception from the proposed requirement in Section 800-52 to remove accumulations of abandoned cable. "Limited Combustible Cable" or "Permanent Plenum Cable" definitions seen in these proposals for a new cable Type are NOT based on any test method incorporating an actual cable fire hazard evaluation. Without adequate test methods and with the current status of the NFPRF "Permanent Plenum Cable Project", NO cables have been shown to meet the requirements proposed. The data generated in this Project have NOT been related to any appropriate fire hazard evaluation and should NOT be used to establish ANY relative cable fire performance comparisons.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975.

The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259 / NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Reject.
PANEL STATEMENT: The proposal does not conform to section 4-3.3(c) of the Regulations Governing Committee Projects. The submitter has made other proposals on this subject that meet the Regulations Governing Committee Projects. The issues raised in this proposal were addressed when the other proposals were considered.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 1
ABSTENTION: 1
EXPLANATION OF NEGATIVE:
ROMLEIN: See my Explanation of Negative Vote on Proposal 16-3.
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #2991)

16- 228 - (800-51(a)): Reject
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:
(a) Type CMP. Type CMP communications plenum cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air per Sections 300-22(b) and 300-22(c), and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.
SUBSTANTIATION: This proposal clarifies that Optical Fiber Cables Type CMP is suitable for use per Sections 300-22(b) and 300-22(c).
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed change does not add any value to a listing agency when it determines the appropriate listing requirements for plenum cable.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #501)

16- 229 - (800-51(a), FPN; 800-51(c), FPN; 800-51(d), FPN; 800-51(h), FPN; 800-51(i), FPN): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 800-51(a) FPN - change "5 ft (1.52 m)" to "1.52 m (5 ft)"
800-51(c) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
800-51(d) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
800-51(h) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
800-51(i) FPN - change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since the values specify a minimum safety level.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1520)

16- 230 - (800-51(a), FPN): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Change NFPA 262-1994 to NFPA 262-1999.
SUBSTANTIATION: NFPA 262 has been revised.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1219)

16- 231 - (Table 800-51(g)): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: In section 800-51(g) revise the reference to section 760-71(h) to 760-71(i).
SUBSTANTIATION: If my proposal to establish a new section 760-71(e) is accepted, a new section is added and the sections will be renumbered. The new section creates a new cable type, Type FPLP-50. This proposal correlates section 800-51(g) with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1198)

16- 232 - (800-51(h)): Accept in Principle
Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA 90A Technical Committee on Air Conditioning for comment.
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Renumber sections as follows:

Existing Section	Renumbered section
800-51(h)	800-51(i)
800-51(i)	800-51(j)
800-51(j)	800-51(k)
800-51(k)	800-51(l)
800-51(l)	800-51(m)

Add a new section 800-51(h).
(h) Limited Combustible Cables. Types CMP and MPP cables that are also listed as being limited combustible and having a maximum smoke developed index of 50 shall be permitted to be listed and marked as Types CMP-50 and MPP-50.
FPN No. 1: See NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems for a definition of limited combustible. See NFPA 255-2000, Standard Method of Test of Surface Burning Characteristics of Building Materials for a definition of the smoke developed index.
FPN No. 2: For further information on the requirements for materials in ceiling cavity and raised floor plenums, see NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems, Sections 2-3.10.1 Ceiling Cavity Plenum and 2-3.10.5 Raised Floor Plenum.

SUBSTANTIATION: The NFPA Standards Council has assigned primary responsibility for the fire protection of plenums to the Technical Committee on Air Conditioning. That technical committee is responsible for NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. The NFPA 90A (1996) requirements for ceiling cavity and raised floor plenums are shown below:

2-3.10 Plenums.

2-3.10.1 Ceiling Cavity Plenum. The space between the top of the finished ceiling and the underside of the floor or roof above shall be permitted to be used to supply air to, or return or exhaust air from, or return and exhaust air from, the occupied area, provided that the following conditions are met:

(a) All materials exposed to the airflow shall be noncombustible or limited combustible and have a maximum smoke developed index of 50.

Exception No. 1: The following materials shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft (1.5 m) or less when tested in accordance with the specified test method:

(a) Electrical wires and cables NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables

(b) Pneumatic tubing for control systems — UL 1820, Standard for Safety Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics Only

(c) Optical-fiber cables NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables

(d) Fire sprinkler piping — UL 1887, Standard for Safety Fire Test of Plastic Sprinkler Pipe for Flame and Smoke Characteristics

(e) Optical-fiber raceway NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables.

Exception No. 2: Smoke detectors.

Exception No. 3: Loudspeakers, loudspeaker assemblies, and their accessories shall be permitted in the ceiling cavity plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less when tested in accordance with UL 2043, Standard for Safety Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.

(b) The integrity of the firestopping for penetrations shall be maintained.

(c) Light diffusers, other than those made of metal or glass, used in air-handling light fixtures shall be listed and marked "Fixture Light Diffusers for Air-Handling Fixtures."

(d) The temperature of air delivered to these plenums shall not exceed 250°F (121°C).

(e) Materials used in the construction of a ceiling plenum shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

(f) Where the plenum is a part of a floor-ceiling or roof-ceiling assembly that has been tested or investigated and assigned a fire resistance rating of 1 hour or more, the assembly shall meet the requirements of 3-3.3.

2-3.10.2 Duct Distribution Plenum. A duct enclosure used for the multiple distribution or gathering of ducts or connectors shall be constructed of materials and methods specified in 2-3.1.

2-3.10.3 Apparatus Casing Plenum. A fabricated plenum and apparatus casing shall be permitted to be used for supply, return, or exhaust air service and shall be constructed of materials and methods specified in 2-3.1, and in accordance with the following:

(a) The casing and plenum construction standards in SMACNA HVAC Duct Construction Standards — Metal and Flexible;

(b) The 1992 ASHRAE Handbook — HVAC Systems and Equipment;

(c) Paragraph 2-3.3 for all air duct coverings, duct lining acoustical liner/cells, and miscellaneous materials.

2-3.10.4 Air-Handling Unit Room Plenum.

(a) Individual rooms containing an air-handling unit(s) gather return air from various sources and combine the return air within the room for returning to the air-handling unit. Duct covering, duct lining, acoustical liner/cells, and miscellaneous materials shall comply with 2-3.3.

(b) Air-handling unit room plenums shall not be used for storage or occupied other than during equipment servicing.

2-3.10.5 Raised Floor Plenum. The space between the top of the finished floor and the underside of a raised floor shall be permitted to be used to supply air to, or return exhaust air from, or return and exhaust air from, the occupied area, provided that the following conditions are met:

(a) All materials exposed to the airflow shall be noncombustible or limited combustible and shall have a maximum smoke developed index of 50.

Exception No. 1: The following materials shall be permitted in the raised floor plenum where listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft (1.5 m) or less when tested in accordance with the specified test method:

(a) Electrical wires and cables NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables

(b) Pneumatic tubing for control systems — UL 1820, Standard for Safety Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics Only

(c) Optical-fiber cables NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables

(d) Fire sprinkler piping — UL 1887, Standard for Safety Fire Test of Plastic Sprinkler Pipe for Flame and Smoke Characteristics

(e) Optical-fiber cable raceway NFPA 262, Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables.

Exception No. 2: Raised floors, intermachine cables, electrical wires, listed plenum optical-fiber cable raceways, and optical-fiber cables in computer/data processing rooms where these rooms are designed and installed in accordance with NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment.

Exception No. 3: Smoke detectors.

(b) The integrity of the firestopping for penetrations shall be maintained.

(c) The temperature of air delivered to these plenums shall not exceed 250°F (121°C).

(d) Materials used in the construction of a raised floor plenum shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the plenum.

Exception No. 3: Use of egress corridors as part of an engineered smoke-control system.

Exception No. 4: In detention and correctional occupancies with corridor separations of open construction (e.g., grating doors or grating partitions).

Establishing Types CMP-50 and MPP-50 cables is a step toward correlating NFPA 70, the National Electrical Code and NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. Types CMP-50 and MPP-50 cables will be superior plenum cables because they will qualify for use by meeting the basic rule for plenum materials, i.e., limited combustible and a smoke developed rating below 50, and meeting the flame spread and smoke requirements of the NFPA 90A Exception which are identical to those in the NEC fine print notes. Cables that meet the CMP-50/MPP-50 requirement typically have less than 1/5 the smoke production of CMP/MPP rated cables.

PANEL ACTION: Accept in Principle.

Revise the submitter's recommendation as follows:

1) Strike "and MPP" and "and MPP-50"

2) Change "cables" to "cable" wherever they appear

3) Change "Types" to "Type" wherever they appear.

PANEL STATEMENT: Multipair MPP cables are essentially identical to multipair CMP cables, hence there is no need to promulgate another cable type.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3050)

16- 233 - (800-51(j)): Reject
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise to read as follows:
(j) Plenum Communications Raceways. ~~Plenum c~~ Communications raceways and associated fittings and boxes installed in ~~listed as plenum optical fiber raceways shall be permitted for use in ducts, plenums, and~~ other spaces used for environmental air ~~and~~ shall ~~also~~ be listed as having ~~adequate~~ fire-resistant and low-smoke producing characteristics equivalent to those required by NFPA 262. Plenum raceway shall be permitted to contain only listed plenum-rated conductors or cables having the same fire-resistant and low-smoke producing characteristics. Installation shall comply with Article 331 and Section 300-21.
Exception: The thermal barrier required in Section 331-3(2) shall not be required for listed plenum communications raceway.
SUBSTANTIATION: • It is not necessary to grant permission for use in these spaces as that is already covered in Section 800-53(a).
• Open plenum-rated wiring is not permitted in Section 300-22(b), which covers ducts and plenums, therefore the raceway should only be permitted in other spaces used for environmental air.
• Placing information on the type of cables acceptable in these raceways in this section makes the Code more user friendly and less prone to error.
• Fittings and boxes making up the raceway system must be of the same material as the raceway.
• Plenum, riser, and general-purpose communications raceway all have different characteristics. The plenum-rated raceway has to be listed to UL 910 (which is equivalent to NFPA 262 but cannot be referenced in the Code except in FPN). Reference to NFPA 262 does not change the current requirements, but does make the testing requirement for plenum rating mandatory.
• The exception that permits installation of the plenum-rated raceway without a thermal barrier has been included for the 2002 NEC while the issue of permanent plenum-rated wiring is being reviewed by the NFPA 90A Committee and others.
See companion proposals to revise Sections 800-48, 800-51(k), 800-51(l), and 800-53(a) for correlation.
PANEL ACTION: Reject.
PANEL STATEMENT: The substantiation provided by the submitter does not provide rationale for restricting listed plenum communications raceways from their current acceptable applications.
The panel rejects the intent to include all the requirements of Article 331 for this requirement. For example, the inclusion of 331-6 would impose requirements for conductor fill that are not appropriate to the application.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #3045)

16- 234 - (800-51(k)): Reject
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise to read as follows:
(k) Riser Communications Raceway. Riser communications raceways shall be listed as having adequate fire-resistant characteristics capable of preventing the carrying of fire from floor to floor. Installation of riser communications raceway shall be in accordance with Article 331.
SUBSTANTIATION: Riser communication raceway is ENT which is covered in the Code by Article 331. Article 331 describes ENT as flame retardant, which is not the same test as UL 1666 which is used for listing of CMR cable. There is no justification for installation practices different from ENT used for other purposes, and the thermal barrier requirement in Section 331-3(2) was added after review by the Toxicity Advisory Committee. Even though CMR cable can be used in some applications without being installed in a raceway, adding the raceway significantly adds to the fireload and to the products of combustion. There is also the danger that the raceway will be used for power conductors once it is in place.
This is a companion proposal to suggested changes to Sections 800-48, 800-51(j) and (l), and 800-53(a).
PANEL ACTION: Reject.
PANEL STATEMENT: The title of Section 800-51 is Listing Requirements for Communications Wires and Cables.
The proposal contains installation requirements. Installation requirements are inappropriate for a section on listing requirements.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #3046)

16- 235 - (800-51(l)): Accept in Part
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise to read as follows:
(l) General-Purpose Communications Raceway. General-purpose communications raceways shall be listed as resistant to the spread of fire and shall be installed in accordance with Article 331.
SUBSTANTIATION: General-purpose communications raceway is similar to ENT, except that it is thinner, lighter weight. This would make it more likely to burn than regular ENT. There is no justification for not requiring the same thermal barrier as that required for ENT. Although CM communications cable can be used without raceway, the addition of this raceway adds substantially to the material available for fireload and products of combustion. The term "resistant to the spread of fire" is the same as that used for general purpose communications cable in Section 800-51(d). They should be the same, particularly as there is no way to show mandatory test requirements to assure what is meant by the term. At least this way it can be referenced back to the FPN in 800-51(d).
One of the failings of the NEC relative to fire testing is that terms such as flame retardant (which is used for ENT in Article 331), flame resistant, resistant to the spread of fire, fire retardant, capable of preventing carrying of fire from floor to floor, etc., are not defined in the Code. It would be very helpful in determining appropriate use if Article 100 contained information to make this determination. With globalization this becomes ever more important. Proposals to add definitions for these terms have been submitted to Panel 1 in the past, but were rejected. Panel 16, with its multitude of listing requirements, might be a catalyst for this change. If you add them to Article 800 via a panel proposal perhaps they would end up later in Article 100.
This is a companion proposal to suggested changes to 800-48, 800-51(j) and (k), and 800-53.
PANEL ACTION: Accept in Part.
Revise the submitter's recommendation to read as follows:
"(l) General-Purpose Communications Raceway. General-purpose communications raceways shall be listed as being resistant to the spread of fire."
PANEL STATEMENT: The change from "having adequate fire resistant characteristics" to "being resistant to the spread of fire" is accepted to use the same wording as that which applies to cables in 800-51(d). This is an editorial change.
The title of Section 800-51 is Listing Requirements for Communications Wires and Cables.
The proposal contains installation requirements. Installation requirements are inappropriate for a section on listing requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1026)

16- 236 - (800-52): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise 800-52 as shown:
800-52. Installation of Communications Wires, Cables, and Equipment
Communications wires and cables from the protector to the equipment or, where no protector is required, communications wires and cables attached to the outside or inside of the building shall comply with (a) through (e).
(a) Separation from Other Conductors.

(1) In Raceways, Boxes, and Cables.

a. Other Power-Limited Circuits. Communications cables shall be permitted in the same raceway or enclosure with cables of any of the following:

1. Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725

2. Power-limited fire alarm systems in compliance with Article 760

3. Nonconductive and conductive optical fiber cables in compliance with Article 770

4. Community antenna television and radio distribution systems in compliance with Article 820

5. Low power network-powered broadband communications circuits in compliance with Article 830

b. Class 2 and Class 3 Circuits. Class 1 circuits shall not be run in the same cable with communications circuits. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits, in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall meet the requirements of this article. The cables shall be listed as communications cables or multipurpose cables.

Exception: Cables constructed of individually listed Class 2, Class 3, and communications cables under a common jacket shall not be required to be classified as communications cable. The fire-resistance rating of the composite cable shall be determined by the performance of the composite cable.

c. Electric Light, Power, Class 1, Nonpower-Limited Fire Alarm, ~~and~~ Medium and High Power Network-Powered Broadband Communications Circuits.

1. In Raceways, Compartments, and Boxes. Communications conductors shall not be placed in any raceway, compartment, outlet box, junction box, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits.

Exception No. 1: Where all of the conductors of electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuits are separated from all of the conductors of communications circuits by a barrier.

Exception No. 2: Power conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to communications equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum of 0.25-in. (6.35-mm) separation from the communications circuit conductors.

(2) Other Applications. Communications wires and cables shall be separated at least 2 in. (50.8 mm) from conductors of any electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits.

Exception No. 1: Where either (1) all of the conductors of the electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuits are in a raceway or in metal-sheathed, metal-clad, nonmetallic-sheathed, Type AC, or Type UF cables, or (2) all of the conductors of communications circuits are encased in raceway.

Exception No. 2: Where the communications wires and cables are permanently separated from the conductors of electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuits by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the wire.

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods.

(c) Equipment in Other Space Used for Environmental Air. Section 300-22(c) shall apply.

(d) Cable Trays. Types MPP, MPR, MPG, and MP multipurpose cables and Types CMP, CMR, CMG, and CM communications cables shall be permitted to be installed in cable trays.

(e) Support of Conductors. Raceways shall be used for their intended purpose. Communications cables or wires shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.

Exception: Overhead (aerial) spans of communications cables or wires shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such conductors.

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. This proposal amends the separation rules between circuits to provide appropriate separation from these new high-power communications circuits.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1736)

16- 237 - (800-52(a)(1)(c)(1) Exception No. 3 (New)): Accept

SUBMITTER: Nick Marchitto, Otis Elevator Co./Rep. Nat'l Elevator Industry Inc. (NEII)

RECOMMENDATION: Add the following exception:

Exception No. 3: As permitted by Section 620-36.

SUBSTANTIATION: To recognize that in elevator systems, communication cables are permitted to be run in the same raceway or traveling cable subject to the requirements of Section 620-36 (i.e. insulated for the maximum voltage within the cable or raceway system).

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1807)

16- 238 - (800-52(a)(1)c): Accept

SUBMITTER: Noel Williams, Noel Williams Consulting

RECOMMENDATION: Revise heading of the subsection (a)(1)(c) to read as follows:

(c) Electric Light, Power, Class 1, Nonpower-Limited Fire Alarm, and Medium Power Network-Powered Broadband Communications Circuits In Raceways, Compartments and Boxes.

(Eliminate number 1. but retain the rest of the language of the subsection.)

SUBSTANTIATION: Currently, (c) is subdivided into numbered paragraph 1. with no paragraph 2. This arrangement is confusing and inconsistent with the editorial style of the document.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4275)

16- 239 - (800-52(a)(1)c): Accept in Principle

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc./Rep. Massachusetts Electrical Code Advisory Committee

RECOMMENDATION: Make no change in the requirements. Delete the heading "1." and the title thereof "In Raceways, Compartments and Boxes." [The result is that "(c)" becomes the title of the rule that in the NEC has the title: "1. In Raceways, Compartments, and Boxes."]

SUBSTANTIATION: This proposal is for editorial clarity. The 1996 NEC had two numbered paragraphs under Section 800-52(a)(1)c., one on enclosures of various sorts and the second on wiring in shafts. The 1999 NEC has effectively incorporated the requirements for shafts elsewhere in this section, allowing that paragraph to be deleted, which was done. That left an orphaned paragraph "1." with no subsequent paragraphs. Ordinarily this wouldn't be of great concern, however, in this case what happens to immediately follow this text is "(2) Other Applications." When users see a "1" they look for a "2", and in this case the temptation will be to see (2) as part of "(c)", which it is not. It is the second numbered paragraph below (a), and has nothing to do with (a)(1)(c). This proposal is in the interest of good code and uniformity of interpretation and application.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-238. The revised text meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #502)

16- 240 - (800-52(a)(1)c1 Exception No. 2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "0.25 in. (6.35 mm)" to "6.35 mm (0.25 in.)"
The CMP should consider rounding to "6 mm (0.25 in.)" if safety would not be compromised.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since the dimensions specify minimum values for safety.
PANEL ACTION: Accept in Principle.
In the submitter's recommended text revise "6.35 mm (0.25 in.)" to "6 mm (0.25 in.)."
PANEL STATEMENT: The Panel has accepted the TCC suggestion to round to "6 mm (0.25 in.)" and has included in the panel action text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1007)

16- 241 - (800-52(a)(2)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Other Applications. Communications wires and cables shall be separated at least 2 in. (508 mm) from open conductors of any electric light, power, Class 1, nonpower-limited fire, alarm, or medium power network-powered broadband communications circuits, unless the communications wires and cables are in a raceway or permanently separated from the conductors of the other circuits by a continuous firmly fixed nonconductor such as porcelain tubes or flexible tubing in addition to the insulation on the wire.
Delete Exception No. 1 and No. 2.
SUBSTANTIATION: Editorial. The proposal simplifies and maintains the requirements. The rule and exceptions infer the separation applies to open conductors, not other wiring methods indicated in Chapter 3 which would otherwise be used, as indicated in Exception No. 1 for which separation is not required. Note that Type UF cable of Exception No. 1 literally includes single-conductor type which may not be intended.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "open conductor" is not defined.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2778)

16- 242 - (800-52(a)(3)): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Add new text as follows:
Raceways or cable trays containing communications circuits shall not contain any pipe, tube, or equal for steam, water, air gas, drainage, or any service other than electrical.
SUBSTANTIATION: There presently is no reference in Article 800 that prohibits this practice.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 16-70. This proposal deals with the same issues as Proposal 16-70 and is rejected for the same reasons.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1127)

16- 243 - (800-52(b)): Accept in Principle in Part
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 800-52(b) as follows:
(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed.
Exception: Type CMP-50 and Type MPP-50 cables shall not be required to be removed.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with section 300-21.
The proposed fine print No. 1 note was copied from the first sentence of the fine print note in section 300-21. It assists installers in locating firestop information.
Cables installed in plenums (other space used for environmental air) are often abandoned, rather than removed, when no longer in use. Consequently, there may exist layer upon layer of abandoned cable in a hung ceiling as communications systems are changed and modernized. Some of this abandoned cable may be nonplenum cable that was installed before plenum cable requirements were in place. These accumulations of abandoned cables serve no useful purpose and unnecessarily increase the potential fire load. The wording of the proposed prohibition on allowing abandoned cables to accumulate is based on NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment, section 4-2.4 that states "Abandoned cables shall not be allowed to accumulate. Cables not identified for future use shall be removed."
This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only accumulations of abandoned cable, thus avoiding a burdensome requirement, which would require the removal of insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cable that is in place, plenum cable as well as non-plenum cable that was installed before the plenum cable requirements were in the Code. The proposed second sentence, Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed, deals with already abandoned cable. The NEC requirements for plenum cable were first promulgated in the 1975 NEC, consequently, abandoned cables in older buildings often include unlisted cable along with listed plenum cable.
Other sections of the NEC require the removal of abandoned wiring. ARTICLE 354 — Underfloor Raceways, Section 354-7. Discontinued Outlets When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.
ARTICLE 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets

When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case of abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 305 — Temporary Wiring, Section305-3(d). Time Constraints, (d) Removal. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

Exempting Types CMP-50 and MPP-50, which are plenum cables that are also listed as limited combustible with a smoke developed rating of less than 50, correlates with NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. Correlating with NFPA 90A acknowledges that the NFPA Standards Council has assigned primary responsibility for fire protection of plenums to NFPA 90A. The basic requirement for materials in a plenum in NFPA 90A is that the materials either be noncombustible or limited combustible with a smoke developed rating of less than 50.

PANEL ACTION: Accept in Principle in Part.

The part being rejected is the recommendation to add the exception. The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the exception.

There is inadequate justification to leave any debris (e.g. abandoned cable).

The remaining part of the proposal is accepted in principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-250.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1537)

16- 244 - (800-52(b)): Accept

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Revise 800-52(b) as follows:

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through ~~fire~~ fire-resistance-rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods to maintain the fire resistance rating.

SUBSTANTIATION: This proposed revision underscores the true purpose of the rule, to maintain the fire resistance rating, and correlates 800-52(b) with 300-21.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #3232)

16- 245 - (800-52(b) (New)): Accept in Principle

SUBMITTER: Hallie Smith-Petee, The Geon Co.

RECOMMENDATION: Add to Section 800-52(b):

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts,plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.

SUBSTANTIATION: Cable congestion in plenum spaces is becoming a problem. Numerous generations of cables are present in plenums, causing restrictions in air flow as well as increased fuel load. Electrical cables, fiber optic cables, and various control/signal cables are present in is area of the ceiling or raised floor.

The proposed wording is based on NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment, Section 4-2.4 which states, "abandoned cables shall not be allowed to accumulate. Cables not identified for future use shall be removed." This wording would enable the NEC to be consistent with NFPA code language.

Removal of abandoned cable applies to all cable contained in the air-handling space, nonplenum as well as plenum-rated products. Since the NEC did not require the use of plenum-rated cables until 1975, abandoned cables in older buildings may contain unlisted, potentially hazardous cable. Removal of unused cable decreases latent fuel load, and improves air flow within the plenum or air-handling space. Recent innovations in data and communication systems have contributed to the installation of several generations of enhanced plenum-rated cables in the plenum space. Layers upon layers of cable may exist, because abandoned cable is not required to be removed.

This modification to the NEC would promote safety as well as address potential concerns regarding air movement within the plenum space.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-250.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3255)

16- 246 - (800-52(b)): Accept in Principle in Part

SUBMITTER: Allen C. Weidman, Society of the Plastics Industry

RECOMMENDATION: Insert a new Section 800-52(b) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods to maintain the fire resistance rating. Cables in ducts, plenums, and other spaces used for environmental air, which are not intended for future use shall be removed. Cables marked type CL2PP and type CL3PP are not required to be removed.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: 1. First two (2) sentences were copied from Article 300.21.

2. Fine print note was copied from Article 300.21s fine print note.

3. Cables installed in plenums and other space used for environmental air are very often left in these spaces after they have been removed from service. Therefore, many generations of unused cables can exist in the ceiling voids from previous systems which are no longer in service or intended for future use. There may also be cables, which are over 20 years old, which are not plenum rated cables. These unused cables increase the potential fuel load in plenums and other space used for environmental air.

This concept of removing unused cables, which will not be used in the future, is not a new concept. Other articles of the NEC have similar requirements. See the following Articles:

(a) 305, (b) 354, (c) 356, (d) 358

Also note NFPA 75 has a similar requirement.

Note: Underwriter Laboratories and Intertek (ETL), both are in a position to start listing this new type of plenum cable having of "Limited Combustibility" requirement, also potentially known as "permanent plenum cable, e.g., CL2PP, CL3PP, OFCPP, OFNPP, CMPP, and MPPP. There is a research program in place at FPRF to establish the protocol to list PP cables.

PANEL ACTION: Accept in Principle in Part.

The part being rejected is the recommendation to add the last sentence before the FPN. The panel actions in other proposals

adopting the requirement to remove abandon cables satisfies the proposal other than the last sentence before the FPN. There is inadequate justification to leave any debris (e.g. abandoned cable).

The remaining part of the proposal is accepted in principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3630)

16- 247 - (800-52(b)): Accept in Principle
SUBMITTER: David B. Kiddoo, AlphaGary Corp.
RECOMMENDATION: Revise 800-52(b) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, ventilation ducts or air-handling plenums shall be made so that the possible spread of fire or fire resistant-rated walls, partitions, floors or ceilings shall be firestopped using approved methods to maintain the fire resistant rating. Abandoned cables in these spaces, shafts, ducts and plenums shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in these spaces, shafts, ducts, plenums, and other space used for environmental air, shall be removed.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

FPN No. 2: Definition of acceptable cable fire performance in various applications are described in Section 800-51.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC

meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-250 which meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3897)

16- 248 - (800-52(b)): Accept in Principle in Part

SUBMITTER: Marek Kapuscinski, NORDX/CDT, Inc.

RECOMMENDATION: Revise Section 800-52(b) as follows:

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire-resistance rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods to maintain the fire resistance rating. Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed.

Exception: Type CMP 50 and Type MPP 50 cables shall not be required to be removed.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with Section 300-21.

The proposed fine print note No. 1 was copied from the first sentence of the fine print note in Section 300-21. It assists installers in locating firestop information.

Cables installed in plenums (other space used for environmental air) are often abandoned, rather than removed, when no longer in use. Consequently, there may exist layer upon layer of abandoned cable in a hung ceiling as communications systems are changed and modernized. Some of this abandoned cable may be nonplenum cable that was installed before plenum cable requirements were in place. These accumulations of abandoned cables serve no useful purpose and unnecessarily increase the potential fire load. he wording of the proposed prohibition of allowing abandoned cables to accumulate is based on NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment, Section 4-2.4 that states "Abandoned cables shall not be allowed to accumulate. Cables not identified for future use shall be removed."

Acceptance of this proposal will result in cable removal being included in the scope of the installation of a new communications and data system. The contractor will remove the old cable before installing the new system.

This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only accumulations of abandoned cable thus avoiding a burdensome requirement, which would require the removal of insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cables that is in place, plenum cable as well as nonplenum cable that was installed before the plenum cable requirements were in the code. The proposed second sentence, Accumulations of abandoned cables, not identified for future use, in ducts, plenums and other space used for environmental air, shall be removed, deals with already abandoned cable. The NEC requirements for plenum cable were first promulgate in the 1975 NEC consequently abandoned cables in older buildings often include unlisted cable along with listed plenum cable.

Other sections of the NEC require the removal of abandoned wiring.

Article 354 —Underfloor Raceways, Section 354-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

Article 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

Article 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case of abandoned outlets on loop wiring, shall be allowed in raceways.

Article 305 — Temporary Wiring, Section 305-3(d). Time Constraints, (d) Removal. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

Exempting Types CMP 50 and MPP 50, which are plenum cables that are also listed as limited combustible with a smoke developed rating of less than 50, correlates with NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems. Correlating with NFPA 90A acknowledges that the NFPA Standards Council has assigned primary responsibility for fire protection of plenums to NFPA 90A. The basic requirement for materials in a plenum in NFPA 90A is that the materials either be noncombustible or limited combustible with a smoke developed rating of less than 50.

PANEL ACTION: Accept in Principle in Part.

The part being rejected is the recommendation to add the exception. The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the exception. There is inadequate justification to leave any debris (e.g. abandoned cable).

The remaining part of the proposal is accepted in principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-250.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3968)

16- 249 - (800-52(b) (New)): Accept in Principle

SUBMITTER: Hallie Smith-Petee, The Geon Co.

RECOMMENDATION: Add text to Section 800-52(b) to read as follows:

(b) Spread of Fire or Products of Combustion: Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be so made that the possibile spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods. Abandoned cables present in ducts, plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.

SUBSTANTIATION: Statement of Problem:

Cable congestion in plenum spaces is becoming a problem. Numerous generations of cables are present in plenums, causing restrictions in air flow as well as increased fuel load. Electrical cables, fiber optic cables, and various control/signal cables are present in this area of the ceiling or raised floor.

Substantiation for Proposal:

The proposed wording is based on NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment, section 4-2.4 which states, "(a)bandoned cables shall not be allowed to accumulate. Cables not identified for future used shall be removed." This wording would enable the NEC to be consistent with NFPA code language.

Removal of abandoned cable applies to all cable contained in the air-handling space, nonplenum as well as plenum-rated products. Since the NEC did not require the use of plenum-rated cables until 1975, abandoned cables in older buildings may contain unlisted, potentially hazardous cable. Removal of unused cable decreases latent fuel load, and improves air flow within the plenum or air-handling space. Recent innovations in data and communication systems have contributed to the installation of several generations of enhanced plenum-rated cables in the plenum space. Layers upon layers of cable may exist, because abandoned cable is not required to be removed.

This modification to the NEC would promote safety as well as address potential concerns regarding air movement within the plenum space.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-250.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #4052)

16- 250 - (800-52(b)): Accept in Principle

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Revise Section 800-52(b) as follows:

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed where practicable.

FPN : Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: BICSI members have been extensively involved with the design and installation of telecommunications cabling. Technology changes have resulted in newer high performance cabling being installed in support of those technologies. We have observed excessive accumulations of abandoned cabling adding to the fuel loading within plenum spaces. This proposal is offered to the NFPA to help reduce the fuel load within these plenum areas.

Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with section 300-21.

The proposed fine print No. 1 note was copied from the first sentence of the fine print note in section 300-21. It assists installers in locating firestop information.

Acceptance of this proposal will result in cable removal being included in the scope of the installation of a new communications and data system. The contractor will remove the old cable before installing the new system.

Acceptance of this proposal will result in many BICSI members specifying abandoned cable removal within the scope of the installation of new communications and data systems.

In two separate proposals, we have offered definitions for "abandoned cable" and "excessive accumulation of abandoned cables".

This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only excessive accumulations of abandoned cable, thus avoiding a burdensome requirement of removing insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cable that is in place, plenum cable as well as non-plenum cable that was installed before the plenum cable requirements were in the Code. The proposed second sentence, Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed, where practicable, deals with already abandoned cable. The wording of "where practicable" aid the situations where cable may be intertwined and cannot be removed without disruption of active services. The NEC requirements for plenum cable were first promulgated in the 1975 NEC, consequently, abandoned cables in older buildings often include unlisted cable along with listed plenum cable.

Other sections of the NEC require the removal of abandoned wiring.

ARTICLE 354 — Underfloor Raceways, Section 354-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case of abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 305 — Temporary Wiring, Section 305-3(d). Time Constraints, (d) Removal. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

PANEL ACTION: Accept in Principle.

Revise Section 800-52(b) as follows:

"(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables not intended for future use shall not be permitted to remain.

FPN : Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made."

PANEL STATEMENT: The second paragraph has been revised to provide a clear concise requirement.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:
BRUNSSEN: See my Comment on Affirmative Vote on Proposal 16-80.
DORNA: The revised wording in 800-52(b) for the last sentence before the FPN should be:
"Abandoned cables ~~not intended for future use~~ shall not be permitted to remain."
The use of the phrase "not intended for future use" is redundant. The definition of "abandoned cable" has this phrase in the definition. To restate this phrase would be grammatically incorrect.
JOHNSON: See my Comment on Affirmative on Proposal 16-80.
KAHN: See my Comment on Affirmative on Proposal 16-80.
WIERENGA: The revised wording for 800-52(b) for the last sentence before the FPN should read as follows:
"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall ~~not~~ be removed."
The use of the phrase "not intended for future use" is redundant because it is already included in the definition of "abandoned cable". The deletion of the words "not" and "permitted to remain" can be readily stated by use of positive code language using the word "removed".
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1008)

16- 251 - (800-52(c)(2)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
In Shafts. Communications wires and cables run in the same shaft with open individual conductors of electric light or power, Class 1, or nonpower-limited fire alarm circuits shall be separated from the electric light or power, Class 1, or nonpower-limited fire alarm circuit conductors by not less than 2 in. (50.8 mm) unless the communications wires and cables are installed in a raceway.
Exception No. 1: Delete.
Exception No. 2: Delete.
SUBSTANTIATION: Editorial. The gist of this rule and the exception infer the conductors of the light or power, Class 1, and fire alarm circuits are open individual conductors, even though such use is restricted by the code and perhaps other codes. If they are not open conductors they are likely to be one of the wiring methods indicated in Exception No. 1 and 2. The condition of raceway use in Exception No. 2 is redundant to the same condition of Exception No. 1. The metal-sheathed (Type MI), metal-clad (Type MC) ignores Type AC which should also be suitable. Type UF cable per Article 339 encompasses single-conductor type which doesn't appear intended. Section 760-25 apparently allows the wiring method of Article 320 where suitable.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "open individual conductor" is not defined.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2942)

16- 252 - (800-52(d)): Reject
SUBMITTER: Richard J. Buschart, PC & E Inc.
RECOMMENDATION: At the end of this section, add the following paragraph:
"The sum of the cross sectional areas of the above cables shall not exceed 60 percent of the cross sectional area at any section of the cable tray."
SUBSTANTIATION: The CTI have been asked by members of various organizations, the maximum cable tray fill where the cable tray contains communications permitted in this section. This proposal is based on discussions with members of telecommunication standard subcommittees.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided any technical substantiation for this proposal.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2992)

16- 253 - (800-52(d)): Accept
SUBMITTER: David H. Kendall, Carlon, Lamson & Sessions
RECOMMENDATION: Revise text as follows:
(d) Cable Trays. Types MPP, MPR, MPG, and MP multipurpose cables and Types CMP, CMR, CMG, and CM communications cables shall be permitted to be installed in cable trays. Communication Raceways as described in 800-51 shall be permitted to be installed in cable trays.
SUBSTANTIATION: Optical Fiber/Communication Raceways are listed raceways used in plenum, riser, and general purpose areas of a building. These listed raceways are commonly used in cable trays. Optical Fiber/Communication Raceways are used to separate the Optical Fiber Cable and/or Telecommunications Cable from the other wiring methods found in the cable tray. These raceways are made of the same materials as the cable jacket and are used as a cable management system.
PANEL ACTION: Accept.
PANEL STATEMENT: Add an "s" to the word communication.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1201)

16- 254 - (Table 800-53): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Table 800-53. Cables Uses and Permitted Substitions, as shown below:
The note is unchanged.
SUBSTANTIATION: If my proposal to establish a new section 820-51(b) is accepted, a new section is added and the sections will be renumbered. The new section creates a new type of cable, Type CATVP-50. This proposal correlates Table 820-53 with those proposed changes.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation as follows:
Strike "MPP-50" wherever it appears.
PANEL STATEMENT: The revision reflects the panel action on Proposal 16-232.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1

Table 800-53. Cable Uses and Permitted Substitutions

Cable Type	Use	References	Permitted Substitutions
CMP	Communications plenum cable	800-53(a)	MPP-50, MPP
CMR	Communications riser cable	800-53(b)	MPP-50, MPP, CMP-50, CMP, MPR
CMG, CM	Communications general-purpose cable	800-53(d)	MPP-50, MPP, CMP-50, CMP, MPR, CMR, MPG, MP
CMX	Communicatons cable, limited use	800-53(d)	MPP-50, MPP, CMP-50, CMP, MPR, CMR, MPG, MP, CMG, CM

COMMENT ON AFFIRMATIVE:
KAUFMAN: In addition to revising Table 800-53, Figure 800-53 should be revised in order to illustrate the changes in Table 800-53, furthermore Type CMP-50 should be added to Table 800-53 as a premitted substitute for Type CMP.

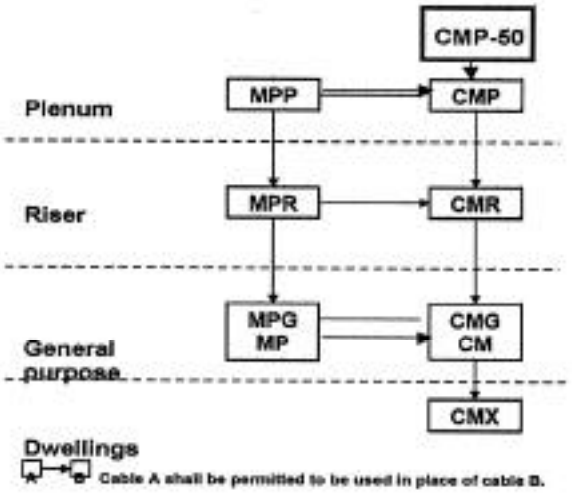


Figure 800-53. Cable Substitution Hierarchy

EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3044)

16- 255 - (800-53(a)): Reject
SUBMITTER: Elaine Thompson, Patricia Horton, Allied Tube & Conduit
RECOMMENDATION: Revise to read as follows:
800-53. Applications of Listed Communications Wires and Cables, and Communications Raceways. Communications wires and cables shall comply with (a) through (f).
(a) Plenums and Other Environmental Air Spaces. Cables installed as open wiring in ~~ducts, plenums, and~~ other spaces used for environmental air, as described in Section 300-22(c), shall be Type CMP. ~~Also, l~~Listed plenum communications raceways complying with Section 800-51(j) shall be permitted to be installed in ~~ducts and plenums as described in Section 300-22(b) and in~~ other spaces used for environmental air as described in Section 300-22(c). Only Type CMP cable shall be permitted to be installed in these raceways. Other type conductors shall be installed in EMT, IMC, RMC, FMC, or, where accessible, surface metal raceway or metal wireway with metal covers or solid bottom metal cable tray with solid metal covers.
~~Exception: Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with Section 300-22.~~
SUBSTANTIATION: • Plenum-rated wiring is not permitted in Section 300-22(b) which covers fabricated ducts and plenums, therefore Type CMP cable and plenum communications raceway have been limited to 300-22(c).
• The reference to Section 800-51(j) is more appropriate as a listing reference than Section 300-22(c).
• By adding the applicable portions of Section 300-22(c), the Exception has been eliminated. This provides clarity, does not make it appear that such installations are secondary choices, and makes the Code more user-friendly in application.
• Acronyms have been used for the wiring methods because a Task Group for Panel 8 is recommending this throughout the Code. Full product names can be used if the TG proposal is not accepted.
This is a companion proposal to suggested revisions for Sections 800-48, and 800-51(j), (k), and (l).
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation (other than correlation with 300-22) has been submitted to provide for the removal of allowing plenum communications cables and plenum communications raceway from being installed in ducts or plenums.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #4139)

16- 256 - (800-53(a)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH Int'l, Inc./Rep. Plenum Cable Assn.
RECOMMENDATION: Revise as follows:
800-53. Applications of Listed Communications Wires and Cables, and Communications Raceways. Communications wires and cables shall comply with (a) through (f).
(a) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Also, listed plenum communications raceways shall be permitted to be installed in ducts and plenums as described in Section 300-22(b) and other spaces used for environmental air as described in Section 300-22(c). Only Type CMP cable shall be permitted to be installed in these raceways. Abandoned cables, not intended for future use, shall not be permitted to remain.
Exception: Types CMP, CMR, CM, and CMX and communications wire installed in compliance with Section 300-22.
SUBSTANTIATION: There is a significant amount of information indicating that the amount of cables installed in plenums, and other air-handling spaces, is increasing rapidly. An understanding of cabling practices indicates that the most common way in which cable installation is carried out is by disconnecting existing cable and leaving it abandoned in place, while introducing the cable needed to perform the additional functions. See Log #4136. There is, as yet, no indication that the additional cables in plenums causes an added fire hazard, and the fire record of cables in concealed spaces, both above ceilings and below floors, remains excellent. In fact, plenum cables, which meet the fire test requirements of NFPA 262, have been shown to have extremely good fire performance and to spread flame only very slowly, if at all. However, this type of preventive measure is worthwhile.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-250.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1812)

16- 257 - (800-53(a), Exception): Accept
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: Delete "CMP".
SUBSTANTIATION: See substantiation for my proposal for 760-61(a) Exception.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1767)

16- 258 - (800-53(b) Exception No. 1): Reject
SUBMITTER: Henry J. Szumiesz, Longchamps Electric Inc.
RECOMMENDATION: Revise to read as follows:
Exception No. 1: Where the listed cables are encased in metal raceway or are located in a metal conduit sleeve having firestops at each floor or in a fireproof shaft having firestops at each floor.
SUBSTANTIATION: UL has fire rating assemblies for ceiling to floor penetrations that have a fire rating equal to the structure assembly effected by the penetration. I have provided IPC product literature.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Reject.
PANEL STATEMENT: Metal conduit sleeves with firestops are a form of firestop and are already permitted to be used.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #503)

16- 259 - (800-53(d), Exception Nos. 2 thru 4): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Exception No. 2 - change "10 ft (3.05 m)" to "3.0 m (10 ft)"
Exception No. 3 - change "0.25 in. (6.35 mm)" to "6.35 mm (0.25 in.)"
Exception No. 4 - change "0.25 in. (6.35 mm)" to "6.35 mm (0.25 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units in Exception No. 2 are rounded since either unit of measurement will provide a safe installation.
The SI units in Exception No. 3 and No. 4 are not rounded since the dimensions are product related.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1202)

16- 260 - (800-53(e)): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Change 800-51(i) to 800-51(j).
SUBSTANTIATION: If my proposal to establish a new Section 800-51(h) is accepted, a new section is added and the sections will be renumbered. The new section creates two new cable types, Type CMP-50 and Type MPP-50. This proposal correlates Section 800-53(e) with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

ARTICLE 810 — RADIO AND TELEVISION EQUIPMENT

(Log #504)

16- 261 - (810): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 810-11 - change "35 ft (10.67 m)" to "11 m (35 ft)"
810-13 - change "2 ft (610 mm)" to "600 mm (2 ft)"
810-18(a) - revise as follows:
change "2 ft (610 mm)" to "600 mm (2 ft)"
change "10 ft (3.05 m)" to "3.0 m (10 ft)"
change "4 in. (102 mm)" to "100 mm (4 in.)"
change "6 ft (1.83 m)" to "1.8 m (6 ft)"
change "12 in. (305 mm)" to "300 mm (12 in.)"
810-18(b) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
810-21(a) - change "18 in. (457 mm)" to "450 mm (18 in.)"
Table 810-52:
change "150 ft" to "45 m (150 ft)" in the two column headings.
delete "Note: For SI units, 1 ft = 0.3048 m."
810-54 - change "3 in. (76 mm)" to "75 mm (3 in.)" in two places.
810-55(2) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
810-70 - change "4 in. (102 mm)" to "100 mm (4 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1681)

16- 262 - (810-5): Accept
SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.
RECOMMENDATION: a) Renumber the Section 810-2 and place after Section 810-1.
b) Change the numbering of Sections 810-2, 810-3, and 810-4 in the 1999 NEC to Sections 810.3, 810.4 and 810.5.
c) Delete the existing wording and replace with:
For definitions applicable to this article, see Article 100, Definitions.
SUBSTANTIATION: Numbering and section placement changes are to comply with the requirements of the new Style Manual Section 2.2.2.2.
The change in text is to use a grammatically correct sentence.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #505)

16- 263 - (Table 810-16(a)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 810-16(a) as shown on the next page, including enclosing the existing inch-pound units in parenthesis:
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1115)

16- 264 - (Table 810-16(a)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise column heading as follows:
"Minimum Size of Conductors (AWG) Where Maximum Open Span Length Is".
SUBSTANTIATION: AWG should be added to the column heading since the numbers in the columns do not have any unit of measure associated with them.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1116)

16- 265 - (810-21): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: 810-21(h) - revise to read: "~~No. 10~~ 10 AWG copper, ~~No. 8~~ 8 AWG aluminum, or ~~No. 17~~ 17 AWG copper-clad steel or bronze."
810-21(j) - change "No. 6" to "6 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1009)

16- 266 - (810-21(d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(d) The metallic power service nonflexible raceway.
SUBSTANTIATION: Editorial. Flexible metallic service raceways do not appear suitable for ground clamp connections or grounding paths.
PANEL ACTION: Reject.
PANEL STATEMENT: The reference to 810-21(d) is incorrect in that 810-21(d) refers to mechanical protection. Assuming that the reference is to 810-21(f)(1)(d), it should be noted that the substantiation is incorrect. Refer to 250-118.

Table 810-16(a). Size of Receiving Station Outdoor Antenna Conductors

Material	Minimum Size of Conductors Where Maximum Open Span Length Is: Less than 11 m (35 ft)	11 m to 45 m (35 ft to 150 ft)	Over 45 m (150 ft)
Aluminum alloy, hard-drawn copper	19	14	12
Copper-clad steel, bronze, or other high-strength material	20	17	14

~~Note: For SI units, 1 ft = 0.3048 m.~~

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1663)

16- 267 - (810-21(f)(1)b): Accept
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise the text of 810-21(f)(1)(b) as follows:
(b) The grounded interior metal water piping systems, within 5 ft (1.52 m) from its point of entrance to the building, as covered in Section ~~250-104(a)~~ 250-50.
SUBSTANTIATION: Section 250-50 (formerly Section 250-81) was revised in the 1993 NEC to eliminate the use of interior metal water piping system as a grounding (bonding) conductor. This was done because of the increased use of nonconductive piping for repair and maintenance rendering the interior metallic water piping system electrically discontinuous. Section 810-21(f)(1)(b) has not been revised to reflect this change. This proposed revision underscores that the interior metal water pipe may no longer be used as a bonding conductor to interconnect a receiving station grounding conductor to the building grounding electrode system, and correlates Section 810-21(f)(1)(b) with Section 250-50. Further, Section 250-104(a) concerns bonding of piping systems and building steel. Since connections to the interior metallic water piping system are now permitted only within the first 5 feet of the pipe's entrance to the building, the more appropriate reference is Section 250-50. This is a companion proposal and is intended to correlate Section 810-21(f)(1)(b) with similar changes proposed for Sections 800-40(b)(1)(b), 820-40(b)(1)(b), and 830-40(b)(1)(b).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1405)

16- 268 - (810-21(j) and (k)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise (j) to read as follows: (j) ~~Bonding of Electrodes. A bonding jumper not smaller than No. 6 copper or equivalent shall be connected between the radio and television equipment equipment grounding electrode and the power grounding electrode system at the building or structure served where separate electrodes are used.~~ Supplementary Grounding Electrodes. Supplementary grounding electrodes shall be permitted to be connected to the grounding conductor specified in this section, but the earth shall not be used as the sole grounding conductor. Bonding together of all separate electrodes shall be permitted.
Add a new (k) to read as follows:
(k) Underground Installations. Conductors (including grounding conductors) shall be installed to meet the minimum cover requirements specified in Column 4 of Table 300-5, except where conductors rise for termination or transition to aboveground installation.
SUBSTANTIATION: Section 810-21(h) requires a (minimum No. 10 copper) grounding conductor run to the building or structure grounding to electrode specified in (f). If a separate electrode is installed at a mast or supporting structure, it does not abrogate that requirement. Many masts are installed at a substantial distance from the building served by the system. If a supplementary (optional) driven electrode is installed at the dish or other antenna for additional safety, this section (j) requires a minimum No. 6 copper as a bonding conductor between the driven electrode and the electrodes of (f). Since the No. 10 copper grounding conductor alone is code-compliant the No. 6 bonding requirement may preclude the installation of separate electrodes for economic reasons, which diminishes any additional safety provided. Section 250-54 in effect, permits the equipment grounding conductor to serve as a bonding conductor from supplemental electrodes.
A new subsection (k) is proposed as no cover requirements are indicated for buried circuit or grounding conductors. This would provide an established criterion for reasonable protection of underground installations.
PANEL ACTION: Reject.
PANEL STATEMENT: No technical substantiation has been given to support the change from mandatory to permissive language.
Subparagraph j refers to the bonding of electrodes. Subparagraph g refers to the grounding conductor. Bonding and grounding conductors are not the same.
With regard to proposed new subparagraph k, the depth of burial requirements of Table 300-5 are specific to service conductors and are concerned with possible shock hazard. These conductors do not carry power and, in the case of bonding of separate electrodes, the conductor is a minimum of 6 AWG and is unlikely to be damaged by general yard maintenance.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1117)

16- 269 - (Table 810-52): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise column heading as follows: "Minimum Size of Conductors (AWG) Where Maximum Open Span Length Is".
SUBSTANTIATION: AWG should be added to the column heading since the numbers in the columns do not have any unit of measure associated with them.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1118)

16- 270 - (810-58): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: 810-58(b) - change "No. 10" to "10 AWG"
810-58(c) - change "No. 14" to "14 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

ARTICLE 820 — COMMUNITY ANTENNA TELEVISION AND RADIO DISTRIBUTION SYSTEMS

(Log #506)

16- 271 - (820): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 820-10(b) Exception - change "12 in. (305 mm)" to "300 mm (12 in.)"
820-10(d) - change "8 ft (2.44 m)" to "2.5 m (8 ft)"
820-10(d) Exception No. 2:
change "18 in. (457 mm)" to "450 mm (18 in.)"
change "4 ft (1.22 m)" to "1.2 m (4 ft)"
820-10(d) Exception No. 3 - revise as follows:
"Exception No. 3: Where the roof has a slope of not less than 100 mm (4 in.) ~~4 in. (102 mm)~~ in 300 mm (12 in.) ~~12 in. (305 mm)~~, a reduction in clearance to not less than 900 mm (3 ft) ~~3 ft (914 mm)~~ shall be permitted."
820-10(f)(1) - change "4 in. (102 mm)" to "100 mm (4 in.)"
820-10(f)(3) - change "6 ft (1.83 m)" to "1.8 m (6 ft)"
820-11(b) - change "12 in. (305 mm)" to "300 mm (12 in.)"
820-33 - change "30 ft (9.14 m)" to "9.0 m (30 ft)" in two places in the second paragraph.
820-42 - change "30 ft (9.14 m)" to "9.0 m (30 ft)" in two places.
820-50 Exception No. 3 - change "50 ft (15.2 m)" to "15 m (50 ft)"
820-52(a)(2) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
820-53(c) Exception No. 2 - change "10 ft (3.05 m)" to "3.0 m (10 ft)"
820-53(c) Exception No. 3 - change "0.375 in. (9.52 mm)" to "9.5 mm (0.375 in.)"
820-53(c) Exception No. 4 - change "0.375 in. (9.52 mm)" to "9.5 mm (0.375 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3344)

16- 272 - (Chapter 8): Reject
SUBMITTER: Michael R. Puckett, Puckett Engineering
RECOMMENDATION: It is proposed that requirements for closed-circuit television wiring be added to the NEC.
SUBSTANTIATION: Closed-circuit television systems exist in many types of buildings, yet there are no code requirements for the installation and types of cables, etc.
PANEL ACTION: Reject.
PANEL STATEMENT: Closed circuit television systems are already covered either by Article 725 (Class 2 or Class 3 circuits) or Article 820 and no reference is required here.
The proposal does not conform to section 4-3.3(c) of the Regulations Governing Committee Projects in that specific wording was not provided.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #4043)

16- 273 - (820-2-Abandoned Cable (New)): Accept in Principle
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add a new definition to read as follows:
Abandoned Cable. Cable that is neither terminated at both ends, at a connector or other equipment, nor identified for future use with a tag.
SUBSTANTIATION: The definition of abandoned cable is needed to accompany the proposals that require removal of abandoned cable. This definition reflects industry practices.
PANEL ACTION: Accept in Principle.
Add a new definition to read as follows:
"Abandoned Cable. Cable that is neither terminated at equipment nor identified for future use with a tag."
PANEL STATEMENT: Abandoned TV cable usually has connectors attached. The modification more clearly states the definition.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #4048)

16- 274 - (820-2- Excessive Accumulation of Abandoned Cables (New)): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add a new definition to read as follows:
Excessive Accumulation of Abandoned Cables. When the number of abandoned cables is greater than 1/3 of the total number of cables within a fire-containment zone.
SUBSTANTIATION: After the concept of plenum cables was introduced into the 1975 NEC, Underwriters Laboratories initially listed plenum cables by comparing the smoke production of plenum cables with the smoke production of conventional cables of the same physical design (but not plenum grade materials) in conduit. Plenum cables (not in conduit) were tested and compared with an equal number of conventional cables in conduit. It was assumed that the plenum cables were a replacement for conventional cables and that in case of a fire the amount of smoke would be reduced because of the lower smoke production of plenum cables. It was not anticipated that plenum cables would be abandoned. Since conventional cables in conduit were deemed to be acceptable the smoke from these cables is the benchmark for comparison and a fire involving an excessive amount of abandoned cables could emit excessive amount of smoke. Until research better defines what amount of abandoned cable might be excessive, allowing up to 1/3 excess of abandoned cables is prudent.
PANEL ACTION: Reject.
PANEL STATEMENT: The term is not used. The proposal that introduced this term was modified to eliminate the term.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #297)

16- 275 - (820-3(g)): Reject
SUBMITTER: Steven C. Johnson, Time Warner Cable
RECOMMENDATION: Revise 820-3(g) to read as follows:
(g) Alternate Wiring Methods. The wiring methods of Articles 830 and 831 shall be permitted to substitute for the wiring methods of Article 820.
FPN: Use of Articles 830 and 831 wiring methods will facilitate the upgrading of Article 820 installations to network-powered broadband applications.
SUBSTANTIATION: The original proposed Article 830 in the NEC 1999 cycle included low, medium, and high power options. During the ROC, high power was removed. In the 2002 cycle, high power is being proposed as a separate Article 831. It was the original proposer's intent to allow transition from traditional CATV to Network powered broadband communications systems by allowing use of Network powered wiring methods in CATV systems.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1659)

16- 276 - (820-5): Accept in Principle
Note: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable." This action will be consideed by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise 820-5 as follows:
820-5. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to equipment shall not be denied by an excess

accumulation of cables ~~that prevents~~ sufficient to prevent the removal of panels, including suspended ceiling panels.

SUBSTANTIATION: Section 820-5 may be misinterpreted to mean that conductors and cables may not be placed directly on suspended ceilings. While the 1999 National Electrical Code Handbook emphasizes "excess accumulation" in the interpretive text, Figures 820-1 and 820-2 lead the reader to conclude that no conductors or cables are permitted to rest directly on the suspended ceiling. This was not the intent of CMP 16 when 820-5 was introduced into the 1993 NEC. At that time, CMP 16 stated in response to a similar proposal to Article 725 (1992 TCD, Comment 16-18) that the proposed requirement "... would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." The proposed revision emphasizes that it is an excessive accumulation of cabling that is of concern. A limited amount of cabling laid directly on a suspended ceiling is permitted, will not deny access to equipment, and does not present an unsafe working environment. This is a companion proposal and is intended to correlate with 725-5, 760-5, 770-7, 800-5, and 830-6.

PANEL ACTION: Accept in Principle.

Revise 820-5 to read as follows:

"820-5. Access to Electrical Equipment Behind Panels Designed to Allow Access

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).

a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.

b. Buildings with existing cabling systems.

Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.

1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.

2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."

PANEL STATEMENT: The revised text satisfies the intent of the original recommendation in that it allows some cabling of a limited quantity above ceiling tile but not an excessive amount, which would interfere with accessibility.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

EGEDSAL: See my Explanation of Negative Vote on Proposal 16-192.

COMMENT ON AFFIRMATIVE:

BRUNSSEN: I concur with the panel action in providing relief for a limited amount of after-construction CATV cables to be placed directly on the suspended ceiling tiles. However, proposed Section 820-5(b)(2), as presently written, is confusing and could be interpreted as permitting a total of only three unsupported cables. The intent of the panel was that up to a maximum of three unsupported cables may be routed across each and every ceiling tile. Revising 820-5(b)(2) to state: "...permissible to install a maximum of three unsupported cables on top of ~~any one~~ each ceiling tile, i.e., up to three cables are permitted to lay on a ceiling tile." would clarify the intent. Note that the word "of" is inserted and is missing in the original text.

(Log #CP1606)

16- 276a - (820-6): Accept

SUBMITTER: CMP 16

RECOMMENDATION: Revise text to read as follows:

"Mechanical Execution of Work. Community antenna television and radio distribution systems shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceiling and sidewalls shall be supported by the structural components of the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d)."

Also, delete the Fine Print Note.

SUBSTANTIATION: This proposal provides additional rules for the mechanical execution of the work. Since there are additional rules, the fine print note is not necessary. This provides parallel requirements to those used in Articles 640, 725, 760, 770, 800, and 830.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

JOHNSON: See my Explanation of Negative Vote on Proposal 16-2a.

(Log #3658)

16- 277 - (820-6): Accept

SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.

RECOMMENDATION: Delete the FPN associated with this section.

SUBSTANTIATION: Problem: The standards listed contain insufficient information to determine accepted industry practice for systems and equipment included in Article 820.

Substantiation: A detailed review of ANSI/EIA/TIA/568A-1995, ANSI/EIA/TIA/569-1990 , and ANSI/EIA/TIA/570-1991 was completed by the submitter and no significant information, guidance, or directives were found, that would be helpful to a user of this Article of the Code. These standards were developed by the telecom and computer industries. They provide the details covering telecommunication infrastructure such as cable pathways, equipment spaces, telephone grounding/bonding, and telecommunication administration. They are excellent standards but they do not address typical cabling installation issues such as:

(a) how to properly pull wire(s) above a lay in ceiling.

(b) when and where to support the wire in a building structure.

(c) how to dress various types of audio signal wires coming into and within an equipment cabinet.

(d) how and where to set up wire reels for riser cables in tall structures.

(e) how and where to dress audio speaker wire along a steel beam in a gymnasium or factory.

(f) what to watch out for when pulling a cable into a raceway.

These standards are purported to be the concept standards for guiding the users of the Code in determining appropriate mechanical execution of work and determination of acceptable industry practices. However, such is not the intent of the standards. For those who do not have a set of the standard available, the submitter has provided an Appendix that summarizes each section of each standard. The appendix will give you an overview of the contents of each section of each standard and enable you to gain a better understanding of what the standards cover.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Accept.

PANEL STATEMENT: The proposed recommendation has been incorporated by the panel action on Proposal 16-276(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

LANNI: After reviewing the NECA index No. 5037, I realized that there are very useful National Electrical Installation Standards available and a Fine Print Note is the appropriate way to guide the code user. I also feel that the panel did satisfy the original submitter when the Fine Print Note was incorporated into the code. Improving the references, instead of removing the Fine Print Note, would improve our original work. Installation documents are being produced all the time partially in response to our note in the code. The panel could only answer one of the Submitter's concerns, namely, "when and where to support the wire in a building structure." Other issues are left unanswered. Good workmanship is an important component of a safe installation, but the code cannot address all these issues and other documents are more suited for the purpose.

(Log #4025)

16- 278 - (820-6): Reject

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Revise the FPN to read: "One way to determine accepted industry practice is to refer to nationally recognized standards such as Commercial Building Telecommunications Cabling Standard, ANSI / EIA / TIA 568-A-1995; Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI / TIA / EIA 569-A-1997; and Residential ~~and Light Commercial~~ Telecommunications Cabling ~~Wiring~~ Standard, ~~ANSI / EIA / TIA 570-1991~~ ANSI / EIA / TIA 570-A-1999, ANSI / NECA / BICSI 568 or other ANSI-approved installation standards."

SUBSTANTIATION: A revision to the standard number and the title for residential cabling has been updated. Another standard is currently under review that will be focused at the installation of telecommunications cabling and connectors and will become an ANSI standard within the next year.

PANEL ACTION: Reject.

PANEL STATEMENT: Section 820-6 has been revised to remove the FPN and provide specific installation requirements. A FPN is no longer necessary. Refer to the panel action and statement on Proposal 16-276(a).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

LANNI: After reviewing the NECA index No. 5037, I realized that there are very useful National Electrical Installation Standards available and a Fine Print Note is the appropriate way to guide the code user. I also feel that the panel did satisfy the original submitter when the Fine Print Note was incorporated into the code. Improving the references, instead of removing the Fine Print Note, would improve our original work. Installation documents are being produced all the time partially in response to our note in the code. The panel could only answer one of the Submitter's concerns, namely, "when and where to support the wire in a building structure." Other issues are left unanswered. Good workmanship is an important component of a safe installation, but the code cannot address all these issues and other documents are more suited for the purpose.

(Log #4030)

16- 279 - (820-10): Accept

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design / Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add a Fine Print Note to read as follows:

FPN: For additional information regarding overhead wires and cables, see National Electric Safety Code, ANSI C2-1997, Part 2 Safety Rules For Overhead Lines.

SUBSTANTIATION: The primary focus of this recommendation is to promote parity between the two codes in an effort to eliminate confusion and multiple interpretations of codes contained in two separate volumes that are attempting to safely address the same issue. Due to the de-regulation of cabling on the customer premises and electrical power distribution, adhearance to the NESC is required.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #4272)

16- 280 - (820-10(b), Exception): Accept in Part

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

Exception: Where proximity to electric light, power, Class 1, or nonpower-limited fire alarm circuit service conductors cannot be avoided, and where the ungrounded nonpower-limited conductors are insulated, the installation shall be such as to provide clearances of not less than 12 in. (305 mm) from light, power, Class 1, or nonpower-limited fire alarm circuit service drops. The clearance requirement shall apply at all points along the drop, and it shall increase to 40 in. (1.02 m) at the pole.

SUBSTANTIATION: This rule presently differs from the rule in Article 800 [Sec. 800-10(b)(4)] for a similar application, even though Art. 800 circuits could run in coaxial cable assemblies. With increasing interaction and competition between these technologies, differing Code rule on similar topics should be as consistent as technically possible, within the boundaries of effective safety. This proposal is intended as a vehicle to allow CMP 16 to act on this issue by making comparable rules consistent. A companion proposal has been made to Article 830.

PANEL ACTION: Accept in Part.

The addition of the phrase "and where the ungrounded nonpower-limited conductors are insulated," is rejected.

The balance of the recomendation is accepted.

PANEL STATEMENT: Nonpower-limited conductors are always insulated. Refer to 760-27 (b).

The reference to 800-10(b)(4) in the substantiation is incorrect; it is believed that the reference is 800-10(a)(4).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1675)

16- 281 - (820-10(c)): Reject

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc. / Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Revise the text of Section 820-10(c) as follows:

(c) On Masts. Aerial cable shall be permitted to be attached to an above-the-roof raceway mast. ~~that does not enclose or support conductors of electric light or power circuits.~~ Aerial cable shall be permitted to be attached to a service mast that is listed for the purpose of accepting multiple attachments.

SUBSTANTIATION: The present wording of Section 820-10(c) prohibits the attachment of aerial cable to a raceway mast that either encloses or supports conductors of electric light or power circuits. Such prohibition is excessive. Where the mast is listed for the purpose of attaching multiple service drops, multiple attachments should be permitted. It is unnecessarily costly to the building owner and aesthetically unsightly when two service masts must be provided, one for power service and another for CATV aerial services.

Note that a companion proposal for a new Section 230-28, Exception has been submitted. The proposed Section 230-28, Exception would permit a CATV service drop attachment to a power service mast where the mast is listed for the purpose.

PANEL ACTION: Reject.

PANEL STATEMENT: Although requirements for the power service mast are specified in Article 230, the detailed design and installation requirements are not defined. The electric service company specifies the type, size and height of mast to be used and the manner in which it is to be installed. The NEC can not dictate to the utility the specific installation requirements. Code Panel 4, which has jurisdiction over service masts, has consistently rejected this concept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 19

NEGATIVE: 2

EXPLANATION OF NEGATIVE:

BRUNSSEN: See my Explanation of Negative Vote on Proposal 16-202.

JOHNSON: See my Explanation of Negative Vote on Proposal 16-202.

(Log #2378)

16- 282 - (820-11): Reject

SUBMITTER: Rodney Parker, GTE North / Rep. Network Design

RECOMMENDATION: Part (c) is missing. Language should be similar to Point of Entry in Section 800-11(c).

SUBSTANTIATION: Since this Section 820-11 is titled "Entering Building" a(n) additional part should be added explaining where communications wires and cables shall enter the building. The language should be similar to that written in Section 800-11(c). Or reference should be made to refer to Section 800-11(c).

PANEL ACTION: Reject.

PANEL STATEMENT: The proposer did not provide the specific language to be used.

Section 820-11(c) was removed by floor action at the 1998 NFPA Annual Meeting. TIA-608 seeks to remove 800-11(c) and will likely be approved by the Standards Council. Further, the critical issue is not the separation of power and communications entrances, but the length of the grounding conductor. See panel action on Proposals 16-196 and 16-293.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1010)

16- 283 - (820-11(b)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

(b) Direct-buried Cables and Raceways. Direct-buried coaxial cable shall be separated at least 12 in. (305 mm) from conductors of any light, power, ~~or~~ Class 1, or nonpower-limited fire alarm circuits.

Exception: Separation shall not be required where (1) all electric service conductors are installed in raceways or have metal cable armor or (2) all coaxial cables have metal cable armor or (3) all feeder, branch-circuit, Class 1, and nonpower-limited fire alarm circuit conductors are installed in raceways or in Type MC, Type MI, or multiconductor Type UF or Type USE cables.

Delete present Exception No. 1 and No. 2.

SUBSTANTIATION: Since nonpower-limited fire alarm circuits can have the same parameters as Class 1 circuits, and there is apparently no prohibition against direct-burial in the form of single-conductor Type UF cable, they should be included.

Proposal combines both exceptions in sentence form and clarifies Type UF to be multiconductor type, deletes two references to coaxial cable in raceways since such installations do not require separation and are not direct cable burial addressed in the rule, and therefore not an exception to anything in the rule.

PANEL ACTION: Reject.
PANEL STATEMENT: The proposed recommendation would permit the installation of Class 1 and nonpower-limited conductors in the same raceway as electric power and light conductors (branch and feeder circuits). This would violate the separation rules in Articles 725 and 760.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #328)

16- 284 - (820-11(c)): Reject

NOTE: In accordance with 4-6.2(c) of the Regulations Governing Committee Projects, the following Proposal 16-220 and Comment 16-134 were returned to Committee at the 1998 Annual Meeting, and now are being processed as a Proposal for this revision.

SUBMITTER: Roger Witt, State Farm Ins. Co.
RECOMMENDATION: The Proposal 16-220:

RECOMMENDATION: Add new section 820-11(c) to read as follows:

(c) Point of Entry Where practicable, the point of entry for communications wiring and cables shall be within 5 feet of the electrical service entry point.

(FPN) The distance to the electrical system grounding electrode has a direct relationship to the potential difference between the communications circuits and the power circuits.

SUBSTANTIATION: It has been observed that when the communication circuit's point of entry is located remote from the electric service point, proper bonding is not provided. When power and communications service entry points are remote and the systems are bonded, then L di/dt losses come into play and the equalization of potential is not achieved.

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.

PANEL STATEMENT: As worded, this proposed requirement would be very difficult, if not impossible to enforce. There would seldom be agreement between installers and inspectors as to whether meeting this requirement was practical.

The Comment 16-134:

SUBMITTER: Roger Witt, State Farm Ins. Co.

COMMENT ON PROPOSAL NO.: 16-220

RECOMMENDATION: Add new Section 820-11(c) to read as follows:

(c) Point of Entry. The point of entry for communications wiring and cables shall be within 5 feet of the electrical service entry point.

(FPN): The distance to the electrical system, grounding electrode has a direct relationship to the potential difference between the communications circuits and the power circuits.

Exception: Where it is not practicable to install the communications and electrical service in this manner, a separate grounding electrode, installed in compliance with 250-83 (c), shall be installed for the communications systems and the grounding electrodes for the electrical and communications systems shall be connected with a bare or insulated #4 copper conductor. The conductor shall not be exposed to mechanical injury, and when buried, shall be buried to a depth of 24 inches

SUBSTANTIATION: Change in proposed text as recommended by one of the panel members and shown in the ROP.

By requiring a specific point of entry, the requirement becomes enforceable. Single point grounding for all communications services and power services is needed to provide equal potential between the systems.

There is evidence that when communications services are installed remote from the power system service, separate ground rods are installed and not bonded to the electrical service grounding electrode. By specifying a service entrance location adjacent to the power system service entrance a better chance of single point grounding is presented.

PANEL ACTION: Accept in Principle.

Add new section 820-11(c) to read as follows:

(c) Grounding Point. The grounding terminal for communications wiring and cables shall be located within 20 feet of and bonded to the electrical service ground.

Exception: Where it is not practicable to install the communications service in this manner, a grounding electrode shall be installed in compliance with 820-40(b)(3) and bonded in accordance with 820-40(c) and 820-40(d).

(FPN): Under certain conditions, the length of the bonding conductor has a direct relationship to the difference in potential between the communications and the power circuits.

PANEL STATEMENT: The Panel believes these changes meet the concerns of the submitter and adds clarity to the text.

SUBSTANTIATION: (See the Recomendation field above that includes substantiation for 1998 edition Proposal 16-220 and 1998 edition Comment 16-134.)

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action on Proposal 16-293. The submitter is concerned with voltage differences between the telephone and power service on the premises because of excessive telephone grounding conductor length. Locating the power and telephone entrances within 5 feet of each other as the submitter proposes will not necessarily ensure a short telephone grounding conductor. Proposal 16-293 addresses that issue directly and ensures that this conductor shall be a maximum of 20 feet in length, thereby minimizing potential differences.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #4027)

16- 285 - (820-12, 820-13, 820-30, 820-31): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Add the following:

820-12. Circuits Requiring Primary Protectors. Circuits that require primary protectors as provided in Section 820-30 shall comply with the following.

(a) Insulation, Wires, and Cables. Communications wires and cables without a metallic shield, running from the last outdoor support to the primary protector, shall be listed as being suitable for the purpose and shall have current-carrying capacity as specified in Section 820-30(a)(1)(b) or 820-30(a)(1)(c).

(b) On Buildings. Communications wires and cables in accordance with Section 800-12(a) shall be separated at least 4 in. (102 mm) from electric light or power conductors not in a raceway or cable, or be permanently separated from conductors of the other system by a continuous and firmly fixed nonconductor in addition to the

insulation on the wires, such as porcelain tubes or flexible tubing. Communications wires and cables in accordance with Section 820-12(a) exposed to accidental contact with electric light and power conductors operating at over 300 volts to ground and attached to buildings shall be separated from woodwork by being supported on glass, porcelain, or other insulating material.

Exception: Separation from woodwork shall not be required where fuses are omitted as provided for in Section 820-30(a)(1), or where conductors are used to extend circuits to a building from a cable having a grounded metal sheath.

(c) Entering Buildings. Where a primary protector is installed inside the building, the communications wires and cables shall enter the building either through a noncombustible, nonabsorbent insulating bushing or through a metal raceway. The insulating bushing shall not be required where the entering communications wires and cables (1) are in metal-sheathed cable, (2) pass through masonry, (3) meet the requirements of Section 820-12(a) and fuses are omitted as provided in Section 820-30(a)(1), or (4) meet the requirements of Section 820-12(a) and are used to extend circuits to a building from a cable having a grounded metallic sheath. Raceways or bushings shall slope upward from the outside or, where this cannot be done, drip loops shall be formed in the communications wires and cables immediately before they enter the building.

Raceways shall be equipped with an approved service head. More than one communications wire and cable shall be permitted to enter through a single raceway or bushing. Conduits or other metal raceways located ahead of the primary protector shall be grounded.

820-13. Lightning Conductors. Where practicable, a separation of at least 6 ft (1.83 m) shall be maintained between communications wires and cables on buildings and lightning conductors.

C. Protection.

820-30. Protective Devices.

(a) Application. A listed primary protector shall be provided on each circuit run partly or entirely in aerial wire or aerial cable not confined within a block. Also, a listed primary protector shall be provided on each circuit, aerial or underground, located within the block containing the building served so as to be exposed to accidental contact with electric light or power conductors operating at over 300 volts to ground. In addition, where there exists a lightning exposure, each interbuilding circuit on a premises shall be protected by a listed primary protector at each end of the interbuilding circuit. Installation of primary protectors shall also comply with Section 110-3(b).

FPN No. 1: On a circuit not exposed to accidental contact with power conductors, providing a listed primary protector in accordance with this article will help protect against other hazards, such as lightning and above-normal voltages induced by fault currents on power circuits in proximity to the communications circuit.

FPN No. 2: Interbuilding circuits are considered to have a lightning exposure unless one or more of the following conditions exist.

1. Circuits in large metropolitan areas where buildings are close together and sufficiently high to intercept lightning.

2. Interbuilding cable runs of 140 ft (42.7 m) or less, directly buried or in underground conduit, where a continuous metallic cable shield or a continuous metallic conduit containing the cable is bonded to each building grounding electrode system.

3. Areas having an average of five or fewer thunderstorm days per year and earth resistivity of less than 100 ohm-meters. Such areas are found along the Pacific coast.

(1) Fuseless Primary Protectors. Fuseless-type primary protectors shall be permitted under any of the following conditions:

a. Where conductors enter a building through a cable with grounded metallic sheath member(s) and if the conductors in the cable safely fuse on all currents greater than the current-carrying capacity of the primary protector and of the primary protector grounding conductor

b. Where insulated conductors in accordance with Section 820-12(a) are used to extend circuits to a building from a cable with an effectively grounded metallic sheath member(s) and if the conductors in the cable or cable stub, or the connections between the insulated conductors and the exposed plant, safely fuse on all currents greater than the current-carrying capacity of the primary protector, or the associated insulated conductors and of the primary protector grounding conductor.

c. Where insulated conductors in accordance with Section 820-12(a) or (b) are used to extend circuits to a building from other than a cable with a metallic sheath member(s) if (1) the primary protector is listed for this purpose, and (2) the connections of the insulated conductors to the exposed plant or the conductors of the exposed plant safely fuse on all currents greater than the current-carrying capacity of the primary protector, or the associated insulated conductors and of the primary protector grounding conductor

d. Where insulated conductors in accordance with Section 820-12(a) are used to extend circuits aerially to a building from an unexposed buried or underground circuit

e. Where insulated conductors in accordance with Section 820-12(a) are used to extend circuits to a building from cable with an effectively grounded metallic sheath member(s) and if (1) the combination of the primary protector and insulated conductors is listed for this purpose, and (2) the insulated conductors safely fuse on all currents greater than the current-carrying capacity of the primary protector and of the primary protector grounding conductor

(2) Fused Primary Protectors. Where the requirements listed under Sections 820-30(a)(1)(a) through (e) are not met, fused-type primary protectors shall be used. Fused-type primary protectors shall consist of an arrester connected between each line conductor and ground, a fuse in series with each line conductor, and an appropriate mounting arrangement. Primary protector terminals shall be marked to indicate line, instrument, and ground, as applicable.

(b) Location. The primary protector shall be located in, on, or immediately adjacent to the structure or building served and as close as practicable to the point at which the exposed conductors enter or attach.

For purposes of this section, the point at which the exposed conductors enter shall be considered to be the point of emergence through an exterior wall, a concrete floor slab, or from a rigid metal conduit or an intermediate metal conduit grounded to an electrode in accordance with Section 820-40(b).

For purposes of this section, primary protectors located at mobile home service equipment located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with Section 250-32 and located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.

FPN: Selecting a primary protector location to achieve the shortest practicable primary protector grounding conductor will help limit potential differences between communications circuits and other metallic systems.

(c) Hazardous (Classified) Locations. The primary protector shall not be located in any hazardous (classified) location as defined in Article 500, nor in the vicinity of easily ignitible material.

Exception: As permitted in Sections 501-14, 502-14, and 503-12.

820-31. Primary Protector Requirements. The primary protector shall consist of an arrester connected between each line conductor and ground in an appropriate mounting. Primary protector terminals shall be marked to indicate line and ground as applicable.

SUBSTANTIATION: Coaxial systems are only protected by a thin shield. The center conductor of a coaxial system can accidentally come into contact with power on a pole line or underground system. Energizing the center conductor can cause electrical shock to personnel (end-user and technician) without having the center conductor protected. This proposal is in line with the requirements in Section 800 and 830-30. The evolving technologies on CATV systems are including voice and data transmission and require safety protection. It wouldn't be nice to blow up grandma's ear while she is on the phone and watching I Love Lucy on the TV.

PANEL ACTION: Reject.

PANEL STATEMENT: By referencing telephone applications, the proposal should more correctly apply to Articles 800 or 830. Both 800 and 830 already require protection to be installed. Additionally, the proposal references communication wires and cables without metallic shielding. Article 820's scope indicates the use of coaxial cables, which inherently include metallic shielding. No technical documentation has been included to indicate the presence of safety hazards to protect against.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

COMMENT ON AFFIRMATIVE:

JOHNSON: By referencing telephone applications, the proposal should more correctly apply to Articles 800 or 830. Both 800 and 830 already require protection to be installed. Additionally, the proposal references communications wires and cables without metallic

shielding. Article 820's scope indicates the use of coaxial cables, which inherently include metallic shielding. No technical documentation has been included to indicate the presence of safety hazards to protect against. Data collected from cable television set top manufacturers indicate a negligible (less than (0.02%) problem with failures due to surges coming in on the coaxial input. A bigger problem is surges coming in on the power leads. No evidence was found of any significant damage to consumer owned electronics from the coaxial input.

(Log #379)

16- 286 - (820-33): Accept in Principle
SUBMITTER: Steven C. Johnson, Time Warner Cable/Rep. Nat'l Cable Television Assn.
RECOMMENDATION: Revise as follows:
820-33. Grounding of Outer Conductive Shield of a Coaxial Cable. ~~Where coaxial cable is exposed to lightning or to accidental contact with lightning arrester conductors or power conductors operating at a voltage of over 300 volts to ground, the~~The outer conductive shield of the coaxial cable shall be grounded at the building premises as close to the point of cable entry as practicable. For purposes of this section, the point at which the exposed cable enters shall be considered to be the point of emergence through an exterior wall, a concrete floor slab, or from a rigid or intermediate metal conduit grounded to an electrode in accordance with Section 820-40(b).
SUBSTANTIATION: This change would make 820 grounding requirements consistent with those of Articles 800 and 830. Common industry practice is to ground all installations. Removing the indicated text would eliminate confusion as to when grounding is necessary by requiring it in all cases.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-288 which incorporates this proposal. The final text is shown in Proposal 16-288.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #593)

16- 287 - (820-33): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Delete "For purposes of this section, the point at which the exposed cable enters shall be considered to be the point of emergence through an exterior wall, a concrete floor slab, or from a rigid or intermediate metal conduit grounded to an electrode in accordance with Section 820-40(b)."
SUBSTANTIATION: Point of entrance is defined in Section 820-2.
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to the final text in Proposal 16-288.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1046)

16- 288 - (820-33): Accept in Principle
SUBMITTER: Steven C. Johnson, Time Warner Cable/Rep. Nat'l Cable Television Assn.
RECOMMENDATION: Revise text to read:
820-33. Grounding of Outer Conductive Shield of a Coaxial Cable. Where coaxial cable is exposed to lightning or to accidental contact with lightning arrester conductors or power conductors operating at a voltage of over 300 volts to ground, the outer conductive shield of the coaxial cable shall be grounded at the building premises as close to the point of cable ~~entry~~ attachment as practicable. ~~For purposes of this section, the point at which the exposed cable enters shall be considered to be the point of emergence through an exterior wall, a concrete floor slab, or from a rigid or intermediate metal conduit grounded to an electrode in accordance with Section 820-40(b).~~
SUBSTANTIATION: The point of attachment does not necessarily coincide with the point of entrance. Standard practice is to attach to the building near the building's electrical ground and bond at that point.
The cable generally enters the building near the location of the customer's home entertainment equipment. Where this does not coincide with the location of the building electrical ground, the present code wording is requiring a less desirable grounding situation.
PANEL ACTION: Accept in Principle.
"Revise text to read:
"820-33. Grounding of Outer Conductive Shield of a Coaxial Cable. The outer conductive shield of the coaxial cable shall be grounded at the building premises as close to the point of cable entrance or attachment as practicable. ~~For purposes of this section, the point at which the exposed cable enters shall be considered to be the point of emergence through an exterior wall, a concrete floor slab, or from a rigid or intermediate metal conduit grounded to an electrode in accordance with Section 820-40(b).~~"
PANEL STATEMENT: The submitter's recommendation has been revised from "point of cable attachment" to the "point of cable entrance or attachment." The text has been revised to add clarity and be more consistent with other parallel articles. In addition the revised text incorporates the panel action on Proposal 16-286.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1119)

16- 289 - (820-40): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: 820-40(a)(3) - change "No. 14" to "14 AWG"
820-40(d) - change "No. 6" to "6 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3367)

16- 290 - (820-40(a)(1)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise as follows:
(a) Grounding Conductor.
(1) Insulation. The grounding conductor shall be insulated and shall be identified as being suitable for wet locations as stated in Table 310-13 ~~listed as suitable for the purpose.~~
SUBSTANTIATION: I do not believe that conductors are listed as suitable for grounding.
PANEL ACTION: Reject.
PANEL STATEMENT: The original text states: "…. listed as suitable for the purpose." Inherent in the listing process is the assurance that the item or product will perform safely in its intended application. Since the grounding conductor can be applied in wet locations, this is taken into consideration in the listing of the conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3370)

16- 291 - (820-40(a)(1)): Reject
SUBMITTER: Paul Dobrowsky, Holley, NY
RECOMMENDATION: Revise as follows:
(a) Grounding Conductor.
(1) Insulation. The grounding conductor shall be insulated and shall be identified as being suitable for wet locations as stated in Table 310-13 ~~listed as suitable for the purpose.~~
SUBSTANTIATION: I do not believe that conductors are listed as suitable for grounding.
PANEL ACTION: Reject.

PANEL STATEMENT: The original text states: "…. listed as suitable for the purpose." Inherent in the listing process is the assurance that the item or product will perform safely in its intended application. Since the grounding conductor can be applied in wet locations, this is taken into consideration in the listing of the conductor.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3033)

16- 292 - (820-40(a)(3)): Accept
SUBMITTER: Steven C. Johnson, Time Warner Cable
RECOMMENDATION: Revise text as follows:
Size. The grounding conductor shall not be smaller than No. 14. It shall have a current-carrying capacity approximately equal to that of the outer conductor of the coaxial cable. The grounding conductor shall not be required to exceed No. 6.
SUBSTANTIATION: This change is being proposed to make 820-40(a)(3) consistent with 830-40(a)(3).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1661)

16- 293 - (820-40(a)(4) and Exception (New)): Accept
Note: The Technical Correlating Committee directs the Panel to change "residences" to "dwellings."
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Insert new 820-40(a)(4) and Exception as follows. Renumber existing 820-40(a)(4) and 820-40(a)(5) as 820-40(a)(5) and 820-40(a)(6), respectively.
(4) Length. The grounding conductor shall be as short as practicable. In one- and two-family residences, the grounding conductor shall be as short as practicable, not to exceed 20 ft (6.0 m) in length.
Exception: In one- and two-famlily residences where it is not practicable to achieve an overall maximum grounding conductor length of 20 ft (6.0 m), a separate ground as specified in Section 250-52 shall be used, the grounding conductor shall be grounded to the separate ground in accordance with Section 250-70, and the separate ground bonded to the power grounding electrode system in accorance with Section 820-40(d).
SUBSTANTIATION: During the 1999 Code cycle, a number of proposals and comments were submitted to limit the separation of power and communications entrances to the building. The intent of these proposals and comments was to limit the potential difference between power and communications circuits during lightning events. That potential difference is generally a function of conductor inductance (L), which increases in direct proportion to conductor length, and the rate of rise of the current (di/dt). These proposals and comments were generally rejected as they did not address the real issue, the length of the coxial cable shield grounding conductor. This proposal addresses that issue, encourages short coxial cable, shield grounding conductors, provides guidance as to a reasonable maximum length, and provide an alternative where it is not practicable to meet the maximum length (20 ft) restriction. The proposed length restriction is limited to one- and two-family residences as it is such installations that are more likely to have diverse power and communications entrances and experience lightning-related problems. (urban/suburban environment with a fewer elevated structures and extensive buried metallic objects). This is a companion proposal and is intended to correlate Section 820-40(a)(4)(New) with similar changes proposed for Sections 800-40(a)(4)(New) and 830-40(a)(4)(New).
PANEL ACTION: Accept.
PANEL STATEMENT: Editorially change "20 ft (6.0 m)" to "6.0 m (20 ft)" in both places of the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation of Negative Vote on Proposal 16-212.

(Log #2211)

16- 294 - (820-40(b)): Accept in Principle
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise text as follows:
(b) Electrode. The grounding conductor shall be connected as follows:
1. In Buildings or Structures With Grounding Means. To the nearest accessible location on the following:
a. The building or structure grounding electrode system as covered in Section 250-50
b. The grounded interior metal water piping system as covered in Section 250-104(a)
c. The power service accessible means external to enclosures as covered in Section 250-92(b)
d. The metallic power serivce raceway
e. The service equipment enclosure
f. The grounding electrode conductor or the grounding electrode conductor metal enclosure; or
g. To the grounding conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in Section 250-32.
2. In Buildings or Structures Without Grounding Means. If the building or structure served has no grounding means, as described in (b)(1):
a. To any one of the individual electrodes described in Section 250-50; or,
b. If the building or structure served has no grounding means, as described in (b)(1) or (b)(2)(a), to an effectively grounded metal structure or to any one of the individual electrodes described in Section 250-52.
SUBSTANTIATION: The new style manual requires titles for this section.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation as follows:
Revise the text of 820-40(b)(1)(b) as follows:
"(b) The grounded interior metal water piping system, within 5 ft (1.52 m) from its point of entrance to the building, as covered in Section ~~250-104(a)~~ 250-50."
The remaining text is unchanged.
PANEL STATEMENT: The change incorporates the recommendation of Proposal 16-295 and this is the final text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1667)

16- 295 - (820-40(b)(1)(b)): Accept
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise the text of 820-40(b)(1)(b) as follows:
(b) The grounded interior metal water piping system, within 5 ft (1.52 m) from its point of entrance to the building, as covered in Section ~~250-104(a)~~ 250-50.
SUBSTANTIATION: Section 250-50 (formerly Section 250-81) was revised in the 1993 NEC to eliminate the use of the interior metal water piping system as a grounding (bonding) conductor. This was done because of the increased use of nonconductive piping for repair and maintenance rendering the interior metallic water piping system electrically discontinuous. Section 820-40(b)(1)(b) has not been revised to reflect this change. This proposed revision underscores that the interior metal water pipe may no longer be used as an intersystem bonding conductor to interconnect CATV and power, and correlates Section 820-40(b)(1)(b) with Section 250-50. Further, Section 250-104(a) concerns bonding of piping systems and building steel. Since connections to the interior metallic water piping system are now permitted only within the first 5 feet of the pipe's entrance to the building, the more appropriate reference is Section 250-50. This is a companion proposal and is intended to correlate Section 820-

40(b)(1)(b) with similar changes proposed for Sections 800-40(b)(1)(b), 810-21(f)(1)(b), and 830-40(b)(1)(b).
PANEL ACTION: Accept.
PANEL STATEMENT: Refer to Proposal 16-294 for the final text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1120)

16- 296 - (820-42(b)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 12" to "12 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1205)

16- 297 - (Table 820-50): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: In Table 820-50. Cable Markings, revise as follows:

Table 820-50. Cable Markings.

Cable Marking	Type	Reference
CATVP-50	Limited combustibility CATV plenum cable	820-51(b) and 820-53(a)
CATVP	CATV plenum cable	820-51(a) and 820-53(a)
CATVR	CATV riser cable	820-51(c) and 820-53(b)
CATV	CATV cable	820-51(d) and 820-53(c)
CATVX	CATV cable, limited use	820-51(e) and 820-53(c), Exception Nos. 1, 2, 3, and 4

The fine print notes are unchanged.
SUBSTANTIATION: If my proposal to establish a new section 820-51(b) is accepted, a new section is added and the sections will be renumbered. The new section creates a new type of cable, Type CATVP-50. This proposal correlates Table 820-50 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1204)

16- 298 - (820-51): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Change (a) through (d), to (a) through (e).
SUBSTANTIATION: If my proposal to establish a new section 820-51(b) is accepted, a new section is added and the sections will be renumbered. The new section creates a new type of cable, Type CATVP-50. This proposal correlates section 820-51 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3628)

16- 299 - (820-51): Reject
SUBMITTER: David B. Kiddoo, AlphaGary Corp.
RECOMMENDATION: With regards to Section 820-51, "Limited Combustion Cable" or "Permanent Plenum Cable" should not be accepted as an additional Listing based on the lack of testing definition, the absence of cable Listing capability, and the proven adequacy of an integrated and enhanced NFPA 262 test method. NFPA 262 differentiates cables as to their fire performance to provide acceptable values for smoke generation and flame travel distance.
Propoents of "Limited Combustible Cable" or "Permanent Plenum Cable" have been actively soliciting support from cable market trade organizations, Code-Making Panel 16 Members or Alternates, cable manufacturers, etc. for a proposal to include a new paragraph in the Section to provide for a new Type of cable based on the definitions of "limited combustibility" and "smoke developed index" per the definitions in NFPA 90A. These definitions ONLY govern construction products for the installation of air conditioning and ventilating systems. The NFPA 255 and NFPA 259 fire test methods being promoted are NOT applicable to evaluate the fire hazard nor the geometries and material synergies in cables as they pertain to fire performance.
As these proposals have been made public through this solicitation for support, I wish to respond at this time to say that there is no safety record or fire performance issue necessitating any additional cable type of ruse in plenum cable applications. The inclusion of this new Type of cable is partially as a means to provide for an Exception from the proposed requirement in Section 820-52 to remove accumulations of abandoned cable. "Limited Combustible Cable" or "Permanent Plenum Cable" definitions seen in these proposals for a new cable Type are NOT based on any test method incorporating an actual cable fire hazard evaluation. Without adequate test methods and with the current status of the NFPRF "Permanent Plenum Cable Project", NO cables have been shown to meet the requirements proposed. The data generated in this Project have NOT been related to any appropriate fire hazard evaluation and should NOT be used to establish ANY relative cable fire performance comparisons.
SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".
An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:
- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."

• "...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not conform to section 4-3.3(c) of the Regulations Governing Committee Projects. The submitter has made other proposals on this subject that meet the Regulations Governing Committee Projects. The issues raised in this proposal were addressed when the other proposals were considered.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #507)

16- 300 - (820-51(a), FPN): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Change "5 ft (1.52 m)" to 1.52 m (5 ft)"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

The SI units are not rounded since this value specifies a minimum safety level.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1521)

16- 301 - (820-51(a), FPN): Accept

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Change NFPA 262-1994 to NFPA 262-1999.

SUBSTANTIATION: NFPA 262 has been revised.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1203)

16- 302 - (820-51(b)): Accept

Note: The Technical Correlating Committee directs that this Proposal be referred to the NFPA 90A Technical Committee on Air Conditioning for comment.

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Renumber sections as follows:

Existing section	Renumbered section
820-51(b)	820-51(c)
820-51(c)	820-51(d)
820-51(d)	820-51(e)

Add a new section 820-51(b).

(b) Limited Combustible Cable. Types CATVP cables that are also listed as being limited combustible and having a maximum smoke developed index of 50 shall be permitted to be listed and marked as Types CATVP-50.

FPN No. 1: See NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems for a definition of limited combustible. See NFPA 255-2000, Standard Method of Test of Surface Burning Characteristics of Building Materials for a definition of the smoke developed index.

FPN No. 2: For further information on the requirements for materials in ceiling cavity and raised floor plenums, see NFPA 90A-1999, Standard for the Installation of Air Conditioning and Ventilating Systems, Sections 2-3.10.1 Ceiling Cavity Plenum and 2-3.10.5 Raised Floor Plenum.

SUBSTANTIATION: See my proposal for section 800-51(h) to establish limited combustible cables.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #508)

16- 303 - (820-51(c), FPN): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

The inch-pound units are not rounded since this value specifies a minimum safety level.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #1027)

16- 304 - (820-52): Reject

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Revise 820-52 as shown:

820-52. Installation of Cables and Equipment

Beyond the point of grounding, as defined in Section 820-33, the cable installation shall comply with (a) through (e).

(a) Separation from Other Conductors.

(1) In Raceways and Boxes.

a. Other Circuits. Coaxial cables shall be permitted in the same raceway or enclosure with jacketed cables of any of the following:

1. Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725

2. Power-limited fire alarm systems in compliance with Article 760

3. Communications circuits in compliance with Article 800

4. Nonconductive and conductive optical fiber cables in compliance with Article 770

5. Low power network-powered broadband communications circuits in compliance with Article 830

b. Electric Light, Power, Class 1, Nonpower-Limited Fire Alarm, ~~and~~ Medium and High Power Network-Powered Broadband Communications Circuits. Coaxial cable shall not be placed in any raceway, compartment, outlet box, junction box, or other enclosures with conductors of electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits.

Exception No. 1: Where all of the conductors of electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuits are separated from all of the coaxial cables by a barrier.

Exception No. 2: Power circuit conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to the coaxial cable system distribution equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum 0.25-in. (6.35-mm) separation from coaxial cables.

(2) Other Applications. Coaxial cable shall be separated at least 2 in. (50.8 mm) from conductors of any electric light, power, Class 1, nonpower-limited fire alarm, ~~or~~ medium or high power network-powered broadband communications circuits.

Exception No. 1: Where either (1) all of the conductors of electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications and circuits are in a raceway, or in metal-sheathed, metal-clad, nonmetallic-sheathed, Type AC, or Type UF cables, or (2) all of the coaxial cables are encased in raceway.

Exception No. 2: Where the coaxial cables are permanently separated from the conductors of electric light, power, Class 1, nonpower-limited fire alarm, ~~and~~ medium and high power network-powered broadband communications circuits by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the wire.

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods.

(c) Equipment in Other Space Used for Environmental Air. Section 300-22(c) shall apply.

(d) Hybrid Power and Coaxial Cabling. The provisions of Section 780-6 shall apply for listed hybrid power and coaxial cabling in closed-loop and programmed power distribution.

(e) Support of Conductors. Raceways shall not be used as a means of support for coaxial cables.

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. This proposal amends the separation rules between circuits to provide appropriate separation from these new high-power communications circuits.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #644)

16- 305 - (820-52(a)(1)a): Accept in Principle

SUBMITTER: Stanley Kaufman, Lucent Technologies

RECOMMENDATION: Delete "Power-Limited" so the title will read "Other Circuits"

SUBSTANTIATION: Deleting "Power-Limited" will bring about correlation with 820-52(a)(1)(a).

PANEL ACTION: Accept in Principle.

In 800-52(a)(1)(a) delete "Power-Limited" so the title will read "Other Circuits"

PANEL STATEMENT: This section refers to more than just power-limited circuits.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

(Log #645)

16- 306 - (820-52(a)(1)a): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Renumber 820-52(a)(1)(a)(3) to 820-52(a)(1)(a)(4) and
Renumber 820-52(a)(1)(a)(4) to 820-52(a)(1)(a)(3).
SUBSTANTIATION: Editorial; the list of articles should be in numerical order.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #509)

16- 307 - (820-52(a)(1)b Exception No. 2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "0.25-in. (6.35-mm)" to "6.35 mm (0.25 in.)"
The CMP should consider rounding to "6 mm (0.25 in.)" if safety would not be compromised.
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since the dimensions specify minimum values for safety.
PANEL ACTION: Accept in Principle.
In the submitter's recommended text revise "6.35 mm (0.25 in.)" to "6 mm (0.25 in.)."
PANEL STATEMENT: The panel has accepted the TCC suggestion to round to "6 mm (0.25 in.)" and has included in the panel action text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1011)

16- 308 - (820-52(a)(2)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(2) Other Applications. Coaxial cable shall be separated at least 2 in. (50.8 mm) from open conductors of any electric light, power, Class 1, nonpower-limited fire alarm circuits, and ~~or~~ medium power network-powered broadband communications circuits.
Exception No. 1: Delete.
Exception ~~No. 2:~~ Separation shall not be required where ~~Where~~ the coaxial cable(s) ~~are~~ is ~~permanently separated from the conductors of~~ installed in a raceway(s), or the coaxial cable(s) or the electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits conductors ~~by a continuous and~~ are enclosed in a firmly fixed nonconductor such as porcelain tubes or flexible tubing, in addition to the insulation on the wire. This nonconductor shall be continuous for any length of conductor(s) with less than 2 in. (50.8 mm) separation.
SUBSTANTIATION: Editorial. The conductors of the text are presumed to be open conductors, since, if not, they would be normally in a raceway or cable covered in Chapter 3 and as indicated in the present Exception No. 1, although Type UF referenced is not indicated as multiconductor form, which seems to be the intent. The proposal includes separation from single-conductor Type UF and incorporates all present requirements in Sentence form, and delineates how long "continuous" is.
PANEL ACTION: Reject.
PANEL STATEMENT: The term "open conductor" is not defined.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #2779)

16- 309 - (820-52(a)(3)): Reject
SUBMITTER: Gregory P. Bierals, Electrical Design Inst.
RECOMMENDATION: Add new text as follows:
Raceways or cable trays containing coaxial cables shall not contain any pipe, tube, or equal for steam, water, air, gas, drainage, or any service other than electrical.
SUBSTANTIATION: There presently is no reference in Article 820 that prohibits this practice.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to the panel action and statement on Proposal 16-70. This proposal deals with the same issues as Proposal 16-70 and is rejected for the same reasons.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1128)

16- 310 - (820-52(b)): Accept in Principle in Part
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 820-52(b) as follows:
(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in ducts, plenums, and other space used for environmental air, shall be removed.
Exception: Type CATVP-50 cables shall not be required to be removed.
FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.
SUBSTANTIATION: See my proposal for Section 800-52(b).
PANEL ACTION: Accept in Principle in Part.
The part being rejected is the recommendation to add the exception. The panel actions in other proposals adopting the requirement to remove abandon cables satisfies the proposal other than the exception. There is inadequate justification to leave any debris (e.g. abandoned cable).
The remaining part of the proposal is accepted in principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-313.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1534)

16- 311 - (820-52(b)): Accept
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise 820-52(b) as follows:
(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through ~~fire~~ fire- resistance-rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods to maintain the fire resistance rating.
SUBSTANTIATION: This proposed revision underscores the true purpose of the rule, to maintain the fire resistance rating, and correlates 820-52(b) with 300-21.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3627)

16- 312 - (820-52(b)): Accept in Principle

SUBMITTER: David B. Kiddoo, AlphaGary Corp.

RECOMMENDATION: Revise 820-52(b) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, ventilation ducts or air-handling plenums shall be made so that the possible spread of fire or fire resistant-rated walls, partitions, floors or ceilings shall be firestopped using approved methods to maintain the fire resistant rating. Abandoned cables in these spaces, shafts, ducts and plenums shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in these spaces, shafts, ducts, plenums, and other space used for environmental air, shall be removed.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

FPN No. 2: Definition of acceptable cable fire performance in various applications are described in Section 820-51.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has

assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: Refer to panel action on Proposal 16-313 which meets the intent of the submitter.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 21

ABSTENTION: 1

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #4053)

16- 313 - (820-52(b)): Accept in Principle

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Revise Section 820-52(b) as follows:

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate. Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed where practicable.

FPN : Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

SUBSTANTIATION: BICSI members have been extensively involved with the design and installation of telecommunications cabling. Technology changes have resulted in newer high performance cabling being installed in support of those technologies. We have observed excessive accumulations of abandoned cabling adding to the fuel loading within plenum spaces. This proposal is offered to the NFPA to help reduce the fuel load within these plenum areas.

Addition of "to maintain the fire resistance rating" to the end of the second sentence will correlate this section with section 300-21.

The proposed fine print No. 1 note was copied from the first sentence of the fine print note in section 300-21. It assists installers in locating firestop information.

Acceptance of this proposal will result in cable removal being included in the scope of the installation of a new communications and data system. The contractor will remove the old cable before installing the new system.

Acceptance of this proposal will result in many BICSI members specifying abandoned cable removal within the scope of the installation of new communications and data systems.

In two separate proposals, we have offered definitions for "abandoned cable" and "excessive accumulation of abandoned cables".

This proposed wording addresses the issue of excess combustibles in plenums without requiring the removal of all abandoned cable, only excessive accumulations of abandoned cable, thus avoiding a burdensome requirement of removing insignificant amounts of cable. The proposed first sentence, Abandoned cables in ducts, plenums, and other space used for environmental air shall not be allowed to accumulate, limits the amount of cable that will be permitted to be abandoned. It applies to all cable that is in place, plenum cable as well as non-plenum cable that was installed before the plenum cable requirements were in the Code. The proposed second sentence, Excessive accumulations of abandoned cables, in ducts, plenums, and other space used for environmental air, shall be removed, where practicable, deals with already abandoned cable. The wording of "where practicable" aid the situations where cable may be intertwined and cannot be removed without disruption of active services. The NEC requirements for plenum cable were first promulgated in the 1975 NEC, consequently, abandoned cables in older buildings often include unlisted cable along with listed plenum cable.

Other sections of the NEC require the removal of abandoned wiring.

ARTICLE 354 — Underfloor Raceways, Section 354-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 356 — Cellular Metal Floor Raceways, Section 356-7. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 358 — Cellular Concrete Floor Raceways, Section 358-13. Discontinued Outlets. When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case of abandoned outlets on loop wiring, shall be allowed in raceways.

ARTICLE 305 — Temporary Wiring, Section 305-3(d). Time Constraints, (d) Removal. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

PANEL ACTION: Accept in Principle.

Revise 820-3(a) to read as follows:

"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables not intended for future use shall not be permitted to remain."

PANEL STATEMENT: The revision meets the intent of the submitter. It is more appropriate to place the requirement in 820-3(a) which addresses the subject.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

ABSTENTION: 1

COMMENT ON AFFIRMATIVE:

BRUNSSEN: See my Comment on Affirmative Vote on Proposal 16-80.

DORNA: The revised wording for 820-3(a) should read as follows:

"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall not be permitted to remain."

The use of the phrase "not intended for future use" is redundant. The definition of "abandoned cable" has this phrase in the definition. To restate this phrase would be grammatically incorrect.

JOHNSON: See my Comment on Affirmative on Proposal 16-80.

KAHN: See my Comment on Affirmative on Proposal 16-80.

WIERENGA: The revised wording for 820-3(a) should read as follows:

"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables ~~not intended for future use~~ shall ~~not~~ be removed."

The use of the phrase "not intended for future use" is redundant because it is already included in the definition of "abandoned cable". The deletion of the words "not" and "permitted to remain" can be readily stated by use of positive code language using the word "removed".

EXPLANATION OF ABSTENTION:

CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1012)

16- 314 - (820-52(e)): Accept in Principle

SUBMITTER: Dan Leaf, Palmdale, CA

RECOMMENDATION: Revise to read as follows:

Support of Conductors. ~~Raceways shall not be used as a means of support for coaxial~~ Coaxial cables shall not be strapped, taped, or

attached by any means to the exterior of any raceway or cable as a means of support, except as permitted in Section 820-10(c).
SUBSTANTIATION: Editorial. Where installed in raceways support is obviously provided. Where terminated at a raceway mast support is also provided. The proposal is intended to clarify what is apparently intended and also includes cables such as Types AC, MC, MI, NM, etc.
PANEL ACTION: Accept in Principle.
Replace 820-52(e) as follows:
"(e) Support of Cables. Raceways shall be used for their intended purpose. Coaxial cables shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.
Exception: Overhead (aerial) spans of coaxial cables shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such cables."
PANEL STATEMENT: The revised wording satisfies the submitter's intent and correlates with 800-52(e), to provide consistent wording and requirements.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #591)

16- 315 - (820-53): Accept in Principle
SUBMITTER: Gerald Lee Dorna, Belden Wire & Cable Co.
RECOMMENDATION: 1. Change "(c)" to "(d)"
2. Change "(d)" to "(e)"
3. Add new "(c)" Cable Trays. Cables installed in cable trays shall be types CATVP, CATVR, and CATV
Note: If this is accepted then the first sentence of Section 820-53 would need to be modified as follows:
"CATV cables shall comply with (a) through ~~(d)~~ (e) "
SUBSTANTIATION: This change will make Article 820 correspondent with Article 725.
It will also resolve the problem of whether or not CATV cables are allowed in cable trays.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation by changing item 2) to read as follows: "Change "(d)" to "(f)""
In addition revise the last sentence of the recommendation to read as follows:
"CATV cables shall comply with (a) through ~~(d)~~ (f) "
PANEL STATEMENT: Refer to panel action on Proposal 16-319 where a new section (e) was added. The change in numbers are made to correlate with this.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #1206)

16- 316 - (Table 820-53): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: In Table 820-50. Cable Markings, revise as follows:
SUBSTANTIATION: If my proposal to establish a new section 820-51(b) is accepted, a new section is added and the sections will be renumbered. The new section creates a new type of cable, Type CATVP-50. This proposal correlates Table 820-50 with those proposed changes.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:
KAUFMAN: The recommendation and substantiation incorrectly refers to Table 820-50. This proposal deals with Table 820-53.
In addition to revising Table 820-53, Figure 820-53 should be revised in order to illustrate the changes in Table 800-53.

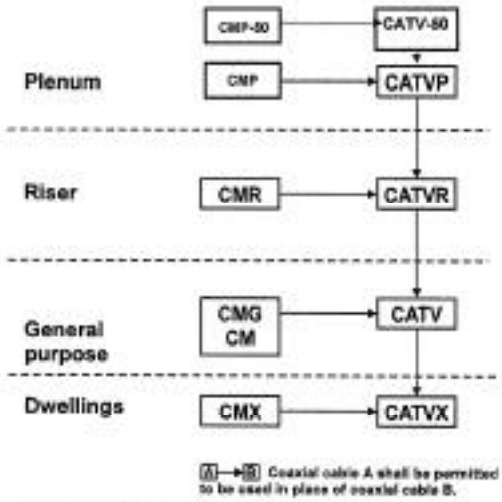


Figure 820-53. Cable Substitution Hierarchy

EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #2244)

16- 317 - (Figure 820-53): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: Add vertical arrows between CMP, CMR, CMG/CM, and CMX.
SUBSTANTIATION: Correct error in the 1999 Code
PANEL ACTION: Reject.
PANEL STATEMENT: The arrows were removed to simplify the diagram. Only substitutions for cables within the Article are shown.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

Table 820-53. Coaxial Cable Uses and Permitted Substitutions

Cable Type	Use	References	Permitted Substitutions
CATVP	Coaxial plenum cable	820-53(a)	CATVP-50, CMP
CATVR	Coaxial riser cable	820-53(b)	CATVP-50, CATVP, CMP, CMR
CATV	Coaxial general-purpose cable	820-53(c)	CATVP-50, CATVP, CMP, CATVR, CMR, CMG, CM
CATVX	Coaxial cable, limited use	820-53(c)	CATVP-50, CATVP, CMP, CATVR, CMR, CATV, CMG, CM

The note is unchanged.

VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #4140)

16- 318 - (820-53(a)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH Int'l, Inc./Rep. Plenum Cable Assn.
RECOMMENDATION: Revise as follows:
820-53. Applications of Listed CATV Cables. CATV cables shall comply wih (a) through (d).
(a) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandoned cables, not intended for future use, shall not be permitted to remain.
Exception: Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with Section 300-22.
SUBSTANTIATION: There is a significant amount of information indicating that the amount of cables installed in plenums, and other air-handling spaces, is increasing rapidly. An understanding of cabling practices indicates that the most common way in which cable installation is carried out is by disconnecting existing cable and leaving it abandoned in place, while introducing the cable needed to perform the additional functions. See Log #4136. There is, as yet, no indication that the additional cables in plenums causes an added fire hazard, and the fire record of cables in concealed spaces, both above ceilings and below floors, remains excellent. In fact, plenum cables, which meet the fire test requirements of NFPA 262, have been shown to have extremely good fire performance and to spread flame only very slowly, if at all. However, this type of preventive measure is worthwhile.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-313.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #2141)

16- 319 - (820-53(d) and (e)):
Note: It was the action of the Technical Correlating Committee that this Proposal be reported as "Reject" since Code-Making Panel 14 rejected Proposals 14-73 and 14-217 that proposed to add Types CATVP, CATVR, and CATV cables. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 14 for information.
SUBMITTER: Kari Barrett, Chemical Manufacturers Assn.
RECOMMENDATION: Renumber 820-53(d) Cable Substitutions, (e); and provide the following new 820-53(d) as follows:
(d) Hazardous (Classified) Locations. Where the use of Type CATVP, CATVR, CATV, and CATVX cable is permitted in Sections 501-4(b), 502-4(b), and 504-20, the cable shall be installed in cable trays; in raceways; supported by messenger wire, or otherwise adequately supported and mechanically protected by angles, struts, channels, or by other mechanical means.
SUBSTANTIATION: This is a companion proposal to correlate with the introduction of Coaxial cables in Sections 501-5(b) and 502-4(b). Type CATVP, CATVR, CATV, or CATVX coaxial cables, as described in Section 820-51, have the additional having fire-resistant characteristics similar to the requirements for other types of cables such as TC and ITC, which are currently permitted for Class II Division 2 locations. In addition they are suitable for installation in cable trays as permitted by Article 318. Coaxial cables are needed in modern industrial facilities for digital and video signal transmission.
PANEL ACTION: Accept in Principle in Part.
Revise the submitter's proposal by adding a new 820-53(e) as follows:
"(e) Hazardous (Classified) Locations. Where the use of Type CATVP, CATVR, and CATV cable is permitted in Sections 501-4(b), 502-4(b), and 504-20, the cable shall be installed in cable trays; in raceways; supported by messenger wire, or otherwise adequately supported and mechanically protected by angles, struts, channels, or by other mechanical means."
PANEL STATEMENT: The Type CATVX is rejected. Type CATVX cables have inadequate fire-resistance to be used in cable trays (to correlate with the panel action Proposal 16-315).
The numbering has been modified to correlate with Proposal 16-315.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 21

(Log #3233)

16- 320 - (820-54(e) (New)): Accept in Principle
SUBMITTER: Hallie Smith-Petee, The Geon Co.
RECOMMENDATION: Insert a new Section 820-54(e):
(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts,plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.
SUBSTANTIATION: See Substantiation for 800-52(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-313.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #3969)

16- 321 - (820-54(e) (New)): Accept in Principle
SUBMITTER: Hallie Smith-Petee, The Geon Co.
RECOMMENDATION: Insert a new Section 820-54(e) to read as follows:
(e) Spread of Fire or Products of Combustion: Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be so made that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating. Abandoned cables present in ducts, plenums and other air handling space shall not be allowed to accumulate. Cables not intended for future use shall be removed.
SUBSTANTIATION: See Substantiation for Section 800-52(b).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The proposer's intent was satisfied by panel action on Proposal 16-313.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

ARTICLE 830 — NETWORK-POWERED BROADBAND COMMUNICATIONS SYSTEMS

(Log #510)

16- 322 - (830): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 830-10(c) Exception - change "12 in. (305 mm)" to "300 mm (12 in.)"
830-10(d):
change "9.5 ft (2.89 m)" to "2.9 m (9.5 ft)"
change "11.5 ft (3.50 m)" to "3.5 m (11.5 ft)"
change "15.5 ft (4.72 m)" to "4.7 m (15.5 ft)"
830-10(e):
change "22 ft (6.71 m)" to "6.7 m (22 ft)"
change "14 ft (4.27 m)" to "4.3 m (14 ft)"
830-10(e) Exception No. 2 - change "10 ft (3.05 m)" to "3.0 m (10 ft)"
830-10(f) - change "8 ft (2.44 m)" to "2.5 m (8 ft)"
830-10(f) Exception No. 2:
change "18 in. (457 mm)" to "450 mm (18 in.)"
change "4 ft (1.22 m)" to "1.2 m (4 ft)"
830-10(f) Exception No. 3 - revise as follows:
"Exception No. 3: Where the roof has a slope of not less than 100 mm (4 in.) ~~4 in. (102 mm)~~ in 300 mm (12 in.) ~~12 in. (305 mm)~~, a reduction in clearance to not less than 900 mm (3 ft) ~~3 ft (914 mm)~~ shall be permitted."
830-10(g) - change "3 ft (914 mm)" to "900 mm (3 ft)"
830-10(g) Exception - change "3-ft (914-mm)" to "900 mm (3 ft)"
830-10(i)(1) - change "4 in. (102 mm)" to "100 mm (4 in.)"
830-10(i)(3) - change "6 ft (1.83 m)" to "1.8 m (6 ft)"
830-10(i)(4) - change "8 ft (2.44 m)" to "2.5 m (8 ft)"
830-11(b) - change "12 in. (305 mm)" to "300 mm (12 in.)"
830-11(c):
change "8 ft (2.44 m)" to "2.5 m (8 ft)"
change "18 in. (457 mm)" to "450 mm (18 in.)"
830-11(d) - change "5 ft (1.52 m)" to "1.5 m (5 ft)"
830-11(d) Exception:
change "5 ft (1.52 m)" to "1.5 m (5 ft)"
add a (mm) column in addition to the (in.) column under Minimum Burial and insert "150" mm beside the two "6" in. dimensions and insert "450" mm beside the two "18" in. dimensions
delete "Note: For SI units, 1 in. = 25.4 mm."
change "2 in. (50.8 mm)" to "50 mm (2 in.)"
830-30(a) FPN No. 2 (2) - change "140 ft (42.7 m)" to "42 m (140 ft)"
830-30(b)(3) - change "30 ft (9.14 m)" to "9.0 m (30 ft)" in two places in the third paragraph.
830-33 - change "30 ft (9.14 m)" to "9.0 m (30 ft)" in two places in the second paragraph.
830-40(b)(3):
change "5 ft (1.52 m)" to "1.5 m (5 ft)"
change "_ in. (12.7 mm)" to "12.7 mm (_ in.)"
change "6 ft (1.83 m)" to "1.8 m (6 ft)"
830-42 - change "30 ft (9.14 m)" to "9.0 m (30 ft)" in two places
830-55(b) Exception No. 2 - change "0.375 in. (9.52 mm)" to "9.5 mm (0.375 in.)"
830-55(c) Exception No. 3 - change "0.375 in. (9.52 mm)" to "9.5 mm (0.375 in.)"
830-55(c) Exception No. 4 - change "50 ft (15.2 m)" to "15 m (50 ft)"
830-55(c) Exception No. 4 FPN - change "50 ft (15.2 m)" to "15 m (50 ft)"in three places
830-58(a)(2) - change "2 in. (50.8 mm)" to "50 mm (2 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
In 830-40(b)(3), the SI units for 1/2 in. are not rounded since it specifies at minimum trade size.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1028)

16- 323 - (830-1): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise the title and scope of Article 830 as shown:
ARTICLE 830 Low and Medium Power Network-Powered Broadband Communications Systems
A. General
830-1. Scope. This article covers low and medium power network-powered broadband communications systems that provide any combination of voice, audio, video, data, and interactive services through a network interface unit.
FPN No. 1: A typical basic system configuration includes a cable supplying power and broadband signal to a network interface unit that converts the broadband signal to the component signals. Typical cables are coaxial cable with both broadband signal and power on the center conductor, composite metallic cable with a coaxial member for the broadband signal and a twisted pair for power, and composite optical fiber cable with a pair of conductors for power. Larger systems may also include network components such as amplifiers that require network power.
FPN No. 2: See Section 90-2(b)(4) for installations of broadband communications systems that are not covered.
SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. The title and scope of Article 830 need to be changed to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1014)

16- 324 - (830-3(d)(4)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(4) Installations of Class 1, Class 2, and Class 3 circuits - Article 725.
SUBSTANTIATION: Comment 16-261 in the 1998 ROC which included Class 1 circuits was revised by the panel and excluded Class 1 due to power limitation of low and medium power network-powered broadband communications systems. However, a Class 1 circuit can be within the voltage/power parameters of Class 2 or 3. Code doesn't indicate Class 1 must exceed Class 2 or 3 parameters.
PANEL ACTION: Reject.
PANEL STATEMENT: Class 1 circuits are not derived from an NIU.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1033)

16- 325 - (Table 830-4): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise the title of Table 830-4 as shown:
Table 830-4. Limitations for Low and Medium Power Network-Powered Broadband Communications Systems.
SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1035)

16- 326 - (830-5): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 830-5 as shown:

830-5. Low and Medium Power Network-Powered Broadband Communications Equipment and Cables. Low and medium power ~~N~~network-powered broadband communications equipment and cables shall be listed as suitable for the purpose.

Exception No. 1: This listing requirement shall not apply to community antenna television and radio distribution system coaxial cables that were installed prior to January 1, 2000, in accordance with Article 820 and are used for low power network-powered broadband communications circuits. See Section 830-9.

Exception No. 2: Substitute cables for low and medium power network-powered broadband communications cables shall be permitted as shown in Table 830-58.

(a) Listing and Marking. Listing and marking of low and medium power network-powered broadband communications cables shall comply with (1) or (2).

(1) Type BMU, Type BM, and Type BMR Cables. Network-powered broadband communications medium power underground cable, Type BMU; network-powered broadband communications medium power cable, Type BM; and network-powered broadband communications medium power riser cable, Type BMR, shall be factory-assembled cables consisting of a jacketed coaxial cable, a jacketed combination of coaxial cable and multiple individual conductors, or a jacketed combination of an optical fiber cable and multiple individual conductors. The insulation for the individual conductors shall be rated for 300 volts minimum. Cables intended for outdoor use shall be listed as suitable for the application. Cables shall be marked in accordance with Section 310-11. Type BMU cables shall be jacketed and listed as being suitable for outdoor underground use. Type BM cables shall be listed as being suitable for general purpose use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire. Type BMR cables shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

FPN No. 1: One method of defining resistant to spread of fire is that the cables do not spread fire to the top of the tray in the vertical tray flame test in the Reference Standard for Electrical Wires, Cables and Flexible Cords, ANSI/UL 1581-1991. Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 4 ft. 11 in. (1.5 m) when performing the CSA vertical flame test for cables in cable trays, as described in Test Methods for Electrical Wires and Cables, CSA C22.2 No. 0.3-M-1985.

FPN No. 2: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of the Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts, ANSI/UL 1666-1997.

(2) Type BLU, Type BLX, and Type BLP Cables. Network-powered broadband communications low power underground cable, Type BLU; limited use network-powered broadband communications low power cable, Type BLX; and network-powered broadband communications low power plenum cable, Type BLP, shall be factory assembled cables consisting of a jacketed coaxial cable, a jacketed combination of coaxial cable and multiple individual conductors, or a jacketed combination of an optical fiber cable and multiple individual conductors. The insulation for the individual conductors shall be rated for 300 volts minimum. Cables intended for outdoor use shall be listed as suitable for the application. Cables shall be marked in accordance with Section 310-11. Type BLU cables shall be jacketed and listed as being suitable for outdoor underground use. Type BLX limited-use cables shall be listed as being suitable for use outside, for use in dwellings, and for use in raceways, and shall also be listed as being flame retardant. Type BLP cables shall be listed as being suitable for use in ducts, plenums, and other spaces for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN No. 1: One method of determining that cable is flame retardant is by testing the cable to VW-1 (vertical-wire) flame test in the Reference Standard for Electrical Wires, Cables and Flexible Cords, ANSI/UL 1581-1991.

FPN No. 2: One method of defining low smoke-producing cable is by establishing an acceptable value of the smoke produced when tested in accordance with Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables, NFPA 262 -1994, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing maximum allowable flame travel distance of 5 ft (1.52 m) when tested in accordance with the same test.

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20
COMMENT ON AFFIRMATIVE:

DORNA: I only comment on this proposal because the panel, including me, missed an opportunity to revise 830-5(a)(1) and 830-5(a)(2) with respect to not allowing the voltage rating to be marked on the cable. Both sections above { 830-5(a)(1) and 830-5(a)(2) } have a sentence in the middle of their sections which reads: "Cables shall be marked in accordance with Section 310-11."

Section 310-11(a)(1) says "The maximum rated voltage for which the conductor was listed" is to be marked on the cable. With respect to Medium Power (BM Types) they are for use on 0-150 volt circuits. However, the insulated conductor will have a 300 volt rating. In addition, the Low Power (BL Types) they are for use on 0-100 volt circuits. Their insulated conductor rating is also a 300 volt rating. In either case I do not believe that the panel wishes to have "the maximum rated voltage for which the conductor was listed" marked on the cable.

A new sentence should follow the one above in both sections { 830-5(a)(1) and 830-5(a)(2) } so it would now read: "… Section 310-11. The voltage rating shall not be marked on the cable."

This would make it correspondent with Article 725 (see Proposal 16-91), Article 727 (see Proposal 16-106), Article 800-50, and Article 820-50.

The voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1 and electric light applications.

(Log #3623)

16- 327 - (830-5): Reject
SUBMITTER: David B. Kiddoo, AlphaGary Corp.
RECOMMENDATION: With regards to Section 830-5, "Limited Combustion Cable" or "Permanent Plenum Cable" should not be accepted as an additional Listing based on the lack of testing definition, the absence of cable Listing capability, and the proven adequacy of an integrated and enhanced NFPA 262 test method. NFPA 262 differentiates cables as to their fire performance to provide acceptable values for smoke generation and flame travel distance.

Propoents of "Limited Combustible Cable" or "Permanent Plenum Cable" have been actively soliciting support from cable market trade organizations, Code-Making Panel 16 Members or Alternates, cable manufacturers, etc. for a proposal to include a new paragraph in the Section to provide for a new Type of cable based on the definitions of "limited combustibility" and "smoke developed index" per the definitions in NFPA 90A. These definitions ONLY govern construction products for the installation of air conditioning and ventilating systems. The NFPA 255 and NFPA 259 fire test methods being promoted are NOT applicable to evaluate the fire hazard nor the geometries and material synergies in cables as they pertain to fire performance.

As these proposals have been made public through this solicitation for support, I wish to respond at this time to say that there is no safety record or fire performance issue necessitating any additional cable type for use in plenum cable applications. The inclusion of this new Type of cable is partially as a means to provide for an Exception from the proposed requirement in Section 830-58 to remove accumulations of abandoned cable. "Limited Combustible Cable" or "Permanent Plenum Cable" definitions seen in these proposals for a new cable Type are NOT based on any test method incorporating an actual cable fire hazard evaluation. Without adequate test methods and with the current status of the NFPRF "Permanent Plenum Cable Project", NO cables have been shown to meet the requirements proposed. The data generated in this Project have NOT been related to any appropriate fire hazard evaluation and should NOT be used to establish ANY relative cable fire performance comparisons.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:

- **"After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."**
- **"...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."**
- **"...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."**
- **"...the previous edition text is, in the Council's view, clearly suitable."**
- **"...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."**
- **"...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."**

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal does not conform to section 4-3.3(c) of the Regulations Governing Committee Projects. The submitter has made other proposals on this subject that meet the Regulations Governing Committee Projects. The issues raised in this proposal were addressed when the other proposals were considered.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #511)

16- 328 - (830-5(a)(1), FPN No. 1): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "4 ft 11 in. (1.5 m)" to "1.5 m (4 ft 11 in.)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The inch-pound units are not rounded since this value specifies a minimum safety level.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2238)

16- 329 - (830-5(a)(2)): Accept in Principle
SUBMITTER: Ravindra H. Ganatra, Alcan Cable
RECOMMENDATION: Change the phrase "flame-retardant" to "flame tested."
SUBSTANTIATION: Specific requirements applicable for a given product's performance when subjected to the required flame test are addressed in the product standard applicable for that product. The NEC does not define "flame-retardant" (or "flame retardant") because the performance requirements vary by product. One may suggest that the present use of the term "flame-retardant" is not measurable and therefore implies a false sense of security. Use of the phrase "flame tested" informs the user that the product shall be tested against the requirements for a specific flame test and directs the user's attention to seek further understanding about the given product's performance.
[Note: The phrases "flame-retardant" (or "flame retardant") and "flame resistant" appear in 22 and 3 locations, respectively. This is a companion proposal to all other similar proposals. Also, see a general proposal for Article 110 that provides a basis to replace the phrases "flame-retardant" (or "flame retardant") and "flame resistant" by a phrase "flame tested" throughout the Code.]
PANEL ACTION: Accept in Principle.
Replace "flame retardant" with "resistant to flame spread" in the section and in FPN No. 1.
PANEL STATEMENT: This change will correlate with the wording used for the requirements for CMX and CATVX.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #512)

16- 330 - (830-5(a)(2), FPN No. 2): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "5 ft (1.52 m)" to "1.52 m (5 ft)"
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
The SI units are not rounded since this value specifies a minimum safety level.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1522)

16- 331 - (830-5(a)(2), FPN No. 2): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Change NFPA 262-1994 to NFPA 262-1999.
SUBSTANTIATION: NFPA 262 has been revised.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1536)

16- 332 - (830-6): Accept in Principle
Note: See Technical Correlating Committee action on Proposal 16-38. It was the action of the Technical Correlating Committee that further consideration be given to the comments expressed in the voting. The Technical Correlating Committee directs that the Action on this Proposal be revised to comply with the NEC Style Manual 3.2.1 relative to use of the unenforceable terms "practicable" and "impracticable." This action will be consideed by the Panel as a Public Comment. It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 3 for Comment.
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise 830-6 as follows:
830-6. Access to Electrical Equipment Behind Panels Designed to Allow Access. Access to equipment shall not be denied by an excess accumulation of cables ~~that prevents~~ sufficient to prevent the removal of panels, including suspended ceiling panels.
SUBSTANTIATION: Section 830-6 may be misinterpreted to mean that cables may not be placed directly on suspended ceilings. While the 1999 National Electrical Code Handbook emphasizes "excess accumulation" in the interpretive text, Figures 830-2 and 830-3 lead the reader to conclude that no cables are permitted to rest directly on the suspended ceiling. This was not the intent of CMP 16 when similar rules were introduced into other sections of the 1993 NEC. At that time, CMP 16 stated in response to a proposal to Article 725 (1992 TCD, Comment 16-18) that the proposed requirement "... would still allow some cabling of a limited quantity above the ceiling tile, but not to an excessive amount." The proposed revision emphasizes that is an excessive accumulation of cable that is of concern. A limited amount of cabling laid directly on a suspended ceiling is permitted, will not deny access to equipment, and does not present an unsafe working environment. This is a companion proposal and is intended to correlate with 725-5, 760-5, 770-7, 800-5 and 820-5.
PANEL ACTION: Accept in Principle.
Revise 830-6 to read as follows:
"830-6. Access to Electrical Equipment Behind Panels Designed to Allow Access
Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels. Cables shall be installed in such a manner that the cable will not be damaged by normal building use. Access to electrical equipment behind ceilings designed to allow access shall comply with (a) or (b).
a. New building construction (e.g., renovation, remodeling, new spaces). Installation of cables shall comply with Section 300.11.
b. Buildings with existing cabling systems.
Where practicable, installation of cables shall comply with Section 300-11. Where impracticable to comply with Section 300-11, cables less than 13 mm (0.5 in) in diameter shall be permitted to be installed unsupported by the building structure in accordance with 1 or 2.
1. In areas having ceilings with access points or access panels, it shall be permissible to fish a maximum of three cables between access points in the ceiling.
2. In areas having suspended lay-in ceilings, it shall be permissible to install a maximum three unsupported cables on top of any one ceiling tile. The cables shall be run parallel to the ceiling grid."
PANEL STATEMENT: The revised text satisfies the intent of the original recommendation in that it allows some cabling of a limited quantity above ceiling tile but not an excessive amount, which would interfere with accessibility.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1

EXPLANATION OF NEGATIVE:
EGEDSAL: See my Explanation of Negative Vote on Proposal 16-192.
COMMENT ON AFFIRMATIVE:
BRUNSSEN: I concur with the panel action in providing relief for a limited amount of after-construction network-powered broadband communications cables to be placed directly on the suspended ceiling tiles. However, proposed Section 830-6(b)(2), as presently written, is confusing and could be interpreted as permitting a total of only three unsupported cables. The intent of the panel was that up to a maximum of three unsupported cables may be routed across each and every ceiling tile. Revising 830-6(b)(2) to state: "...permissible to install a maximum of three unsupported cables on top of ~~any one~~ each ceiling tile, i.e., up to three cables are permitted to lay on a ceiling tile." would clarify the intent. Note that the word "of" is inserted and is missing in the original text.

(Log #1037)

16- 334 - (830-7): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 830-7 as shown:
830-7. Mechanical Execution of Work. Low and medium power ~~N~~network-powered broadband communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use.
FPN: One way to determine accepted industry practice is to refer to nationally recognized standards such as Commercial Building Telecommunications Cabling Standard, ANSI/EIA/TIA 568-A-1995; Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA/EIA 569-A-1997; and Residential and Light Commercial Telecommunications Wiring Standard, ANSI/EIA/TIA 570-1991, or other ANSI-approved installation standards.
SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #CP1607)

16- 333a - (830-7): Accept
SUBMITTER: CMP 16
RECOMMENDATION: Revise text to read as follows:
"Mechanical Execution of Work. Network-powered broadband communications circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceiling and sidewalls shall be supported by the structural components of the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be attached to structural components at intervals not exceeding 1.52 m (5 ft) and within 305 mm (12 in.) from every cabinet, box or fitting by straps, staples, hangers or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with Section 300-4(d)."
Also, delete the Fine Print Note.
SUBSTANTIATION: This proposal provides additional rules for the mechanical execution of the work. Since there are additional rules, the fine print note is not necessary. This provides parallel requirements to those used in Articles 640, 725, 760, 770, 800, and 820.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation of Negative Vote on Proposal 16-2a.

(Log #3657)

16- 335 - (830-7): Accept
SUBMITTER: Melvin J. Wierenga, Wierenga & Assoc.
RECOMMENDATION: Delete the FPN associated with this section.
SUBSTANTIATION: Problem: The standards listed contain insufficient information to determine accepted industry practice for systems and equipment included in Article 830.
Substantiation: A detailed review of ANSI/EIA/TIA/568A-1995, ANSI/EIA/TIA/569-1990 , and ANSI/EIA/TIA/570-1991 was completed by the submitter and no significant information, guidance, or directives were found, that would be helpful to a user of this Article of the Code. These standards were developed by the telecom and computer industries. They provide the details covering telecommunication infrastructure such as cable pathways, equipment spaces, telephone grounding/bonding, and telecommunication administration. They are excellent standards but they do not address typical cabling installation issues such as:
(a) how to properly pull wire(s) above a lay in ceiling.
(b) when and where to support the wire in a building structure.
(c) how to dress various types of audio signal wires coming into and within an equipment cabinet.
(d) how and where to set up wire reels for riser cables in tall structures.
(e) how and where to dress audio speaker wire along a steel beam in a gymnasium or factory.
(f) what to watch out for when pulling a cable into a raceway.
These standards are purported to be the concept standards for guiding the users of the Code in determining appropriate mechanical execution of work and determination of acceptable industry practices. However, such is not the intent of the standards. For those who do not have a set of the standard available, the submitter has provided an Appendix that summarizes each section of each standard. The appendix will give you an overview of the contents of each section of each standard and enable you to gain a better understanding of what the standards cover.
Note: Supporting material is available for review at NFPA Headquarters.
PANEL ACTION: Accept.
PANEL STATEMENT: The proposed recommendation has been incorporated by the panel action on Proposal 16-333(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
ROMLEIN: See my Explanation of Negative Vote on Proposal 16-3.

(Log #4026)

16- 333 - (830-7, FPN): Reject
SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l
RECOMMENDATION: Revise the FPN to read: "One way to determine accepted industry practice is to refer to nationally recognized standards such as Commercial Building Telecommunications Cabling Standard, ANSI/EIA/TIA 568-A-1995; Commercial Building Standard for Telecommunications Pathways and Spaces, ANSI/TIA/EIA 569-A-1997; and Residential ~~and Light Commercial~~ Telecommunications Cabling ~~Wiring~~ Standard, ~~ANSI/EIA/TIA 570-1991~~ ANSI/EIA/TIA 570-A-1999, ANSI/NECA/BICSI 568 or other ANSI-approved installation standards."
SUBSTANTIATION: A revision to the standard number and the title for residential cabling has been updated. Another standard is currently under review that will be focused at the installation of telecommunications cabling and connectors and will become an ANSI standard within the next year.
PANEL ACTION: Reject.
PANEL STATEMENT: Section 830-7 has been revised to remove the FPN and provide specific installation requirements. A FPN is no longer necessary. Refer to the panel action and statement on Proposal 16-333(a).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1017)

16- 336 - (830-7(a) (New)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Add a new section to 830-7(a) to read as follows:
(a) Support of Conductors. Network-powered broadband communications systems conductors shall not be strapped, taped, or attached by any means to the exterior of any raceway or cable as a means of support, except that aerial cable shall be permitted to be attached to an approved raceway mast.
SUBSTANTIATION: The proposal is similar to requirements for other type systems conductors and appears to be a reasonable rule for the conductors of this article.
PANEL ACTION: Reject.
PANEL STATEMENT: The requirement is partially addressed in 830-58(d). The submitter has not specified the type (function) of raceway mast that would be permitted.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1038)

16- 337 - (830-8): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 830-8 as shown:
830-8. Hazardous (Classified) Locations. Low and medium power ~~N~~network-powered broadband communications circuits and equipment installed in a location that is classified in accordance with Article 500 shall comply with the applicable requirements of Chapter 5.
SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1039)

16- 338 - (830-9): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 830-9 as shown:
830-9. Entrance Cables. Cables installed outdoors shall be listed as suitable for the application. In addition, low and medium power network-powered broadband communications cables located outside and entering buildings shall comply with (a) and (b).
(a) Medium Power Circuits. Medium power network-powered broadband communications circuits located outside and entering buildings shall be installed using Type BMU, Type BM, or Type BMR network-powered broadband communications medium power cables.
(b) Low Power Circuits. Low power network-powered broadband communications circuits located outside and entering buildings shall be installed using Type BLU or Type BLX low power network-powered broadband communications cables. Cables shown in Table 830-58 shall be permitted to substitute.
Exception: Outdoor community antenna television and radio distribution system coaxial cables installed prior to January 1, 2000, and installed in accordance with Article 820, shall be permitted for low-power type, network-powered broadband communications circuits.
SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1029)

16- 339 - (830-10): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 830-10 as shown:
830-10. Aerial Cables. Aerial low and medium power network-powered broadband communications cables shall comply with (a) through (g).
(a) On Poles. Where practicable, low and medium power network-powered broadband communications cables on poles shall be located below the electric light, power, Class 1, or nonpower-limited fire alarm circuit conductors and shall not be attached to a crossarm that carries electric light or power conductors.
(b) Climbing Space. The climbing space through low and medium power network-powered broadband communications cables shall comply with the requirements of Section 225-14(d).
(c) Lead-in Clearance. Lead-in or aerial-drop low and medium power network-powered broadband communications cables from a pole or other support, including the point of initial attachment to a building or structure, shall be kept away from electric light, power, Class 1, ~~or~~ nonpower-limited fire alarm, or high-power network-powered broadband communications circuit conductors so as to avoid the possibility of accidental contact.
Exception: Where proximity to electric light, power, Class 1, ~~or~~ nonpower-limited fire alarm circuit service or high-power network-powered broadband communications conductors cannot be avoided, the installation shall be such as to provide clearances of not less than 12 in. (305 mm) from light, power, Class 1, ~~or~~ nonpower-limited fire alarm circuit or high-power network-powered broadband communications service drops.
(d) Clearance from Ground. Overhead spans of low and medium power network-powered broadband communication cables shall conform to not less than the following:
9.5 ft (2.89 m) — above finished grade, sidewalks, or from any platform or projection from which they might be reached and accessible to pedestrians only
11.5 ft (3.50 m) — over residential property and driveways, and those commercial areas not subject to truck traffic
15.5 ft (4.72 m) — over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land traversed by vehicles such as cultivated, grazing, forest, and orchard
FPN: These clearances have been specifically chosen to correlate with the National Electrical Safety Code, ANSI C2-1997, Table 232-1, which provides for clearances of wires, conductors, and cables above ground and roadways, rather than using the clearances referenced in Section 225-18. Because Article 800 and Article 820 have had no required clearances, the communications industry has used the clearances from the NESC for their installed cable plant.
(e) Over Pools. Clearance of network-powered broadband communications cable in any direction from the water level, edge of pool, base of diving platform, or anchored raft shall be not less than 22 ft (6.71 m). Clearance in any direction to the diving platform or tower shall be not less than 14 ft (4.27 m).
Exception No. 1: Where the pool is fully enclosed by a solid or screened permanent structure.
FPN: These clearances have been specifically chosen to correlate with Section 680-8 and to incorporate the more stringent clearance requirements of the National Electrical Safety Code, ANSI C2-1997, Table 234-3, which provides for clearances of wires, conductors, and cables over pools.
Exception No. 2: Where the cables are located more than 10 ft (3.05 m) horizontally from the following:
1. The edge of the pool
2. Diving structure or diving tower, or
3. Observation stands, towers, or platforms
(f) Above Roofs. Network-powered broadband communications cables shall have a vertical clearance of not less than 8 ft (2.44 m) from all points of roofs above which they pass.
Exception No. 1: Auxiliary buildings such as garages and the like.
Exception No. 2: A reduction in clearance above only the overhanging portion of the roof to not less than 18 in. (457 mm) shall be permitted if (1) not more than 4 ft (1.22 m) of the broadband communications drop cables pass above the roof overhang, and (2) they are terminated at a through-the-roof raceway or support.
Exception No. 3: Where the roof has a slope of not less than 4 in. (102 mm) in 12 in. (305 mm), a reduction in clearance to not less than 3 ft (914 mm) shall be permitted.
(g) Final Spans. Final spans of low and medium power network-powered broadband communications cables without an outer jacket shall be permitted to be attached to the building, but they shall be kept not less than 3 ft (914 mm) from windows that are designed to

be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.

Exception: Conductors run above the top level of a window shall be permitted to be less than the 3-ft (914-mm) requirement above. Overhead low and medium power network-powered broadband communications cables shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they will obstruct entrance to these building openings.

(h) Between Buildings. Low and medium power ~~N~~network-powered broadband communications cables extending between buildings and also the supports or attachment fixtures shall be acceptable for the purpose and shall have sufficient strength to withstand the loads to which they may be subjected.

Exception: Where a low and medium power network-powered broadband communications cable does not have sufficient strength to be self-supporting, it shall be attached to a supporting messenger cable that, together with the attachment fixtures or supports, shall be acceptable for the purpose and shall have sufficient strength to withstand the loads to which they may be subjected.

(i) On Buildings. Where attached to buildings, low and medium power network-powered broadband communications cables shall be securely fastened in such a manner that they will be separated from other conductors as follows.

(1) Electric Light or Power. The low and medium power network-powered broadband communications cable shall have a separation of at least 4 in. (102 mm) from electric light, power, Class 1, ~~or~~ nonpower-limited fire alarm circuit conductors or high-power network-powered broadband communications not in raceway or cable, or be permanently separated from conductors of the other system by a continuous and firmly fixed nonconductor in addition to the insulation on the wires.

(2) Other Communications Systems. Low and medium power ~~N~~network-powered broadband communications cables shall be installed so that there will be no unnecessary interference in the maintenance of the separate systems. In no case shall the conductors, cables, messenger strand, or equipment of one system cause abrasion to the conductors, cables, messenger strand, or equipment of any other system.

(3) Lightning Conductors. Where practicable, a separation of at least 6 ft (1.83 m) shall be maintained between any low and medium power network-powered broadband communications cable and lightning conductors.

(4) Protection from Damage. Low and medium power ~~N~~network-powered broadband communications cables attached to buildings and located within 8 ft (2.44 m) of finished grade shall be protected by enclosures, raceways, or other approved means.

Exception: A low power network-powered broadband communications circuit that is equipped with a listed fault protection device, appropriate to the network-powered broadband communications cable used, and located on the network side of the network-powered broadband communications cable being protected.

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.

PANEL ACTION: Reject.

PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #3777)

16- 340 - (830-10): Accept in Principle in Part

SUBMITTER: Rodney Parker, GTE North/Rep. Network Design

RECOMMENDATION: Revise text to read as follows:

830-10. Aerial Cables. Aerial-powered broadband communications cables shall comply with (a) through (j).

(j) Point of Entry. The point of entry for broadband communication cables shall be within 20 ft (7.0 m) of the electrical service entry point.

SUBSTANTIATION: Original text showed only (a) through (g) but the section had parts (a) through (i).

830(g) Final Span or 830(i) On buildings neither article located the entry point for the network-powered broadband communications cables in relations with the service entry point. It should not matter if we are protecting human life or equipment the requirements should be the same.

PANEL ACTION: Accept in Principle in Part.

Revise text to read as follows:

"830-10. Aerial Cables. Aerial-powered broadband communications cables shall comply with (a) through (i)."

PANEL STATEMENT: The first part of the proposal regarding the correction in section reference is accepted in principle. The reference is changed to (i) rather than (j) because the part of the proposal adding (j) is rejected.

The part adding (j) is rejected because the panel action taken on Proposal 16-357 limiting the length of the grounding conductor to 20 feet addresses the submitter's concern. While the submitter is concerned that the electric service entrance and the broadband communications service entrance be within 20 feet of each other, limiting the length of the grounding conductor to 20 feet accomplishes this intent.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4029)

16- 341 - (830-10, FPN): Accept

SUBMITTER: Robert Jensen, dbi-Telecommunications Infrastructure Design/Rep. Building Industry Consulting Service Int'l

RECOMMENDATION: Add a fine print note to read as follows:

FPN: For additional information regarding overhead wires and cables, see National Electric Safety Code, ANSI C2-1997, Part 2 Safety Rules For Overhead Lines.

SUBSTANTIATION: The primary focus of this recommendation is to promote parity between the two codes in an effort to eliminate confusion and multiple interpretations of codes contained in two separate volumes that are attempting to safely address the same issue. Due to the de-regulation of cabling on the customer premises and electrical power distribution, adhearance to the NESC is required.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #4276)

16- 342 - (830-10(c), Exception): Accept in Part

SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.

RECOMMENDATION: Revise as follows:

Exception: Where proximity to electric light, power, Class 1, or nonpower-limited fire alarm circuit service conductors cannot be avoided, and where the ungrounded nonpower-limited conductors are insulated, the installation shall be such as to provide clearances of not less than 12 in. (305 mm) from light, power, Class 1, or nonpower-limited fire alarm circuit service drops. The clearance requirement shall apply at all points along the drop, and it shall increase to 40 in. (1.02 m) at the pole.

SUBSTANTIATION: This rule presently differs from the rule in Article 800 [Section 800-10(b)(4)] for a similar application, even though Art. 800 circuits could run in coaxial cable assemblies. With increasing interaction and competition between these technologies, differing Code rule on similar topics should be as consistent as technically possible, within the boundaries of effective safety. This proposal is intended as a vehicle to allow CMP 16 to act on this issue by making comparable rules consistent. A companion proposal has been made to Article 820.

PANEL ACTION: Accept in Part.

The addition of the phrase "and where the ungrounded nonpower-limited conductors are insulated," is rejected.

The balance of the recomendation is accepted.

PANEL STATEMENT: Nonpower-limited conductors are always insulated. Refer to 760-27 (b).

The reference to 800-10(b)(4) in the substantiation is incorrect; it is believed that the reference is 800-10(a)(4).

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #3128)

16- 343 - (830-10(e)): Accept
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: Change:
830.10. Aerial Cables.
(e) Over Pools. Clearance of network-powered broadband communications cable in any direction from the water level, edge of pool, base of diving platform, or anchored raft shall ~~be not less than 22 ft (6.71 m). Clearance in any direction to the diving platform or tower shall be not less than 14 ft (4.27 m).~~
~~Exception No. 1: Where the pool is fully enclosed by a solid or screened permanent structure.~~
~~FPN: These clearances have been specifically chosen to correlate with Section 680-8 and to incorporate the more stringent clearance requirements of the National Electrical Safety Code, ANSI C2-1997, Table 234-3, which provides for clearances of wires, conductors, and cables over pools.~~
~~Exception No. 2: Where the cables are located more than 10 ft (3.05 m) horizontally from the following:~~
~~1. The edge of the pool~~
~~2. Diving structure or diving tower, or~~
~~3. Observation stands, towers, or platforms~~
comply with those clearances in Section 680.8.
SUBSTANTIATION: This change is necessary to maintain consistency of applying overhead wiring clearances regarding pools already required in Section 680.8 of the 1999 NEC. Also, this improves the user-friendliness of the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: The proposed revision does not add clarity. By refering the code user to another section, the requirements may be less clear than by listing them within the text of this section, as is being done in the present wording.

(Log #1672)

16- 344 - (830-10(j) (New)): Reject
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Add a new Section 830-10(j) as follows:
(j) On Masts. Aerial cable shall be permitted to be attached to an above-the-roof raceway mast. Aerial cable shall be permitted to be attached to a service mast that is listed for the purpose of accepting multiple attachments.
SUBSTANTIATION: Section 830-10 does not presently address aerial cable attachments to an above-the-roof mast. This area needs to be addressed, however, for correlation with the companion proposal for new Section 230-28, Exception, that has also been submitted. The proposed Section 230-28, Exception, would permit a network-powered broadband communications system service drop attachment to a power service mast where the mast is listed for the purpose. It is unnecessarily costly to the building owner and aesthetically unsightly when two service masts must be provided, one for power service and another for broadband communications system aerial services.
PANEL ACTION: Reject.
PANEL STATEMENT: Although requirements for the power service mast are specified in Article 230, the detailed design and installation requirements are not defined. The electric service company specifies the type, size and height of mast to be used and the manner in which it is to be installed. The NEC can not dictate to the utility the specific installation requirements. Code Panel 4, which has jurisdiction over service masts, has consistently rejected this concept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 18
NEGATIVE: 2
EXPLANATION OF NEGATIVE:
BRUNSSEN: This proposal was developed as a companion proposal to the proposal to revise Section 230-28. The proposal to revise Section 230-28 to permit comunications wires and cables to be attached to a service mast that is listed for the purpose of accepting multiple attachments should be accepted. There is no reason to force a homeowner to install a separate mast to accommodate communications (telephone, CATV, network-powered broadband) service drops when the service mast can be listed to do so. The panel acknowledged that detailed design and installation requirements are not defined. This is the purpose of listing the service mast. The listing is only valid when the listed product is installed properly for its intended use.
JOHNSON: See my Explanation of Negative Vote on Proposal 16-202.

(Log #1030)

16- 345 - (830-11): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: 830-11. Underground Circuits Entering Buildings.
(a) Underground Systems. Underground low and medium power network-powered broadband communications cables in a duct, pedestal, handhole, or manhole that contains electric light, power conductors, nonpower-limited fire alarm circuit conductors, ~~or~~ Class 1 or high-power network powered broadband communications circuits shall be in a section permanently separated from such conductors by means of a suitable barrier.
(b) Direct-Buried Cables and Raceways. Direct-buried low and medium power network-powered broadband communications cables shall be separated at least 12 in. (305 mm) from conductors of any light, power, nonpower-limited fire alarm circuit conductors ~~or~~ Class 1 or high-power network powered broadband communications circuit.
Exception No. 1: Where electric service conductors or low and medium power network-powered broadband communications cables are installed in raceways or have metal cable armor.
Exception No. 2: Where electric light or power branch-circuit or feeder conductors, nonpower-limited fire alarm circuit conductors, ~~or~~ Class 1 or high-power network powered broadband communications circuit conductors are installed in a raceway or in metal-sheathed, metal-clad, or Type UF or Type USE cables; or the low and medium power network-powered broadband communications cables have metal cable armor or are installed in a raceway.
(c) Mechanical Protection. Direct-buried cable, conduit, or other raceways shall be installed to meet the minimum cover requirements of Table 830-11. In addition, direct-buried cables emerging from the ground shall be protected by enclosures, raceways, or other approved means extending from the minimum cover distance required by Table 830-11 below grade to a point at least 8 ft (2.44 m) above finished grade. In no case shall the protection be required to exceed 18 in. (457 mm) below finished grade. Type BMU and BLU direct-buried cables emerging from the ground shall be installed in rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, or other approved means extending from the minimum cover distance required by Table 830-11 below grade to the point of entrance.
Exception: A low power network-powered broadband communications circuit that is equipped with a listed fault protection device, appropriate to the network-powered broadband communications cable used, and located on the network side of the network-powered broadband communications cable being protected.
Table 830-11. Low and medium power ~~N~~network-Powered Broadband Communications Systems Minimum Cover Requirements, Burial in Inches (Cover is the shortest distance measured between a point on the top surface of any direct-buried cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.)
(Except for the title, Table 830-11 is unchanged.)
(d) Pools. Underground cables shall not be permitted under the pool or within the area extending 5 ft (1.52 m) horizontally from the inside wall of the pool.
Exception: Where space limitations prevent cables from being routed 5 ft (1.52 m) or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be as follows:

Wiring Method	Minimum Burial (in.)
Rigid metal conduit	6
Intermediate metal conduit	6
Nonmetallic raceways listed for direct burial	18
Other approved raceways*	18

Note: For SI units, 1 in. = 25.4 mm.
* Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 2 in. (50.8 mm) thick.

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #513)

16- 346 - (Table 830-11): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 830-11 title and include SI units as shown below:
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1680)

16- 347 - (830-11(d)): Accept
SUBMITTER: Stanley D. Kahn, Tri-City Electric Co., Inc.
RECOMMENDATION: a) Change the last sentence in the exception to:
The minimum burial depth shall be as shown in Table 830-11(d).
b) Insert the following title before the table:
Table 830-11(d) Minimum Burial Depth
SUBSTANTIATION: New Style Manual Section 2.3.1 requires that all tables have titles (NFPA staff will change the numbering to the new format.)
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #3129)

16- 348 - (830-11(d)): Accept
SUBMITTER: Neil F. LaBrake, Jr., Niagara Mohawk Power Corp.
RECOMMENDATION: Change:
830.11. Underground Circuits Entering Buildings.
(d) Pools. ~~Underground c~~Cables located ~~shall not be permitted~~ under the pool or within the area extending 5 ft (1.52 m) horizontally from the inside wall of the pool~~.~~
~~Exception: Where space limitations prevent cables from being routed 5 ft (1.52 m) or more from the pool, such wiring shall be permitted where installed in rigid metal conduit, intermediate metal conduit, or a nonmetallic raceway system. All metal conduit shall be corrosion resistant and suitable for the location. The minimum burial depth shall be as follows:~~

Table 830-11. Network-Powered Broadband Communications Systems Minimum Cover Requirements, ~~Burial in Inches~~ (Cover is the shortest distance measured between a point on the top surface of any direct-buried cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.)

Location of Wiring Method or Circuit	Direct Burial Cables		Rigid Metal Conduit or Intermediate Metal conduit		Nonmetallic Raceways Listed for Direct Burial; Without Concrete Encasement or Other Approved Raceways	
	mm	in.	mm	in.	mm	in.
All locations not specified below	450	18	150	6	300	12
In trench below 50 mm (2 in.) ~~2 in~~. thick concrete or equivalent	300	12	150	6	150	6
Under a building (in raceway only)	0	0	0	0	0	0
Under minimum of 100 mm (4 in.) ~~4 in~~. thick concrete exterior slab with no vehicular traffic and the slab extending not less than 150 mm (6 in.) ~~6 in~~. beyond the underground installation	300	12	100	4	100	4
One- and two-family dwelling driveways and outdoor parking areas and used only for dwelling related purposes	300	12	300	12	300	12

Notes:
~~1. For SI units, 1 in. = 25.4 mm.~~
~~2.~~ Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 50 mm (2 in.) ~~2 in. (50.8 mm)~~ thick
~~3.~~ Lesser depths shall be permitted where cables rise for terminations or splices or where access is otherwise required.
~~4.~~ Where solid rock is encountered, all wiring shall be installed in metal or nonmetallic raceway permitted for direct burial. The raceways shall be covered by a minimum of 50 mm (2 in.) ~~2 in. (50.8 mm)~~ of concrete extending down to rock.
5. Low power network-powered broadband communications circuits using directly buried community antenna television and radio distribution system coaxial cables that were installed outside and entering buildings prior to January 1, 2000, in accordance with Article 820 shall be permitted were buried to a minimum depth of 300 mm (12 in.) ~~12 in. (30.48 cm)~~

~~Wiring Method — Minimum Burial (in.)~~
~~Rigid metal conduit — 6~~
~~Intermediate metal conduit — 6~~
~~Nonmetallic raceways listed for direct burial — 18~~
~~Other approved raceways* — 18~~
~~Note: For SI units, 1 in. = 25.4 mm.~~
~~*Raceways approved for burial only where concrete encase shall require a concrete envelope not less than 2 in. (50.8 mm) thick.~~
shall meet those clearances and requirements specified in 680.10.

SUBSTANTIATION: This change is necessary to maintain consistency of applying underground wiring clearances regarding pools already required in Section 680.10 of the 1999 NEC. Also, this improves the user-friendliness of the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation of Negative Vote on Proposal 16-343.

(Log #1013)

16- 349 - (830-11(d), Exception): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
Exception: Where space limitations prevent cables from being routed 5 ft (1.52 m) or more from the pool, such wiring shall be permitted where installed in rigid metal conduit or intermediate metal conduit bonded to a common bonding grid as specified in Section 680-22(b), or in a nonmetallic raceway system.
SUBSTANTIATION: Since Chapter 8 is independent of other chapters, the proposal would provide for bonding of the specified metal raceways.
PANEL ACTION: Reject.
PANEL STATEMENT: Refer to panel action on Proposal 16-348 which elliminated the exception being revised in the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1031)

16- 350 - (830-30): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 830-30 as shown:
830-30. Primary Electrical Protection.
(a) Application. Primary electrical protection shall be provided on all low and medium network-powered broadband communications conductors that are neither grounded nor interrupted and are run partly or entirely in aerial cable not confined within a block. Also, primary electrical protection shall be provided on all aerial or underground low and medium network-powered broadband communications conductors that are neither grounded nor interrupted and are located within the block containing the building served so as to be exposed to lightning or accidental contact with electric light or power conductors operating at over 300 volts to ground.
Exception: Where electrical protection is provided on the derived circuit(s) (output side of the NIU) in accordance with Section 830-30(b)(3).
FPN No. 1: On low and medium network-powered broadband communications conductors not exposed to lightning or accidental contact with power conductors, providing primary electrical protection in accordance with this article will help protect against other hazards, such as ground potential rise caused by power fault currents, and above-normal voltages induced by fault currents on power circuits in proximity to the network-powered broadband communications conductors.
FPN No. 2: Low and medium ~~N~~network-powered broadband communications circuits are considered to have a lightning exposure unless one or more of the following conditions exist.
1. Circuits in large metropolitan areas where buildings are close together and sufficiently high to intercept lightning.
2. Interbuilding cable runs of 140 ft (42.7 m) or less, directly buried or in underground conduit, where a continuous metallic cable shield or a continuous metallic conduit containing the cable is bonded to each building grounding electrode system.
3. Areas having an average of five or fewer thunderstorm days per year and earth resistivity of less than 100 ohm-meters. Such areas are found along the Pacific coast.
(1) Fuseless Primary Protectors. Fuseless-type primary protectors shall be permitted where power fault currents on all protected conductors in the cable are safely limited to a value no greater than the current-carrying capacity of the primary protector and of the primary protector grounding conductor.
(2) Fused Primary Protectors. Where the requirements listed under (1) are not met, fused-type primary protectors shall be used. Fused-type primary protectors shall consist of an arrester connected between each conductor to be protected and ground, a fuse in series with each conductor to be protected, and an appropriate mounting arrangement. Fused primary protector terminals shall be marked to indicate line, instrument, and ground, as applicable.
(b) Location. The location of the primary protector, where required, shall comply with (1), (2), or (3).
1. A listed primary protector shall be applied on each low and medium network-powered broadband communications cable external to and on the network side of the network interface unit.
2. The primary protection function shall be an integral part of and contained in the network interface unit. The network interface unit shall be listed for the purpose and shall have an external marking indicating that it contains primary electrical protection.
3. The primary protector(s) shall be provided on the derived circuit(s) (output side of the NIU), and the combination of the NIU and the protector(s) shall be listed for the purpose.
A primary protector, whether provided integrally or external to the network interface unit, shall be located as close as practicable to the point of entrance.
For purposes of this section, a network interface unit and any externally provided primary protectors located at mobile home service equipment located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with Section 250-32 and located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.
FPN: Selecting a network interface unit and primary protector location to achieve the shortest practicable primary protector grounding conductor will help limit potential differences between communications circuits and other metallic systems.
(c) Hazardous (Classified) Locations. The primary protector or equipment providing the primary protection function shall not be located in any hazardous (classified) location as defined in Article 500 or in the vicinity of easily ignitible material.
Exception: As permitted in Sections 501-14, 502-14, and 503-12.
SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #CP1609)

16- 350a - (830-30(a)): Accept
SUBMITTER: CMP 16
RECOMMENDATION: In 830-30(a) revise FPN No 2 by deleting "(2)" and renumbering "(3)" to "(2)."
SUBSTANTIATION: Article 830 circuits are not designed for interbuilding use and, therefore, part (2) of FPN No. 2 is not required.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JONES: This is a vote against the Panel Action to "accept 16-350a." Article 830 circuits are "Network-Powered Broadband Communications Circuits." The Panel assumes that utility or franchised operating companies, i.e., telephone, CATV etc. will be the only ones providing these type services to all locations. A company, school or other entity operating in a campus environment or even in a block can provide communications powering over

broadband circuits between buildings using the technologies of the Network-Powered Broadband Service. The Panel in this proposal is eliminating a portion of a Fine Print Note that helps to define the existence of a "lightning exposure" for interbuilding circuits. The Panel by eliminating this portion of the Fine Print Note takes away the guidance needed to ensure safe and proper protection on interbuilding circuits with a lightning exposure. (See also vote on Proposal 16-351 (Log #4277)).

(Log #4277)

16- 351 - (830-30(a)): Reject
SUBMITTER: Frederic P. Hartwell, Hartwell Electrical Services, Inc.
RECOMMENDATION: Revise by adding the following sentence:
"In addition, where there exists a lightning exposure, each interbuilding circuit on a premises shall be provided with primary electrical protection at each end of the interbuilding circuit."
SUBSTANTIATION: This proposal makes this section consistent with comparable requirements in Section 800-30(a). That section has the same set of fine print notes (FPN No. 2 in each location) as this section covering interbuilding lightning exposure, and yet only this section omits the operational rule that says what you must do upon a showing of a lightning exposure. This makes no sense, and if CMP 16 rejects this proposal, it should immediately process a panel proposal to delete Section 830-30(a) FPN No. 2.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not anticipate that network-powered broadband communications systems will be run as an interbuilding circuit in a campus environment. The network-powered broadband communications system will enter the campus at a single point, and the various services, e.g., telephone, data, CATV, distributed from that point. The rules of Section 800, Section 820, etc., would then apply.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JONES: This is a vote against the Panel Action to "reject Proposal 16-351 (Log #4277)". The Panel assumes that only utility and franchised operating companies, i.e., telephone, CATV, etc., will be providing these type services to all locations. A company, school or other entity operating in a campus environment or even within a block can provide communications powering over broadband circuits between buildings using the technologies of the Network-Powered Broadband service. The sentence, "In addition where there exists a lightning exposure, each interbuilding circuit on a premises shall be provided with primary electrical protection at each end of the interbuilding circuit." will add safety guidance for the ones providing their own such services. (See also vote on 16-350a (Log #CP1609)).

(Log #1032)

16- 352 - (830-33): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 830-33 as shown:
830-33. Grounding or Interruption of Metallic Members of Low and Medium Power Network-Powered Broadband Communications Cables. The shields of low and medium power network-powered broadband communications cables used for communications or powering shall be grounded at the building as close to the point of entrance as practicable. Metallic cable members not used for communications or powering shall be grounded or interrupted by an insulating joint or equivalent device as close to the point of entrance as practicable.
For purposes of this section, grounding or interruption of low and medium power network-powered broadband communications cable metallic members installed at mobile home service equipment located in sight from and no more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with Section 250-24 and located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.
FPN: Selecting a grounding location to achieve the shortest practicable grounding conductor will help limit potential differences between the network-powered broadband communications circuits and other metallic systems.
SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1045)

16- 353 - (830-33): Accept in Principle
SUBMITTER: Steven C. Johnson, Time Warner Cable/Rep. Nat'l Cable Television Assn.
RECOMMENDATION: Revise text to read:
830-33. Grounding or Interruption of Metallic Members of Network-Powered Broadband Communications Cables. The shields of network-powered broadband communications cables used for communications or powering shall be grounded at the building as close to the point of ~~entrance~~ attachment as practicable. Metallic cable members not used for communications or powering shall be grounded or interrupted by an insulating joint or equivalent device as close to the point of ~~entrance~~ attachment as practicable.
SUBSTANTIATION: The point of attachment does not necessarily coincide with the point of entrance. Standard practice is to attach to the building near the building's electrical ground and bond at that point.
The cable generally enters the building near the location of the customer's home entertainment equipment. Where this does not coincide with the location of the building electrical ground, the present code wording is requiring a less desirable grounding situation.
PANEL ACTION: Accept in Principle.
Revise text to read:
"830-33. Grounding or Interruption of Metallic Members of Network-Powered Broadband Communications Cables. The shields of network-powered broadband communications cables used for communications or powering shall be grounded at the building as close as practicable to the point of entrance or attachment of the NIU. Metallic cable members not used for communications or powering shall be grounded or interrupted by an insulating joint or equivalent device as close as practicable to the point of entrance or attachment of the NIU."
PANEL STATEMENT: Article 830 cables are terminated at the NIU, and the NIU is often outside.
The revised text meets the intent of the submitter.
Proposal 16-357 adds requirements limiting the grounding conductor length to 20 feet.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #380)

16- 354 - (830-40): Accept in Principle
SUBMITTER: Steven C. Johnson, Time Warner Cable/Rep. Nat'l Cable Television Assn.
RECOMMENDATION: Revise as follows:
830-40. Cable, Network Interface Unit, and Primary Protector Grounding. Network interface units containing protectors, NIUs with metallic enclosures, primary protectors, and the ~~grounded~~ metallic members of the network-powered broadband communications cable, which are intended to be grounded, shall be grounded as specified in (a) through (d).
SUBSTANTIATION: Editorial changes intended to clarify.
PANEL ACTION: Accept in Principle.
Revise the submitter's recommendation by changing the word "which" to "that" in the added text.
PANEL STATEMENT: The change is made to be consistent with the Manual of Style.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1121)

16- 355 - (830-40): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: 830-40(a)(3) - change:
"No. 14" to "14 AWG"
"No. 6" to "6 AWG"
830-40(d) - change "No. 6" to "6 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1669)

16- 356 - (830-40): Accept in Principle
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise the text of 830-40 as follows:
830-40. Cable, Network Interface Unit, and Primary Protector Grounding. Network interface units containing protectors, NIUs with metallic enclosures, primary protectors, and the ~~grounded~~ metallic members of the network-powered broadband communications cable required to be grounded shall be grounded as specified in (a) through (d).
SUBSTANTIATION: The proposed change is editorial. The text of 830-40, as presently written, requires that the "grounded metallic ... members of the cable shall be grounded". The statement directs that something that is already grounded shall be grounded. What is meant to be implied is that metallic members required to be grounded shall be grounded as specified in (a) through (d).
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to the panel action on Proposal 16-354. That language is preferred and meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1660)

16- 357 - (830-40(a)(4) and Exception (New)): Accept
Note: The Technical Correlating Committee directs the Panel to change "residences" to "dwellings."
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Insert new 830-40(a)(4) and Exception as follows. Renumber existing 830-40(a)(4) and 830-40(a)(5) as 830-40(a)(5) and 830-40(a)(6) respectively.
(4) Length. The grounding conductor shall be as short as practicable. In one and multifamily residences the grounding conductor shall be as short as permissible, not to exceed 20 ft (6.0 m) in length.
Exception: In one- and two-family residences where it is not practicable to achieve an overall maximum grounding conductor length of 20 ft (6.0 m), a separate communications ground rod meeting the minimum dimensional criteria of Section 830-40(b)(3) shall be driven, and the grounding conductor connected to the communications ground rod in accordance with Section 830-40(c). The communications ground rod shall be bonded to the power grounding electrode system in accordance with Section 830-40(d).
SUBSTANTIATION: During the 1999 Code cycle, a number of proposals and comments were submitted to limit the separation of power and communications entrances to the building. The intent of these proposals and comments was to limit the potential difference between power and communications circuits during lightning events. That potential difference is generally a function of conductor inductance (L), which increases in direct proportion to conductor length, and the rate of rise of the current (di/dt). These proposals and comments were generally rejected as they did not address the real issue, the length of the communications cable, NIU, and primary protector grounding conductor. This proposal addresses that issue, encourages short cable, NIU and primary protector grounding conductors, provides guidance as to a reasonable maximum length, and provides an alternative where it is not practicable to meet the maximum length (20 ft) restriction. The proposed length restriction is limited to one- and two-family residences as it is such installations that are more likely to have diverse power and communications entrances and experience lightning-related problems. (Urban/suburban environment with fewer elevated structures and extensive buried metallic objects). This is a companion proposal and is intended to correlate Section 830-40(a)(4)(New) with similar changes proposed for Sections 800-10(a)(4)(New) and 820-40(a)(4)(New).
PANEL ACTION: Accept.
PANEL STATEMENT: Editorially change "20 ft (6.0 m)" to "6.0 m (20 ft)" in both places of the recommendation.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
JOHNSON: See my Explanation of Negative Vote on Proposal 16-212.

(Log #2212)

16- 358 - (830-40(b)): Accept
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise text as follows:
(b) Electrode. The grounding conductor shall be connected as follows:
1. In Buildings or Structures With Grounding Means. To the nearest accessible location on the following:
a. The building or structure grounding electrode system as covered in Section 250-50
b. The grounded interior metal water piping system as covered in Section 250-104(a)
c. The power service accessible means external to enclosures as covered in Section 250-92(b)
d. The metallic power service raceway
e. The service equipment enclosure
f. The grounding electrode conductor or the grounding electrode conductor metal enclosure; or
g. To the grounding conductor or the grounding electrode of a building or structure disconnecting means that is grounded to an electrode as covered in Section 250-32.
For purposes of this section, the mobile home service equipment or the mobile home disconnecting means, as described in Section 830-33, shall be considered accessible.
2. In Buildings or Structures Without Grounding Means. If the building or structure served has no grounding means, as described in (b)(1):
a. To any one of the individual electrodes described in Section 250-50; or,
b. If the building or structure served has no grounding means, as described in (b)(1) or (b)(2)(a), to an effectively grounded metal structure or to a ground rod or pipe not less than 5 ft (1.52 m) in length and 1/2 in. (12.7 mm) in diameter, driven, where practicable, into permanently damp earth and separated from lightning conductors as covered in Section 800-13 and at least 6 ft (1.83 m) from electrodes of other systems. Steam or hot water pipes or lightning-rod conductors shall not be employed as electrodes for protectors, NIUs with integral protection, grounded metallic members, NIUs with metallic enclosures, and other equipment.
SUBSTANTIATION: The new style manual requires titles for this section.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1015)

16- 359 - (830-40(b)(1), (d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:
(d) the nonflexible metallic power service raceway.
SUBSTANTIATION: Editorial. Service raceways may be flexible types not suitable for grounding or attachment of ground clamps.
PANEL ACTION: Reject.

PANEL STATEMENT: The substantiation is incorrect. Refer to 250-118.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1666)

16- 360 - (830-40(b)(1)(b)): Accept
SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions
RECOMMENDATION: Revise the text of 830-40(b)(1)(b) as follows:
(b) The grounded interior metal water piping system, within 5 ft (1.52 m) from its point of entrance to the building, as covered in Section ~~250-104(a)~~ 250-50.
SUBSTANTIATION: Section 250-50 (formerly Section 250-81) was revised in the 1993 NEC to eliminate the use of the interior metal water piping system as a grounding (bonding) conductor. This was done because of the increased use of nonconductive piping for repair and maintenance rendering the interior metallic water piping system electrically discontinuous. Section 830-40(b)(1)(b) has not been revised to reflect this change. This proposed revision underscores that the interior metal water pipe may no longer be used as an intersystem bonding conductor to interconnect a network-powered broadband communications system and power, and correlates Section 830-40(b)(1)(b) with Section 250-50. Further, Section 250-104(a) concerns bonding of piping systems and building steel. Since connections to the interior metallic water piping system are now permitted only within the first 5 feet of the pipe's entrance to the building, the more appropriate reference is Section 250-50. This is a companion proposal and is intended to correlate Section 830-40(b)(1)(b) with similar changes proposed for Sections 800-40(b)(1)(b), 810-21(f)(1)(b), and 820-40(b)(1)(b).
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1034)

16- 361 - (830-42): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise Section 830-42 as shown:
830-42. Bonding and Grounding at Mobile Homes
(a) Grounding. Where there is no mobile home service equipment located in sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves, or there is no mobile home disconnecting means grounded in accordance with Section 250-32 and located within sight from and not more than 30 ft (9.14 m) from the exterior wall of the mobile home it serves, the low and medium power network-powered broadband communications cable, network interface unit, and primary protector ground, shall be installed in accordance with Sections 830-40(b)(2) and (3).
(b) Bonding. The low and medium power network-powered broadband communications cable grounding terminal, network interface unit grounding terminal, if present, and primary protector grounding terminal shall be bonded together with a copper bonding conductor not smaller than No. 12. The low and medium power network-powered broadband communications cable grounding terminal, network interface unit grounding terminal, primary protector grounding terminal, or the grounding electrode shall be bonded to the metal frame or available grounding terminal of the mobile home with a copper bonding conductor not smaller than No. 12 under any of the following conditions:
1. Where there is no mobile home service equipment or disconnecting means as in (a), or
2. Where the mobile home is supplied by cord and plug.
SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. Throughout Article 830 changes need to be made to distinguish Article 830 from Article 831.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1122)

16- 362 - (830-42(b)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Change "No. 12" to "12 AWG" in two places.
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #2174)

16- 363 - (830 Part E): Accept
SUBMITTER: Roland L. Comeau, Intermountain Power Service Corp.
RECOMMENDATION: Revise as follows:
~~Network-Powered Broadband Communications Systems.~~ Wiring Methods Within Buildings.
SUBSTANTIATION: The wording deleted is redundant. The article title has exactly the same wording; therefore, does not need to be repeated here. It is not repeated in the titles to the other parts in this article. The Foreword to the NEC Style Manual states, "It is vitally important that the text be as explicit as possible and that maximum consistency be achieved in the language used in the text."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #4141)

16- 364 - (830-55(a)): Accept in Principle
SUBMITTER: Marcelo M. Hirschler, GBH Int'l, Inc./Rep. Plenum Cable Assn.
RECOMMENDATION: Revise as follows:
830-55. Low Power Network Powered Broadband Communications System Wiring Methods. Low-power network-powered broadband communications systems shall be installed within buildings using listed Type BLX or Type BLP network-powered broadband communications low power cables.
(a) Ducts, Plenums, and Other Air-Handling Spaces. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type BLP. Abandoned cables, not intended for future use, shall not be permitted to remain.
Exception: Type BLX cables installed in compliance with Section 300-22.
SUBSTANTIATION: There is a significant amount of information indicating that the amount of cables installed in plenums, and other air-handling spaces, is increasing rapidly. An understanding of cabling practices indicates that the most common way in which cable installation is carried out is by disconnecting existing cable and leaving it abandoned in place, while introducing the cable needed to perform the additional functions. See Log #4136. There is, as yet, no indication that the additional cables in plenums causes an added fire hazard, and the fire record of cables in concealed spaces, both above ceilings and below floors, remains excellent. In fact, plenum cables, which meet the fire test requirements of NFPA 262, have been shown to have extremely good fire performance and to spread flame only very slowly, if at all. However, this type of preventive measure is worthwhile.
PANEL ACTION: Accept in Principle.
Revise 830-3(a) to read as follows:
"(a) Spread of Fire or Products of Combustion. Section 300-21. Abandoned cables not intended for future use shall not be permitted to remain."
PANEL STATEMENT: The revision meets the intent of the submitter. It is more appropriate to place the requirement in 830-3(a) which addresses the subject.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
COMMENT ON AFFIRMATIVE:
JOHNSON: See my Comment on Affirmative on Proposal 16-80.
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #1036)

16- 365 - (830-58): Reject
SUBMITTER: Stanley Kaufman, Lucent Technologies
RECOMMENDATION: Revise 830-58 as shown:

830-58. Installation of Network-Powered Broadband Communications Cables and Equipment. Cable and equipment installations within buildings shall comply with (a) through (e), as applicable.

(a) Separation of Conductors.

(1) In Raceways and Enclosures.

a. Low and Medium Power Network-Powered Broadband Communications Circuit Cables. Low and medium power network-powered broadband communications cables shall be permitted in the same raceway or enclosure.

b. Low Power Network-Powered Broadband Communications Circuit Cables. Low power network-powered broadband communications cables shall be permitted in the same raceway or enclosure with jacketed cables of any of the circuits shown below:

1. Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725
2. Power-limited fire alarm systems in compliance with Article 760
3. Communications circuits in compliance with Article 800
4. Nonconductive and conductive optical fiber cables in compliance with Article 770
5. Community antenna television and radio distribution systems in compliance with Article 820

c. Medium Power Network-Powered Broadband Communications Circuit Cables. Medium power network-powered broadband communications cables shall not be permitted in the same raceway or enclosure with conductors of any of the circuits shown below:

1. Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725
2. Power-limited fire alarm systems in compliance with Article 760
3. Communications circuits in compliance with Article 800
4. Conductive optical fiber cables in compliance with Article 770
5. Community antenna television and radio distribution systems in compliance with Article 820

d. Electric Light, Power, Class 1, Nonpower-Limited Fire Alarm Circuits. Low and medium powered ~~N~~network-powered broadband communications cable shall not be placed in any raceway, compartment, outlet box, junction box, or similar fittings with conductors of electric light, power, Class 1, ~~or~~ nonpower-limited fire alarm circuit ~~cable~~s or high power network-powered communications cables.

Exception No. 1: Where all of the conductors of electric light, power, Class 1, nonpower-limited fire alarm circuits and high power network-powered communications cables are separated from all of the network-powered broadband communications cables by a barrier.

Exception No. 2: Power circuit conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to the network-powered broadband communications system distribution equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum 0.25-in. (6.35-mm) separation from network-powered broadband communications cables.

(2) Other Applications. Low and medium powered ~~N~~network-powered broadband communications cable shall be separated at least 2 in. (50.8 mm) from conductors of any electric light, power, Class 1, ~~and~~ nonpower-limited fire alarm circuits and high-power network-powered communications circuits.

Exception No. 1: Where either (1) all of the conductors of electric light, power, Class 1, ~~and~~ nonpower-limited fire alarm and high-power network-powered communications circuits are in a raceway, or in metal-sheathed, metal-clad, nonmetallic-sheathed, Type AC, or Type UF cables, or (2) all of the low and medium powered network-powered broadband communications cables are encased in raceway.

Exception No. 2: Where the low and medium network-powered broadband communications cables are permanently separated from the conductors of electric light, power, Class 1, ~~and~~ nonpower-limited fire alarm and high-power network-powered communications circuits by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the wire.

(b) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through fireresistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods.

(c) Equipment in Other Space Used for Environmental Air. Section 300-22(c) shall apply.

(d) Support of Conductors. Raceways shall be used for their intended purpose. Network-powered broadband communications cables shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.

(e) Cable Substitutions. The substitutions for network-powered broadband cables listed in Table 830-58 shall be permitted. All cables in Table 830-58, other than network-powered broadband cables, shall be coaxial cables.

Table 830-58. Cable Substitutions

Table 830-58, including FPN, is unchanged.

SUBSTANTIATION: This proposal is a companion proposal to the proposal for Article 831, Network-Powered High-Power Broadband Communications. This proposal amends the separation rules between circuits to provide appropriate separation from these new high-power communications circuits.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposal to establish Article 831 was withdrawn, consequently all the correlating proposals are not needed.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1906)

16- 366 - (Table 830-58): Reject
SUBMITTER: Irving Mande, Edwards Systems Technology
RECOMMENDATION: For Cable Type BLP, delete MPP as a permitted substitution.

For Cable Type BLX, delete MPP, MPR, MPG, MP as permitted substitutions.

Either delete the FPN because it duplicates the last sentence of 830-58(e), or in the FPN, delete "multipurpose,".
SUBSTANTIATION: See substantiation for my Proposal for 800-51(g), et al.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 16-223.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

(Log #1016)

16- 367 - (830-58(a)(2) Exception No. 1, (d)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Exception No. 1: Where either (1) all of the conductors of the electric light, power, Class 1, and nonpower-limited fire alarm circuits are in a raceway(s) or in metal-sheathed, metal-clad, nonmetallic-sheathed cable, Type AC, or, or multiconductor Type UF, cables or, (2) all of the network-powered broadband communications cables are ~~encased~~ in a raceway.

(d) Support of Conductors. ~~Raceways shall be used for their intended purpose.~~ Network-powered broadband communications cables shall not be strapped, taped, or attached by any means to the exterior of any ~~conduit or~~ raceway or cable as ~~a~~ the required means of support except that overhead outdoor aerial cables shall be permitted to be attached to and supported by an approved raceway mast.

SUBSTANTIATION: Editorial. Type UF cable may be single-conductor type; if this is not intended it should be specified as multiconductor type. The word "encased" infers embedment (See definition of conductor in Article 100 and use of the word in other sections).

The first sentence of (d) doesn't specify Code related purposes, which are already covered in other articles. Present text does not prohibit support by Type AC, MC, MI, NM, or SE cables which are even less suitable than rigid metal conduit. "Conduit" is superfluous as it is a raceway.

Provision should be made to permit suitable raceway masts for support. An "approved" mast can be limited to one not supporting or enclosing conductors of other systems, in addition to other requirements.

Proposal does not prohibit bundling/strapping together of cables, provided it is incidental to other provided support.

PANEL ACTION: Reject.

PANEL STATEMENT: The changes are not editorial. The addition of the term multiconductor excludes single conductor cable. The changes includes reference to outside wiring which is not part of 830-58 and changes the intent of the existing section.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #1538)

16- 368 - (830-58(b)): Accept

SUBMITTER: James E. Brunssen, Telcordia Technologies, Inc./Rep. Alliance for Telecommunications Industry Solutions

RECOMMENDATION: Revise 830-58(b) as follows:

(b) Spread of Fire ofrProducts of Combustion. Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations through ~~fire~~ fire-resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

SUBSTANTIATION: This proposed revision underscores the true purpose of the rule, to maintain the fire resistance rating, and correlates 830-58(b) with 300-21.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

(Log #3624)

16- 369 - (830-58(b)): Accept in Principle

SUBMITTER: David B. Kiddoo, AlphaGary Corp.

RECOMMENDATION: Revise 830-58(b) as follows:

(e) Spread of Fire or Products of Combustion. Installations in hollow spaces, vertical shafts, ventilation ducts or air-handling plenums shall be made so that the possible spread of fire or fire resistant-rated walls, partitions, floors or ceilings shall be firestopped using approved methods to maintain the fire resistant rating. Abandoned cables in these spaces, shafts, ducts and plenums shall not be allowed to accumulate. Accumulations of abandoned cables, not identified for future use, in these spaces, shafts, ducts, plenums, and other space used for environmental air, shall be removed.

FPN No. 1: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made.

FPN No. 2: Definition of acceptable cable fire performance in various applications are described in Section 830-5.

SUBSTANTIATION: This issue has been discussed and reviewed in the last cycle of the NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems). The membership of the NFPA did NOT support a proposal to change the provisions for cables in the paragraphs on "ceiling cavity plenums" (2-3.10.1) and "raised floor plenums" (2-3.10.5) that would have allowed "Permanent Plenum Cables" to accumulate in these plenums. ("Permanent Plenum Cables" are so named through a Project being conducted by the National Fire Protection Research Foundation (NFPRF) and are described to meet a new, undefined, cable Listing for "limited combustibility" and "smoke developed index".) The more comprehensive solution to the issue of accumulating abandoned cables would have been to adopt a requirement to remove "ALL" abandoned cables that are removed from service and not intended for future use. Allowing for "Permanent Plenum Cables" to remain in plenums when abandoned would not address the serious issues of "congestion", "air flow restriction", and "total fuel load accumulation".

An appeal to the Standards Council was generated by proponents for "Permanent Plenum Cable" to overturn the Membership Action that occurred at the 1999 Annual Meeting. The Standards Council upheld the NFPA Membership Action after the hearing of the appeal. Comments from the final decision of the Standards Council on this matter are:

- "After a hearing, the Council reviewed and considered all of the information available to it, and voted to deny the appeals."
- "...wire and cable represents a significant potential fuel load in plenums and that, due to the rapidly increasing use of such cable in recent years, some approach to the problem should be devised."
- "...while it is the floor vote in favor of a return to the previous edition text that resulted in this recommendation, informational ballots of the TC (NFPA 90A Technical Committee) following that vote give further support to the conclusion that a lack of consensus exists in favor of going forward with the abandoned cable provisions. A majority of TC members voting on these informational ballots also supported the return to previous edition text..."
- "...the previous edition text is, in the Council's view, clearly suitable."
- "...the Council itself has concerns about the TC's approach and has concluded that further study of this important issue is needed."
- "...the Council wants to ensure that, as the TC undertakes to fully and fairly address these issued going forward, it has the best available range of expertise, representation, and experience. The Council, therefore, is referring the matter of committee membership to the Council's membership task group for review and recommendations."

While plenum cables are not typically the ignition source of fires, due to the low energy conducted through them, the fuel characteristics of high volumes of abandoned cable in plenums, whether combustible or limited combustible by definition, will most certainly add to the heat and energy released in a large, exposing fire, such as those where the ignition source is a room and contents fire below or above the plenum.

This proposal addresses the growing safety issue of accumulating abandoned cable in concealed spaces, without selectively favoring any cable geometry or synergy of materials. It does not allow for further accumulation of "Permanent Plenum Cables" which, when removed from service and not intended for future use, no longer have any function—except perhaps to serve as fuel for some future conflagration.

The proposal adopts consistent wording from NFPA 70, National Electrical Code, Section 300-21 and NFPA 75, Protection of Electronic Computer/Data Processing Equipment, paragraph 4-2.4. Basing this new requirement on existing code shows the strong intent, stated in the past by the Standards Council, to have good consistent code language across the various NFPA standards. Arguments by the proponents of "Permanent Plenum Cable" in the NFPA 90A review process to somehow create a new cable test requirement based on the definition of "limited combustibility" and "smoke developed index" created for building construction products would be a further misuse of the NFPA 255 and NFPA 259 "materials" test methods.

In spite of the rapid attempts by the proponents of "Permanent Plenum Cable", neither Underwriters Laboratories (UL) nor Intertek Testing Services (ITS/ETL) have yet established Listing criteria for "Permanent Plenum Cable" that could cover the matrix of cable types used in a plenum (fiber optics, coax, etc.). In fact, initial attempts over the first 9 months of the NFPRF Project to test finished cable in the NFPA 255 and NFPA 259 test methods has only shown inconsistencies and extremely limited capability of cables to meet the established definitions of "limited combustibility" and "smoke developed index" established for construction products. These test methods do NOT allow for cables to be tested based on their installed condition, nor can they be used to test cables with the important integration of finished cable geometries and materials/conductor or fiber synergies as they impact fire performance.

The proponents of "Permanent Plenum Cable" are applying these "material" tests inappropriately to cables. This is particularly why more sophisticated, integrated "cable" fire tests such as NFPA 262 (Plenum), ANSI/UL 1666 (Riser), and ANSI/UL 1581 (Vertical Tray) have been established and referenced in Standards such as the NFPA 70, NFPA 90A, etc. These tests more accurately simulate the actual fire hazards for installed cables, both in terms of the building environment AND the installed configuration. Integrated tests such as these are used to show the cables are designed to help contribute to minimizing the spread of fire and smoke generation in the early stages of a fire, allowing time for people to egress from the building. The fire safety record clearly shows that these tests have been successful in differentiating the fire performance of cables more accurately than materials tests such as NFPA 255 or NFPA 259.

The definition for cable fire performance in NFPA 90A Sections 2-3.10.1 and 2-3.10.5 are listed as Exceptions because the covering paragraphs (a) in each Section refer only to "materials" used in the construction of plenums. Proponents of "Permanent Plenum Cable" tried to make the argument in the NFPA 90A proposal review

that IF the cable can be shown to meet the requirements of the plenum construction materials, accumulation of this cable is justifiable. As was acknowledged by members of the Standards Council during the NFPA 90A Appeal Hearing, cable jackets and insulations will NEVER look like the rigid materials used to construct plenums. Establishing a "Permanent Plenum Cable" Exception in a requirement to remove abandoned cable would clearly allow for a loop-hole to continue to proliferate abandoned cable accumulation and NOT address the serious issues of total fuel load, congestion, and air flow.

NFPA 75 Appendix A, paragraph A-4-2.4 says: "Abandoned cable will potentially interfere with air flow and extinguishing systems. Abandoned cable also adds to the fuel loading." This proposal would provide consistency with the established fire testing criteria and/or abandoned cable removal provisions established by NFPA 70, NFPA 75 and the appropriate Exceptions established for cables in NFPA 90A.

As was shared by Richard G. Gewain of Hughes Associates (with many years of direct involvement in these definitions) at the NFPA 90A TC meeting in December, 1998, the NFPA 220, Building Construction Committee (BCC) reviewed the definition of "non-combustible" and the new definition "limited combustible" in 1975. The BCC made it clear that these definitions "apply to the materials used in the construction of buildings (floors, roofs, columns, walls, etc.), but do NOT apply to furnishings or the contents of buildings, or to the fire hazard evaluation of materials." This language is clearly spelled out in the Special Interest Bulletin No. 294, currently entitled "Noncombustible and Limited-Combustible Building Construction Materials", published and updated several times since 1956 by the National Board of Fire Underwriters (a.k.a. American Insurance Association, currently known as the American Insurance Services Group).

Because of the concern that other NFPA Committees have been misusing the term "limited combustible", the Standards Council has assigned the responsibility for the term "limited combustible" to the BCC. The BCC has recently requested its Chairman to contact the Chairmen of the other NFPA Committees (covering 48 NFPA Standards) using this term and ask for a clarification of what is intended for its use. A BCC Task Group is now established to develop proposals or comments to ensure that the term in other standards such as NFPA 90A is used correctly. From a fire hazards point of view, it has clearly NOT been shown that using the current definitions of "limited combustible" and "smoke developed index" and NFPA 259/NFPA 255 test methods are appropriate for installed cables.

This proposal also alleviates the concern and burden to the authority having jurisdiction inspector enforcing NFPA 70 to identify different types of cables currently in the concealed spaces and removed from service. The requirements to remove ALL abandoned cable not intended for future use should be less cumbersome than to remove only "some" of the cables.

PANEL ACTION: Accept in Principle.
PANEL STATEMENT: Refer to panel action on Proposal 16-364 which meets the intent of the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 19
ABSTENTION: 1
EXPLANATION OF ABSTENTION:
CAUDILL: See my Explanation of Abstention on Proposal 16-1a.

(Log #514)

16- 370 - (830-58(d) Exception No. 2): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "0.25-in. (6.35 mm)" to "6.35 mm (0.25 in.)"

The CMP should consider rounding to "6 mm (0.25 in.)" if safety would not be compromised.

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept in Principle.
In the submitter's recommended text revise "6.35 mm (0.25 in.)" to "6 mm (0.25 in.)."
PANEL STATEMENT: The panel has accepted the TCC suggestion to round to "6 mm (0.25 in.)" and has included in the panel action text.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON PANEL ACTION:
AFFIRMATIVE: 20

CHAPTER 9 — TABLES

(Log #3190)

8- 445 - (Chapter 9, Notes to Tables, Note (1)): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Delete the Note 1 and replace with the following: See Table 4 of this chapter for nominal dimensions of the various conduits and tubing for computing conductor fill.
SUBSTANTIATION: A companion proposal has been submitted to delete Appendix C. If that proposal is accepted, the recommended change to Note 1 should be made.
PANEL ACTION: Reject.
PANEL STATEMENT: Appendix C has not been deleted therefore the proposed text is not applicable. See panel action and statement on Proposal 8-463.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1018)

8- 446 - (Chapter 9, Notes to Tables, Note (2)): Reject
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise to read as follows:

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to short sections of conduit or tubing used to support or protect exposed wiring from physical damage.

SUBSTANTIATION: Editorial. To correlate with wording of the exceptions for Sections 250-86 and 300-12 Exception which include the words "short" and "support".
PANEL ACTION: Reject.
PANEL STATEMENT: The existing language adequately covers the use of raceways as a method of physical protection for exposed wiring. The proposed change is not just editorial in nature.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1253)

8- 447 - (Chapter 9, Notes to Tables, Note (4)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change "24 in. (610 mm)" to "600 mm (24 in.)".
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Proposal 8-11.

(Log #1298)

8- 448 - (Chapter 9 Notes to Tables, Note (4)): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows"
Notes (4)
4. Where conduit or tubing nipples having a maximum length not to exceed 600 mm (24 in.) ~~(610 mm)~~ are installed between boxes, cabinets, and similar enclosures, the nipples shall be permitted to be filled to 60 percent of their total cross-sectional area, and Section 310-15(b)(2)(a) adjustment factors need not apply to this condition.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 8-447.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11. Editorial - Reference in panel statement should be to Proposal 8-447, not 8-448.
LOYD: See my Explanation of Negative Vote on Proposal 8-11.
COMMENT ON AFFIRMATIVE:
BERMAN: Typographical error - Panel Statement should reference Proposal 8-447.
JANNOT: Panel statement should refer to action on Proposal 8-447.

(Log #1808)

8- 449 - (Chapter 9, Notes to Tables, Note (10) (New)): Reject
SUBMITTER: Noel Williams, Noel Williams Consulting
RECOMMENDATION: Add Note (10) as follows:
"Table 1 does not apply to communications conductors or cables installed in accordance with Article 800 or to Class 2 or Class 3 circuits installed in accordance with Article 725."
SUBSTANTIATION: The applicability of conduit fill requirements to "low voltage" or limited energy circuit conductors is often debated. Although Section 300-17 does not apply to communications and Class 2 and 3 circuits, the conduit fill table is referenced in the individual raceway articles. With the addition of new language in Section 800-48 in the 1999 NEC, these rules are now indirectly referenced for communications as well (although pointedly not applied to listed nonmetallic communications raceways as referenced in the exception to Section 800-48.) At the electrical section meeting at the NFPA annual meeting in 1998, four panel chairmen concerned with related issues were asked if conduit fill limits apply to the circuits referred to in this proposal. Two said yes and two said no. An article in EC&M magazine argued, in effect, that although Table 1 did seem to apply according to the rules, they should not be applied because overfilling conduits with limited energy circuits does not pose any significant risk. Although the submitter does not necessarily agree with this argument, the code panels should clarify the applicability of the conduit fill requirements. Similar exceptions could be added to every raceway article, but this addition is simpler and more comprehensive.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel intends that Table 1 apply to all conductors and cables installed in raceways. The operation of life saftey systems could be compromised by damage to conductors as a result of overfill.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #383)

8- 450 - (Chapter 9, Table 4): Accept
SUBMITTER: V. Blecha, Raytheon
RECOMMENDATION: On page 563 of the 1999 edition of the NEC, Table 4, Rigid PVC, Schedule 80 revise as follows:
2 in. conduit - 1 wire 53% = ~~1.1523~~ 1.523
SUBSTANTIATION: Please correct the available in.^{2} for 1 wire rigid pvc, schedule 80.
PANEL ACTION: Accept.
PANEL STATEMENT: This is editorial in nature.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #427)

8- 451 - (Chapter 9, Table 4): Reject
SUBMITTER: Vohn N. Peeler, Faith, NC
RECOMMENDATION: For each conduit type in Table 4 Chapter 9, eliminate the 2 wire (31 percent) column and add a nipple column (60%).
SUBSTANTIATION: Table 4 is in the code strictly for convenience in determining conduit size. (The actual rule is in table 1.) Rarely do we install two conductors that are different in a single conduit. If the two conductors are alike, we use Appendix C.
Conduit nipples often have a mixture of conductors. It would be convenient to have a 60 percent column in Table 4.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter provided no data to create a column for 60% nipple fill. The submitter did not provide technical substantiation to remove the 2 conductor (31%) column.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #617)

8- 452 - (Chapter 9 Table 4): Reject
SUBMITTER: Rick Stringfield, Westinghouse Savannah River Co.
RECOMMENDATION: Under "Liquidtight Flexible Nonmetallic Conduit," Change (Type LFNC-B*) to (Type FNMC-B*) and change (Type LFNC-A*) to (Type FNMC-A*)
SUBSTANTIATION: Typographical error.
PANEL ACTION: Reject.
PANEL STATEMENT: Although FNMC is a recognized acronym for Liquidtight Flexible Nonmetallic Conduit, LFNC is the industry preferred and correct acronym. See 351-22.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1299)

8- 453 - (Chapter 9 Table 4): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 4 as follows:
(Table shown on following pages)

Table 4

Table 4. Dimensions and Percent Area of Conduit and Tubing (Areas of Conduit or Tubing for the Combinations of Wires Permitted in Table 1, Chapter 9)

Electrical Metallic Tubing

Metric Designator	Trade Size	Internal Diameter	Internal Diameter	Total Area 100%	Total Area 100%	2 Wires 31%	2 Wires 31%	Over 2 Wires 40%	Over 2 Wires 40%	1 Wire 53%	1 Wire 53%
	English	(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
16	1/2	15.8	0.622	196	0.304	61	0.094	79	0.122	104	0.161
21	3/4	20.9	0.824	344	0.533	106	0.165	137	0.213	183	0.283
27	1	26.6	1.049	557	0.864	173	0.268	223	0.346	295	0.458
35	1 1/4	35.1	1.380	965	1.496	299	0.464	386	0.598	512	0.793
41	1 1/2	40.9	1.610	1314	2.036	407	0.631	525	0.814	696	1.079
53	2	52.5	2.067	2165	3.356	671	1.040	866	1.342	1147	1.778
63	2 1/2	69.4	2.731	3779	5.858	1172	1.816	1512	2.343	2003	3.105
78	3	85.2	3.356	5707	8.846	1769	2.742	2283	3.538	3025	4.688
91	3 1/2	97.4	3.834	7448	11.545	2309	3.579	2979	4.618	3948	6.119
103	4	110.1	4.334	9518	14.753	2950	4.573	3807	5.901	5045	7.819

Electrical Nonmetallic Tubing

Metric Designator	Trade Size	Internal Diameter	Internal Diameter	Total Area 100%	Total Area 100%	2 Wires 31%	2 Wires 31%	Over 2 Wires 40%	Over 2 Wires 40%	1 Wire 53%	1 Wire 53%
	English	(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
16	1/2	14.2	0.560	159	0.246	49	0.076	64	0.099	85	0.131
21	3/4	19.3	0.760	293	0.454	91	0.141	117	0.181	155	0.240
27	1	25.4	1.000	506	0.785	157	0.243	203	0.314	268	0.416
35	1 1/4	34.0	1.340	910	1.410	282	0.437	364	0.564	482	0.747
41	1 1/2	39.9	1.570	1249	1.936	387	0.600	499	0.774	662	1.026
53	2	51.3	2.020	2068	3.205	641	0.994	827	1.282	1096	1.699
63	2 1/2	—	—	—	—	—	—	—	—	—	—
78	3	—	—	—	—	—	—	—	—	—	—
91	3 1/2	—	—	—	—	—	—	—	—	—	—

Table 4

Table 4. Dimensions and Percent Area of Conduit and Tubing (Areas of Conduit or Tubing for the Combinations of Wires Permitted in Table 1, Chapter 9)

Flexible Metal Conduit

Metric Designator	Trade Size	Internal Diameter	Internal Diameter	Total Area 100%	Total Area 100%	2 Wires 31%	2 Wires 31%	Over 2 Wires 40%	Over 2 Wires 40%	1 Wire 53%	1 Wire 53%
	English	(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
12	3/8	9.7	0.384	75	0.116	23	0.036	30	0.046	39	0.061
16	1/2	16.1	0.635	205	0.317	63	0.098	82	0.127	108	0.168
21	3/4	20.9	0.824	344	0.533	106	0.165	137	0.213	182	0.282
27	1	25.9	1.020	527	0.817	163	0.253	211	0.327	279	0.433
35	1 1/4	32.4	1.275	824	1.277	255	0.396	330	0.511	437	0.677
41	1 1/2	39.1	1.538	1198	1.857	372	0.576	479	0.743	635	0.984
53	2	51.8	2.040	2109	3.269	654	1.013	843	1.307	1117	1.732
63	2 1/2	63.5	2.500	3167	4.909	982	1.522	1267	1.964	1679	2.602
78	3	76.2	3.000	4561	7.069	1414	2.191	1824	2.827	2417	3.746
91	3 1/2	88.9	3.500	6207	9.621	1925	2.983	2483	3.848	3290	5.099
103	4	101.6	4.000	8107	12.566	2514	3.896	3243	5.027	4297	6.660

Immediate Metal Conduit

Metric Designator	Trade Size	Internal Diameter	Internal Diameter	Total Area 100%	Total Area 100%	2 Wires 31%	2 Wires 31%	Over 2 Wires 40%	Over 2 Wires 40%	1 Wire 53%	1 Wire 53%
	English	(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
12	3/8	—	—	—	—	—	—	—	—	—	—
16	1/2	16.8	0.660	221	0.342	68.4	0.106	88	0.137	117	0.181
21	3/4	21.9	0.864	378	0.586	117	0.182	152	0.235	201	0.311
27	1	28.1	1.105	619	0.959	192	0.297	248	0.384	328	0.508
35	1 1/4	36.8	1.448	1062	1.646	329	0.510	425	0.658	563	0.872
41	1 1/2	42.7	1.683	1434	2.223	445	0.689	574	0.889	760	1.178
53	2	54.6	2.150	2341	3.629	726	1.125	937	1.452	1241	1.923
63	2 1/2	64.9	2.557	3313	5.135	1027	1.592	1325	2.054	1756	2.722
78	3	80.7	3.176	5111	7.922	1585	2.456	2045	3.169	2709	4.199
91	3 1/2	93.2	3.671	6828	10.584	2117	3.281	2732	4.234	3619	5.610
103	4	105.4	4.166	8794	13.631	2726	4.226	3517	5.452	4661	7.224

Table 4. Dimensions and Percent Area of Conduit and Tubing (Areas of Conduit or Tubing for the Combinations of Wires Permitted in Tables 1, Chapter 9)

Liquidtight Flexible Nonmetallic Conduit (Type LFNC-B*)											
				Total	Total			Over 2	Over 2		
	Trade	Internal	Internal	Area	Area	2 Wires	2 Wires	Wires	Wires	1 Wire	1 Wire
Metric	Size	Diameter	Diameter	100%	100%	31%	31%	40%	40%	53%	53%
Designator	English	(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
12	3/8	12.5	0.494	124	0.192	38	0.059	50	0.077	66	0.102
16	1/2	16.1	0.632	203	0.314	63	0.097	81	0.125	107	0.166
21	3/4	21.1	0.830	349	0.541	108	0.168	139	0.216	185	0.287
27	1	26.8	1.054	563	0.872	174	0.270	225	0.349	298	0.462
35	1 1/4	35.4	1.395	986	1.528	306	0.474	394	0.611	523	0.810
41	1 1/2	40.3	1.588	1277	1.979	396	0.614	511	0.792	677	1.049
53	2	51.6	2.033	2094	3.245	649	1.006	837	1.298	1110	1.720
*Corresponds to Section 351-22(2)											

Liquidtight Flexible Nonmetallic Conduit (Type LFNC-A*)											
				Total	Total			Over 2	Over 2		
	Trade	Internal	Internal	Area	Area	2 Wires	2 Wires	Wires	Wires	1 Wire	1 Wire
Metric	Size	Diameter	Diameter	100%	100%	31%	31%	40%	40%	53%	53%
Designator	English	(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
12	3/8	12.6	0.495	124	0.192	39	0.060	50	0.077	66	0.102
16	1/2	16.0	0.630	201	0.312	63	0.097	81	0.125	106	0.165
21	3/4	21.0	0.825	345	0.535	107	0.166	138	0.214	183	0.283
27	1	26.5	1.043	551	0.854	171	0.265	220	0.341	292	0.452
35	1 1/4	35.1	1.383	968	1.501	300	0.465	387	0.600	514	0.796
41	1 1/2	40.7	1.603	1301	2.017	403	0.625	521	0.807	690	1.069
53	2	52.4	2.063	2155	3.341	668	1.036	862	1.336	1143	1.771
*Corresponds to Section 351-22(1)											

Table 4. Dimensions and Percent Area of Conduit and Tubing (Areas of Conduit or Tubing for the Combinations of Wires Permitted in Tables 1, Chapter 9)

Liquidtight Flexible Metal Conduit

				Total	Total			Over 2	Over 2		
	Trade	Internal	Internal	Area	Area	2 Wires	2 Wires	Wires	Wires	1 Wire	1 Wire
Metric	Size	Diameter	Diameter	100%	100%	31%	31%	40%	40%	53%	53%
Designator	English	(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
12	3/8	12.5	0.494	124	0.192	38	0.059	50	0.077	66	0.102
16	1/2	16.1	0.632	203	0.314	63	0.097	81	0.125	107	0.166
21	3/4	21.1	0.830	349	0.541	108	0.168	139	0.216	185	0.287
27	1	26.8	1.054	563	0.872	174	0.270	225	0.349	298	0.462
35	1 1/4	35.4	1.395	986	1.528	306	0.474	394	0.611	523	0.810
41	1 1/2	40.3	1.588	1277	1.979	396	0.614	511	0.792	677	1.049
53	2	51.6	2.033	2094	3.245	649	1.006	837	1.298	1110	1.720
63	2 1/2	63.3	2.493	3148	4.879	976	1.513	1259	1.952	1668	2.586
78	3	78.4	3.085	4823	7.475	1495	2.317	1929	2.990	2556	3.962
91	3 1/2	89.4	3.520	6278	9.731	1946	3.017	2512	3.893	3328	5.158
103	4	102.1	4.020	8188	12.692	2539	3.935	3275	5.077	4340	6.727
129	5	—	—	—	—	—	—	—	—	—	—
155	6	—	—	—	—	—	—	—	—	—	—

Rigid Metal Tubing

				Total	Total			Over 2	Over 2		
	Trade	Internal	Internal	Area	Area	2 Wires	2 Wires	Wires	Wires	1 Wire	1 Wire
Metric	Size	Diameter	Diameter	100%	100%	31%	31%	40%	40%	53%	53%
Designator	English	(mm)	(in.)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)	(mm^2)	($in.^2$)
12	3/8	—	—	—	—	—	—	—	—	—	
16	1/2	16.1	0.632	203	0.314	63	0.097	81	0.125	108	0.166
21	3/4	21.2	0.836	354	0.549	110	0.170	142	0.220	188	0.291
27	1	27.0	1.063	573	0.888	177	0.275	229	0.355	303	0.470
35	1 1/4	35.4	1.394	985	1.526	305	0.473	394	0.610	522	0.809
41	1 1/2	41.2	1.624	1336	2.071	414	0.642	535	0.829	708	1.098
53	2	52.9	2.083	2199	3.408	681	1.056	879	1.363	1165	1.806
63	2 1/2	63.2	2.489	3139	4.866	973	1.508	1255	1.946	1664	2.579
78	3	78.5	3.090	4838	7.499	1500	2.325	1935	3.000	2565	3.975
91	3 1/2	90.7	3.570	6458	10.010	2002	3.103	2583	4.004	3426	5.305
103	4	102.9	4.050	8312	12.883	2577	3.994	3325	5.153	4405	6.828
129	5	128.9	5.073	13041	20.213	4043	6.266	5216	8.085	6912	10.713
155	6	154.8	6.093	18812	29.158	5832	9.039	7525	11.663	9970	15.454

Table 4. Dimensions and Percent Area of Conduit and Tubing (Areas of Conduit or Tubing for the Combinations of Wires Permitted in Tables 1, Chapter 9)

Rigid PVC Conduit, Schedule 80

Metric Designator	Trade Size English	Internal Diameter (mm)	Internal Diameter (in.)	Total Area 100% (mm^2)	Total Area 100% ($in.^2$)	2 Wires 31% (mm^2)	2 Wires 31% ($in.^2$)	Over 2 Wires 40% (mm^2)	Over 2 Wires 40% ($in.^2$)	1 Wire 53% (mm^2)	1 Wire 53% ($in.^2$)
12	3/8	—	—	—	—	—	—	—	—	—	—
16	1/2	13.4	0.526	140	0.217	43	0.067	56	0.087	74	0.115
21	3/4	18.3	0.722	264	0.409	82	0.127	106	0.164	140	0.217
27	1	23.8	0.936	444	0.688	137	0.213	177	0.275	235	0.365
35	1 1/4	31.9	1.255	798	1.237	247	0.383	319	0.495	423	0.656
41	1 1/2	37.5	1.476	1104	1.711	342	0.530	441	0.684	585	0.907
53	2	48.6	1.913	1854	2.874	575	0.891	742	1.150	743	1.152
63	2 1/2	58.2	2.290	2657	4.119	824	1.277	1063	1.647	1408	2.183
78	3	72.7	2.864	4156	6.442	1288	1.997	1663	2.577	2203	3.414
91	3 1/2	84.5	3.326	5605	8.688	1737	2.693	2242	3.475	2971	4.605
103	4	96.2	3.786	7263	11.258	2252	3.490	2905	4.503	3850	5.967
129	5	121.1	4.768	11519	17.855	3751	5.535	4608	7.142	6105	9.463
155	6	145.0	5.709	16515	25.598	5119	7.935	6606	10.239	8753	13.567

Rigid PVC Conduit, Schedule 40, and HDPE Conduit

Metric Designator	Trade Size English	Internal Diameter (mm)	Internal Diameter (in.)	Total Area 100% (mm^2)	Total Area 100% ($in.^2$)	2 Wires 31% (mm^2)	2 Wires 31% ($in.^2$)	Over 2 Wires 40% (mm^2)	Over 2 Wires 40% ($in.^2$)	1 Wire 53% (mm^2)	1 Wire 53% ($in.^2$)
12	3/8	—	—	—	—	—	—	—	—	—	—
16	1/2	15.3	0.602	184	0.285	57	0.088	74	0.114	97	0.151
21	3/4	20.4	0.804	328	0.508	101	0.157	131	0.203	174	0.269
27	1	26.1	1.029	537	0.832	166	0.258	215	0.333	285	0.441
35	1 1/4	34.5	1.360	937	1.453	290	0.450	375	0.581	497	0.770
41	1 1/2	40.4	1.590	1281	1.986	397	0.616	512	0.794	679	1.052
53	2	52.0	2.047	2123	3.291	658	1.020	849	1.316	1125	1.744
63	2 1/2	62.1	2.445	3029	4.695	939	1.455	1212	1.878	1605	2.488
78	3	77.3	3.042	4689	7.268	1454	2.253	1875	2.907	2485	3.852
91	3 1/2	89.4	3.521	6282	9.737	1947	3.018	2513	3.895	3330	5.161
103	4	101.5	3.998	8099	12.554	2511	3.892	3240	5.022	4293	6.654
129	5	127.4	5.016	12749	19.761	3952	6.126	5099	7.904	6757	10.473
155	6	153.2	6.031	18430	28.567	5714	8.856	7372	11.427	9768	15.141

Table 4. Dimensions and Percent Area of Conduit and Tubing (Areas of Conduit or Tubing for the Combinations of Wires Permitted in Tables 1, Chapter 9)

Type A, Rigid PVC Conduit

Metric Designator	Trade Size English	Internal Diameter (mm)	Internal Diameter (in.)	Total Area 100% (mm^2)	Total Area 100% ($in.^2$)	2 Wires 31% (mm^2)	2 Wires 31% ($in.^2$)	Over 2 Wires 40% (mm^2)	Over 2 Wires 40% ($in.^2$)	1 Wire 53% (mm^2)	1 Wire 53% ($in.^2$)
16	1/2	17.8	0.700	248	0.385	77	0.119	99	0.154	132	0.204
21	3/4	23.1	0.910	419	0.650	130	0.202	168	0.260	223	0.345
27	1	29.8	1.175	699	1.084	217	0.336	280	0.434	371	0.575
35	1 1/4	38.1	1.500	1140	1.767	354	0.548	456	0.707	605	0.937
41	1 1/2	43.7	1.720	1499	2.324	465	0.720	599	0.929	794	1.231
53	2	54.7	2.155	2353	3.647	730	1.131	941	1.459	1247	1.933
63	2 1/2	66.9	2.635	3518	5.453	1090	1.690	1407	2.181	1865	2.890
78	3	82.0	3.230	5286	8.194	1639	2.540	2115	3.278	2802	4.343
91	3 1/2	93.7	3.690	6899	10.694	2139	3.315	2760	4.278	3657	5.668
103	4	106.2	4.180	8854	13.723	2745	4.254	3541	5.489	4692	7.273
129	5	—	—	—	—	—	—	—	—	—	—
155	6	—	—	—	—	—	—	—	—	—	—

Type EB, PVC Conduit

Metric Designator	Trade Size English	Internal Diameter (mm)	Internal Diameter (in.)	Total Area 100% (mm^2)	Total Area 100% ($in.^2$)	2 Wires 31% (mm^2)	2 Wires 31% ($in.^2$)	Over 2 Wires 40% (mm^2)	Over 2 Wires 40% ($in.^2$)	1 Wire 53% (mm^2)	1 Wire 53% ($in.^2$)
16	1/2	—	—	—	—	—	—	—	—	—	—
21	3/4	—	—	—	—	—	—	—	—	—	—
27	1	—	—	—	—	—	—	—	—	—	—
35	1 1/4	—	—	—	—	—	—	—	—	—	—
41	1 1/2	—	—	—	—	—	—	—	—	—	—
53	2	56.4	2.221	2499	3.874	775	1.201	1000	1.550	1325	2.053
63	2 1/2	—	—	—	—	—	—	—	—	—	—
78	3	84.6	3.330	5619	8.709	1742	2.700	2248	3.484	2978	4.616
91	3 1/2	96.6	3.804	7332	11.365	2273	3.523	2933	4.546	3886	6.024
103	4	108.9	4.289	9321	14.448	2890	4.479	3728	5.779	4940	7.657
129	5	135.0	5.316	14319	22.195	4439	6.881	5728	8.878	7590	11.764
155	6	160.9	6.336	20342	31.530	6306	9.774	8137	12.612	10781	16.711

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.
In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised.
In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept in Principle.
Delete "English" from second column globally.
I n the Table "Rigid PVC Schedule 80" change Trade Size 2, change "1 wire" column to 983mm2 and 1.523in2.
PANEL STATEMENT: The panel's actions are editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Proposal 8-11.

(Log #1825)

8- 454 - (Chapter 9, Table 4): Reject
SUBMITTER: Joseph A. Tedesco, Nat'l Technology Transfer, Inc.
RECOMMENDATION: Relocate each block of information that covers the specific dimensions into each article, in the section covering "number of conductors" in tubing or conduit. Replace the table with a reference to the following: "See Articles 348, 331, 350, 345, 351A, 351B, 346, 347."
SUBSTANTIATION: The information in Table 4 will be put to better use when it is located where it can be used to determine compliance with Table 1 in Chapter 9. If accepted, the list of articles should flow with the code numbers, instead of the way they are shown.
PANEL ACTION: Reject.
PANEL STATEMENT: The tables are more user friendly in the existing location as opposed to being distributed throughout the Code.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3089)

8- 455 - (Chapter 9, Table 4): Reject
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Above each column headed "Internal Diameter," add the word "Nominal."
SUBSTANTIATION: For clarification. These ID dimensions have never been exact. This makes that clear and DOES NOT change anything from past practice.
PANEL ACTION: Reject.
PANEL STATEMENT: The submitter has not provided substantiation to demonstrate that the use of the existing tables will be enhanced by adding the term "nominal".
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 3
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
BERMAN: I agree with Mr. Dauberger that the present Table 4 internal diameters should not be perceived as exact, and the term "nominal" adds clarity.
DAUBERGER: The current inside diameter dimensions are inaccurately perceived to be exact. Addition of the term "nominal" will make Table 4 more user friendly.
LOYD: The I.D. diameters are perceived to be exact, they are not. Adding "nominal" will make Table 4 more user friendly. The word "nominal" in the heading of this table is appropriate as this implies a measurement with tolerance. Raw materials used in the manufacture of conduit products have inherent variation in the thickness. This has a direct impact on the I.D. measurement since the I.D. is a number derived by subtracting 2X the wall thickness from the nominal O.D. dimension.

(Log #3137)

8- 456 - (Chapter 9, Table 4): Reject
SUBMITTER: Brian Zawora, K.V. Electric
RECOMMENDATION: Add 60 percent column to Table 4 in Chapter 9, to aid in determining conduit fill for 24 in. or less conduit nipples.
SUBSTANTIATION: This situation is frequently encountered in the field and there should be a column in the table for this purpose.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on adding the 60% column in Proposal 8-451.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3291)

8- 457 - (Chapter 9, Table 4): Accept
SUBMITTER: James T. Pauley, Square D Co.
RECOMMENDATION: Revise the headings in Chapter 9 Table 4 as shown by the underlines and strikeout.
Article 348 - Electrical Metallic Tubing (EMT)
Article 331 - Electrical Nonmetallic Tubing (ENT)
Article 350 - Flexible Metal Conduit (FMT)
Article 345 - Intermediate Metal Conduit (IMC)
Article 351 - Liquidtight Flexible Nonmetallic Conduit (~~Type~~ LFNC-B*)
Article 351 - Liquidtight Flexible Nonmetallic Conduit (~~Type~~ LFNC-A*)
Article 351 - Liquidtight Flexible Metal Conduit LFMC)
Article 346 - Rigid Metal Conduit (RMC)
Article 347 - Rigid PVC Conduit (RNC), Schedule 80
Article 347 - Rigid PVC Conduit (RNC), Schedule 40, and HDPE Conduit
Article 347 - Type A, Rigid PVC Conduit (RNC)
Article 347 - Type EB, PVC Conduit (RNC)
SUBSTANTIATION: The NEC Usability Task Group received a suggestion to add article numbers to the headings in Chapter 9, Table 4. The UTG agreed with the concept but did not have an opportunity to draft a proposal and agreed that submittal as an individual proposal would be a good idea. In addition to the Article numbers, the UTG discussed adding the wiring method acronyms to the title as well to correlate with the use of those acronyms in the revised articles submitted by the UTG.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #123a)

6- 212 - (Chapter 9 Table 5):

NOTE: The Technical Correlating Committee understands that Type AF is deleted by the action on Proposal 6-202. The Techncial Correlating Committee directs that Item 5 of the Recommendation in this Proposal be reported as "Reject" to correlate with the action on Proposal 8-458.

The Technical Correlating Committee will form a Task Group between Panels 6 and 8 to correlate this Proposal with Proposal 8-458.

NOTE: The following proposal consists of Comment 6-89 on Proposal 6-47 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-47 was:

Change thickness of insulation for No. 14-10 AWG sizes of Type THHW and THW products from 45 Mils to 30 Mils.

SUBMITTER: Ravindra H. Ganatra, Alcan Cable /Rep. Self

RECOMMENDATION: Panel should continue to accept this proposal. However, following changes need to be made to support this change.

Make following changes in Table 5. Dimensions of Insulated Conductors and Fixture Wires of Chapter 9: (Note: Required additions are highlighted by an underline and required deletions are shown by strikeout.)

1. In row listing product types "AF, TW, XF, XFF" for # 14 AWG to "AF, TW, XF, XFF, <u>THHW, THW, THW-2".</u>

2. In row listing product type "TW" for # 12, 10, and 8 AWG to "TW, <u>THHW, THW, THW-2".</u>

3. In row listing product types "RHH*, RHW*, RHW-2*, THHW, THW, THW-2 " for # 14 AWG to "RHH*, RHW*, RHW-2*~~, THHW, THW, THW-2".~~

4. In row listing product types "RHH*, RHW*, RHW-2*, THHW, THW, THW-2 " for # 12, 10, and 8 AWG to "RHH*, RHW*, RHW-2*~~, THHW, THW, THW-2".~~

Make following changes in the Tables of Appendix C:

1. In Tables C1, C2,...C12, change row titled "TW" for # 14, 12, 10, and 8 AWG to "TW, <u>THHW, THW, THW-2".</u>

2. In Tables C1, C2,...C12, change row titled "RHH*, RHW*, RHW-2*, THHW, THW, THW-2 " for # 14 AWG to "RHH*, RHW*, RHW-2*, THHW, THW, THW-2".

3. In Tables C1, C2,...C12, change row titled "RHH*, RHW*, RHW-2*, THHW, THW" for # 12 and 10 AWG to "RHH*, RHW*, RHW-2*, THHW, THW".

4. In Tables C1, C2,...C12, change row titled "RHH*, RHW*, RHW-2*, THHW, THW, THW-2 " for # 8 AWG to "RHH*, RHW*, RHW-2*, THHW, THW, THW-2".

5. In Tables C1A, C2A,.....C12A, change the first row for # 8 AWG as follows: (Note: This values are obtained for # 8 AWG TW in Tables C1, C2,....C12, respectively.)

In Table C1A:	2	5	8	13	18	30	53	81	105	135		
In Table C2A:	1	4	7	13	17	29						
In Table C3A:	3	5	7	11	17	30	45	64	88	115		
In Table C4A:	3	5	8	15	20	33	47	72	97	124		
In Table C5A:	1	3	5	8	14	18	29					
In Table C6A:	1	3	5	8	13	18	30					
In Table C7A:	3	5	8	14	18	29	44	68	89	116		
In Table C8A:	3	5	8	14	19	31	44	68	91	118	185	267
In Table C9A:	1	3	6	11	15	26	37	59	79	103	163	234
In Table C10A:	2	4	7	13	18	30	43	66	89	115	181	261
In Table C11A:	3	6	10	16	21	33	50	75	98	125		
In Table C12A:	35	79	104	132	203	288						

SUBSTANTIATION: Acceptance of Proposal 6-47 requires that these changes be made in the Code.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 10

VOTE ON PANEL ACTION:

AFFIRMATIVE: 10

(Log #1254)

6- 213 - (Chapter 9, Table 5): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Table 5 of Chapter 9 as shown to add SI units in Columns titled "Approximate Diameter" and "Approximate Area".

(Table shown on following pages)

Table 5. Dimensions of Insulated Conductors and Fixture Wires

Type: AF, FFH-2, RFH-1, RFH-2, RH, RHH*, RHW*, RHW-2*, RHH, RHW, RHW-2, SF-1, SF-2, SFF-1, SFF-2, TF, TFF, THHW, THW, THW-2, TW, XF, XFF

Type	Size (AWG or kcmil)	Approximate Diameter		Approximate Area	
		mm	(in.)	mm^2	($in.^2$)
RFH-2, FFH-2	18	3.454	0.136	9.355	0.0145
	16	3.759	0.148	11.10	0.0172
RH	14	4.140	0.163	13.48	0.0209
	12	4.623	0.182	16.77	0.0260
RHW-2, RHH, RHW	14	4.902	0.193	18.90	0.0293
	12	5.385	0.212	22.77	0.0353
RH, RHH, RHW, RHW-2	10	5.994	0.236	28.19	0.0437
	8	8.280	0.326	53.87	0.0835
	6	9.246	0.364	67.16	0.1041
	4	10.46	0.412	86.00	0.1333
	3	11.18	0.440	98.13	0.1521
	2	11.99	0.472	112.9	0.1750
	1	14.78	0.582	171.6	0.2660
	1/0	15.80	0.622	196.1	0.3039
	2/0	16.97	0.668	226.1	0.3505
	3/0	18.29	0.720	262.7	0.4072
	4/0	19.76	0.778	306.7	0.4754
	250	22.73	0.895	405.9	0.6291
	300	24.13	0.950	457.3	0.7088
	350	25.43	1.001	507.7	0.7870
	400	26.62	1.048	556.5	0.8626
	500	28.78	1.133	650.5	1.0082
	600	31.57	1.243	782.9	1.2135
	700	33.38	1.314	874.9	1.3561
	750	34.24	1.348	920.8	1.4272
	800	35.05	1.380	965.0	1.4957
	900	36.68	1.444	1057	1.6377
	1000	38.15	1.502	1143	1.7719
	1250	43.92	1.729	1515	2.3479
	1500	47.04	1.852	1738	2.6938
	1750	49.94	1.966	1959	3.0357
	2000	52.63	2.072	2175	3.3719
SF-2, SFF-2	18	3.073	0.121	7.419	0.0115
	16	3.378	0.133	8.968	0.0139
	14	3.759	0.148	11.10	0.0172
SF-1, SFF-1	18	2.311	0.091	4.194	0.0065
RFH-1, AF, XF, XFF	18	2.692	0.106	5.161	0.0080
AF, TF, TFF, XF, XFF	16	2.997	0.118	7.032	0.0109
AF, TW, XF, XFF	14	3.378	0.133	8.968	0.0139
TW	12	3.861	0.152	11.68	0.0181
	10	4.470	0.176	15.68	0.0243
	8	5.994	0.236	28.19	0.0437
RHH*, RHW*, RHW-2*, THHW, THW, THW-2	14	4.140	0.163	13.48	0.0209

Table 5. (Continued)

Type: AF, RHH*, RHW*, RHW-2*, THHN, THHW, THW,THW-2, TFN, TFFN, THWN, THWN-2, XF, XFF

Type	Size (AWG or kcmil)	Approximate Diameter		Approximate Area	
		mm	(in.)	mm^2	($in.^2$)
RHH*, RHW*, RHW-2*,	12	4.623	0.182	16.77	0.0260
THHW, THW, AF, XF, XFF,	10	5.232	0.206	21.48	0.0333
RHH*, RHW*, RHW-2*, THHW, THW, THW-2	8	6.756	0.266	35.87	0.0556
TW, THW,	6	7.722	0.304	46.84	0.0726
THHW,	4	8.941	0.352	62.77	0.0973
THW-2,	3	9.652	0.380	73.16	0.1134
RHH*,	2	10.46	0.412	86.00	0.1333
RHW*,	1	12.50	0.492	122.6	0.1901
RHW-2*	1/0	13.51	0.532	143.4	0.2223
	2/0	14.68	0.578	169.3	0.2624
	3/0	16.00	0.630	201.1	0.3117
	4/0	17.48	0.688	239.9	0.3718
	250	19.43	0.765	296.5	0.4596
	300	20.83	0.820	340.7	0.5281
	350	22.12	0.871	384.4	0.5958
	400	23.32	0.918	427.0	0.6619
	500	25.48	1.003	509.7	0.7901
	600	28.27	1.113	627.7	0.9729
	700	30.07	1.184	710.3	1.1010
	750	30.94	1.218	751.7	1.1652
	800	31.75	1.250	791.7	1.2272
	900	33.38	1.314	874.9	1.3561
	1000	34.85	1.372	953.8	1.4784
	1250	39.09	1.539	1200	1.8602
	1500	42.21	1.662	1400	2.1695
	1750	45.11	1.776	1598	2.4773
	2000	47.80	1.882	1795	2.7818
TFN,	18	2.134	0.084	3.548	0.0055
TFFN	16	2.438	0.096	4.645	0.0072
THHN,	14	2.819	0.111	6.258	0.0097
THWN,	12	3.302	0.130	8.581	0.0133
THWN-2	10	4.166	0.164	13.61	0.0211
	8	5.486	0.216	23.61	0.0366
	6	6.452	0.254	32.71	0.0507
	4	8.230	0.324	53.16	0.0824
	3	8.941	0.352	62.77	0.0973
	2	9.754	0.384	74.71	0.1158
	1	11.33	0.446	100.8	0.1562
	1/0	12.34	0.486	119.7	0.1855
	2/0	13.51	0.532	143.4	0.2223
	3/0	14.83	0.584	172.8	0.2679
	4/0	16.31	0.642	208.8	0.3237
	250	18.06	0.711	256.1	0.3970
	300	19.46	0.766	297.3	0.4608

Table 5. (Continued)

Type: FEP, FEPB, PAF, PAFF, PF, PFA, PFAH, PFF, PGF, PGFF, PTF, PTFF, TFE, THHN, THWN, THWN-2, Z, ZF, ZFF

Type	Size (AWG or kcmil)	Approximate Diameter		Approximate Area	
		mm	(in.)	mm^2	($in.^2$)
THHN,	350	20.75	0.817	338.2	0.5242
THWN,	400	21.95	0.864	378.3	0.5863
THWN-2	500	24.10	0.949	456.3	0.7073
	600	26.70	1.051	559.7	0.8676
	700	28.50	1.122	637.9	0.9887
	750	29.36	1.156	677.2	1.0496
	800	30.18	1.188	715.2	1.1085
	900	31.80	1.252	794.3	1.2311
	1000	33.27	1.310	869.5	1.3478
PF, PGFF, PGF, PFF,	18	2.184	0.086	3.742	0.0058
PTF, PAF, PTFF, PAFF	16	2.489	0.098	4.839	0.0075
PF, PGFF, PGF, PFF, PTF, PAF, PTFF, PAFF, TFE, FEP, PFA, FEPB, PFAH	14	2.870	0.113	6.452	0.0100
TFE, FEP,	12	3.353	0.132	8.839	0.0137
PFA, FEPB,	10	3.962	0.156	12.32	0.0191
PFAH	8	5.232	0.206	21.48	0.0333
	6	6.198	0.244	30.19	0.0468
	4	7.417	0.292	43.23	0.0670
	3	8.128	0.320	51.87	0.0804
	2	8.941	0.352	62.77	0.0973
TFE, PFAH	1	10.72	0.422	90.26	0.1399
TFE, PFA	1/0	11.73	0.462	108.1	0.1676
PFAH, Z	2/0	12.90	0.508	130.8	0.2027
	3/0	14.22	0.560	158.9	0.2463
	4/0	15.70	0.618	193.5	0.3000
ZF, ZFF	18	1.930	0.076	2.903	0.0045
	16	2.235	0.088	3.935	0.0061
Z, ZF, ZFF	14	2.616	0.103	5.355	0.0083
Z	12	3.099	0.122	7.548	0.0117
	10	3.962	0.156	12.32	0.0191
	8	4.978	0.196	19.48	0.0302
	6	5.944	0.234	27.74	0.0430
	4	7.163	0.282	40.32	0.0625
	3	8.382	0.330	55.16	0.0855
	2	9.195	0.362	66.39	0.1029
	1	10.21	0.402	81.87	0.1269

Table 5. (Continued)

Type: KF-1, KF-2, KFF-1, KFF-2, XHH, XHHW, XHHW-2, ZW

Type	Size (AWG or kcmil)	Approximate Diameter		Approximate Area	
		mm	(in.)	mm^2	($in.^2$)
XHHW, ZW,	14	3.378	0.133	8.968	0.0139
XHHW-2,	12	3.861	0.152	11.68	0.0181
XHH	10	4.470	0.176	15.68	0.0243
	8	5.994	0.236	28.19	0.0437
	6	6.960	0.274	38.06	0.0590
	4	8.179	0.322	52.52	0.0814
	3	8.890	0.350	62.06	0.0962
	2	9.703	0.382	73.94	0.1146
XHHW,	1	11.23	0.442	98.97	0.1534
XHHW-2,	1/0	12.24	0.482	117.7	0.1825
XHH	2/0	13.41	0.528	141.3	0.2190
	3/0	14.73	0.58	170.5	0.2642
	4/0	16.21	0.638	206.3	0.3197
	250	17.91	0.705	251.9	0.3904
	300	19.30	0.76	292.6	0.4536
	350	20.60	0.811	333.3	0.5166
	400	21.79	0.858	373.0	0.5782
	500	23.95	0.943	450.6	0.6984
	600	26.75	1.053	561.9	0.8709
	700	28.55	1.124	640.2	0.9923
	750	29.41	1.158	679.5	1.0532
	800	30.23	1.190	717.5	1.1122
	900	31.85	1.254	796.8	1.2351
	1000	33.32	1.312	872.2	1.3519
	1250	37.57	1.479	1108	1.7180
	1500	40.69	1.602	1300	2.0157
	1750	43.59	1.716	1492	2.3127
	2000	46.28	1.822	1682	2.6073
KF-2,	18	1.600	0.063	2.000	0.0031
KFF-2	16	1.905	0.075	2.839	0.0044
	14	2.286	0.090	4.129	0.0064
	12	2.769	0.109	6.000	0.0093
	10	3.378	0.133	8.968	0.0139
KF-1,	18	1.448	0.057	1.677	0.0026
KFF-1	16	1.753	0.069	2.387	0.0037
	14	2.134	0.084	3.548	0.0055
	12	2.616	0.103	5.355	0.0083
	10	3.226	0.127	8.194	0.0127

* Types RHH, RHW, and RHW-2 without outer covering.

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. Industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1300)

6- 214 - (Chapter 9, Table 5): Accept
Note: The Technical Correlating Committee understands that Type AF and Type RH is deleted by the action on Proposals 6-202 and 6-215.
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 5 as follows:

Table 5. Dimensions* of Insulated Conductors and Fixture Wires

Type: AF, FFH-2, RFH-1, RFH-2, RH, RHH*, RHW*, RHW-2*, RHH, RHW, RHW-2, SF-1, SF-2, SFF-1, SFF-2, TF, TFF, THHW, THW, THW-2, TW, XF, XFF

Type	Size (AWG or kcmil)	Approximate Diameter (mm)	Approximate Diameter (In.)	Approximate Diameter (mm^2)	Approximate Area ($in.^2$)
RFH-2,	18	3.5	0.136	9	0.0145
FFH-2	16	3.8	0.148	11	0.0172
RH	14	4.1	0.163	13	0.0209
	12	4.6	0.182	17	0.0260
RHW-2, RHH,	14	4.9	0.193	19	0.0293
RHW	12	5.4	0.212	23	0.0353
RH, RHH,	10	6.0	0.236	28	0.0437
RHW,	8	8.3	0.326	54	0.0835
RHW-2	6	9.2	0.364	67	0.1041
	4	10.5	0.412	86	0.1333
	3	11.2	0.440	98	0.1521
	2	12.0	0.472	113	0.1750
	1	14.8	0.582	172	0.2660
	1/0	15.8	0.622	196	0.3039
	2/0	17.0	0.668	226	0.3505
	3/0	18.3	0.720	263	0.4072
	4/0	19.8	0.778	307	0.4754
	250	22.7	0.895	406	0.6291
	300	24.1	0.950	457	0.7088
	350	25.4	1.001	508	0.7870
	400	26.6	1.048	557	0.8626
	500	28.8	1.133	650	1.0082
	600	31.6	1.243	783	1.2135
	700	33.4	1.314	875	1.3561
	750	34.2	1.348	921	1.4272
	800	35.1	1.380	965	1.4957
	900	36.7	1.444	1057	1.6377
	1000	38.2	1.502	1143	1.7719
	1250	43.9	1.729	1515	2.3479
	1500	47.0	1.852	1738	2.6938
	1750	49.9	1.966	1959	3.0357
	2000	52.6	2.072	2175	3.3719
SF-2, SFF-2	18	3.1	0.121	7	0.0115
	16	3.4	0.133	9	0.0139
	14	3.8	0.148	11	0.0172
SF-1, SFF-1	18	2.3	0.091	4	0.0065
RFH-1, AF, XF, XFF	18	2.7	0.106	5	0.0080
AF, TF, TFF, XF, XFF	16	3.0	0.118	7	0.0109
AF, TW, XF, XFF	14	3.4	0.133	9	0.0139
TW	12	3.9	0.152	12	0.0181
	10	4.5	0.176	16	0.0243
	8	6.0	0.236	28	0.0437
RHH*, RHW*, RHW-2*, THHW, THW, THW-2	14	4.1	0.163	13	0.0209

*Types RHH, RHW, and RHW-2 without outer covering.

Table 5. Dimensions of Insulated Conductors and Fixture Wires (continued)

Type: AF, RHH*, RHW*, RHW-2*, THHN, THHW, THW, THW-2, TFN, TFFN, THWN, THWN-2, XF, XFF					
Type	Size (AWG or kcmil)	Approximate Diameter (mm)	Approximate Diameter In.	Approximate Diameter (mm^2)	Approximate Area ($in.^2$)
RHH*, RHW, RHW-2*	12	4.6	0.182	17	0.0260
THHW, THW, AF, XF, XFF	10	5.2	0.206	21	0.0333
RHH*, RHW*, RHW-2* THHW, THW, THW-2	8	6.8	0.266	36	0.0556
TW, THW,	6	7.7	0.304	47	0.0726
THHW	4	8.9	0.352	63	0.0973
THW-2	3	9.7	0.380	73	0.1134
RHH*	2	10.5	0.412	86	0.1333
RHW*	1	12.5	0.492	123	0.1901
RHW-2*	1/0	13.5	0.532	143	0.2223
	2/0	14.7	0.578	169	0.2624
	3/0	16.0	0.630	201	0.3117
	4/0	17.5	0.688	240	0.3718
	250	19.4	0.765	297	0.4596
	300	20.8	0.820	341	0.5281
	350	22.1	0.871	384	0.5958
	400	23.3	0.918	427	0.6619
	500	25.5	1.003	510	0.7901
	600	28.3	1.113	628	0.9729
	700	30.1	1.184	710	1.1010
	750	30.9	1.218	752	1.1652
	800	31.8	1.250	792	1.2272
	900	33.4	1.314	875	1.3561
	1000	34.8	1.372	954	1.4784
	1250	39.1	1.539	1200	1.8602
	1500	42.2	1.662	1400	2.1695
	1750	45.1	1.776	1598	2.4773
	2000	47.8	1.882	1795	2.7818
TFN	18	2.1	0.084	4	0.0055
TFFN	16	2.4	0.096	5	0.0072
THHN	14	2.8	0.111	6	0.0097
THWN	12	3.3	0.130	9	0.0133
THWN-2	10	4.2	0.164	14	0.0211
	8	5.5	0.216	24	0.0366
	6	6.5	0.254	33	0.0507
	4	8.2	0.324	53	0.0824
	3	8.9	0.352	63	0.0973
	2	9.8	0.384	75	0.1158
	1	11.3	0.446	101	0.1562
	1/0	12.3	0.486	120	0.1855
	2/0	13.5	0.532	143	0.2223
	3/0	14.8	0.584	173	0.2679
	4/0	16.3	0.642	209	0.3237
	250	18.1	0.711	256	0.3970
	300	19.5	0.766	297	0.4608

*Types RHH, RHW, and RHW-2 without outer covering.

Table 5. Dimensions of Insulated Conductors and Fixture Wires (continued)

Type: FEP, FEPB, PAF, PAFF, PF, PFA, PFAH, PFF, PGF, PGFF, PTF, PTFF, TFE, THHN, THWN, THWN-2, Z, ZF, ZFF					
Type	**Size (AWG or kcmil)**	**Approximate Diameter (mm)**	**Approximate Diameter (In.)**	**Approximate Diameter (mm^2)**	**Approximate Area ($in.^2$)**
THHN	350	20.8	0.817	338	0.5242
THWN	400	21.9	0.864	378	0.5863
THWN-2	500	24.1	0.949	456	0.7073
	600	26.7	1.051	560	0.8676
	700	28.5	1.122	638	0.9887
	750	29.4	1.156	677	1.0496
	800	30.2	1.188	715	1.1085
	900	31.8	1.252	794	1.2311
	1000	33.3	1.310	870	1.3478
PF, PGFF, PGF, PFF,	18	2.2	0.086	4	0.0058
PTF, PAF, PTFF, PAFF	16	2.5	0.098	5	0.0075
PF, PGFF, PGF, PFF, PTF, PAF, PTFF, PAFF, TFE, FEP, PFA, FEPB, PFAH	14	2.9	0.113	6	0.0100
TFE, FEP,	12	3.4	0.132	9	0.0137
PFA, FEPB,	10	4.0	0.156	12	0.0191
PFAH	8	5.2	0.206	21	0.0333
	6	6.2	0.244	30	0.0468
	4	7.4	0.292	43	0.0670
	3	8.1	0.320	51	0.0804
	2	8.9	0.352	63	0.0973
TFE, PFAH	1	10.7	0.422	90	0.1399
TFE,	1/0	11.7	0.462	108	0.1676
PFA,	2/0	12.9	0.508	130	0.2027
PFAH, Z	3/0	14.2	0.560	158	0.2463
	4/0	15.7	0.618	194	0.3000
ZF, ZFF	18	1.9	0.076	3	0.0045
	16	2.2	0.088	4	0.0061
Z, ZF, ZFF	14	2.6	0.103	5	0.0083
Z	12	3.1	0.122	7	0.0117
	10	4.0	0.156	12	0.0191
	8	5	0.196	19	0.0302
	6	5.9	0.234	2	0.0430
	4	7.2	0.282	40	0.0625
	3	8.4	0.330	55	0.0855
	2	9.2	0.362	66	0.1029
	1	10.2	0.402	82	0.1269

Table 5. Dimensions of Insulated Conductors and Fixture Wires (continued)

Type: KF-1, KF-2, KFF-1, KFF-2, XHH, XHHW, XHHW-2, ZW

Type	Size (AWG or kcmil)	Approximate Diameter (mm)	Approximate Diameter (In.)	Approximate Diameter (mm^2)	Approx. Area ($in.^2$)
XHHW, ZW,	14	3.4	0.133	9	0.0139
XHHW-2,	12	3.9	0.152	12	0.0181
XHH	10	4.5	0.176	15.7	0.0243
	8	6.0	0.236	28.2	0.0437
	6	7.0	0.274	38.1	0.0590
	4	8.2	0.322	52.5	0.0814
	3	8.9	0.350	62	0.0962
	2	9.7	0.382	74	0.1146
XHHW,	1	11.2	0.442	99	0.1534
XHHW-2,	1/0	12.2	0.482	118	0.1825
XHH	2/0	13.4	0.528	141	0.2190
	3/0	14.7	0.580	170	0.2642
	4/0	16.2	0.638	206	0.3197
	250	17.9	0.705	252	0.3904
	300	19.3	0.760	292	0.4536
	350	20.6	0.811	333	0.5166
	400	21.8	0.858	373	0.5782
	500	24.0	0.943	451	0.6984
	600	26.7	1.053	562	0.8709
	700	28.5	1.124	640	0.9923
	750	29.4	1.158	679	1.0532
	800	30.2	1.190	717	1.1122
	900	31.9	1.254	796	1.2351
	1000	33.3	1.312	872	1.3519
	1250	37.6	1.479	1108	1.7180
	1500	40.7	1.602	1300	2.0157
	1750	43.6	1.716	1492	2.3127
	2000	46.29	1.822	1682	2.6073
KF-2,	18	1.60	0.063	2.0	0.0031
KFF-2	16	1.90	0.075	2.8	0.0044
	14	2.28	0.090	4	0.0064
	12	2.76	0.109	6	0.0093
	10	3.37	0.133	9	0.0139
KF-1,	18	1.44	0.057	2	0.0026
KFF-1	16	1.75	0.069	2	0.0037
	14	2.13	0.084	3	0.0055
	12	2.61	0.103	5	0.0083
	10	3.23	0.127	8	0.0127

SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3105)

6- 215 - (Chapter 9, Table 5): Accept
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the table heading and from two locations in the first column.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #123)

8- 458 - (Chapter 9 Table 5): Reject
NOTE: The following proposal consists of Comment 6-89 on Proposal 6-47 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-47 was:
Change thickness of insulation for No. 14-10 AWG sizes of Type THHW and THW products from 45 Mils to 30 Mils.
Note: The Technical Correlating Committee will form a Task Group between Panels 6 and 8 to correlate this Proposal with 6-212.
SUBMITTER: Ravindra H. Ganatra, Alcan Cable / Rep. Self
RECOMMENDATION: Panel should continue to accept this proposal. However, following changes need to be made to support this change.
Make following changes in Table 5. Dimensions of Insulated Conductors and Fixture Wires of Chapter 9: (Note: Required additions are highlighted by an underline and required deletions are shown by strikeout.)
1. In row listing product types "AF, TW, XF, XFF" for # 14 AWG to "AF, TW, XF, XFF, <u>THHW, THW, THW-2".</u>
2. In row listing product type "TW" for # 12, 10, and 8 AWG to "TW, <u>THHW, THW, THW-2".</u>
3. In row listing product types "RHH*, RHW*, RHW-2*, THHW, THW, THW-2 " for # 14 AWG to "RHH*, RHW*, RHW-2*<u>, ~~THHW, THW, THW-2".~~</u>
4. In row listing product types "RHH*, RHW*, RHW-2*, THHW, THW, THW-2 " for # 12, 10, and 8 AWG to "RHH*, RHW*, RHW-2*<u>, ~~THHW, THW, THW-2".~~</u>
Make following changes in the Tables of Appendix C:
1. In Tables C1, C2,...C12, change row titled "TW" for # 14, 12, 10, and 8 AWG to "TW, <u>THHW, THW, THW-2".</u>

2. In Tables C1, C2,...C12, change row titled "RHH*, RHW*, RHW-2*, THHW, THW, THW-2 " for # 14 AWG to "RHH*, RHW*, RHW-2*, THHW, THW, THW-2".

3. In Tables C1, C2,...C12, change row titled "RHH*, RHW*, RHW-2*, THHW, THW" for # 12 and 10 AWG to "RHH*, RHW*, RHW-2*, THHW, THW".

4. In Tables C1, C2,...C12, change row titled "RHH*, RHW*, RHW-2*, THHW, THW, THW-2 " for # 8 AWG to "RHH*, RHW*, RHW-2*, THHW, THW, THW-2".

5. In Tables C1A, C2A,.....C12A, change the first row for # 8 AWG as follows: (Note: This values are obtained for # 8 AWG TW in Tables C1, C2,....C12, respectively.)

In Table C1A: 2 5 8 13 18 30 53 81 105 135
In Table C2A: 1 4 7 13 17 29
In Table C3A: 3 5 7 11 17 30 45 64 88 115
In Table C4A: 3 5 8 15 20 33 47 72 97 124
In Table C5A: 1 3 5 8 14 18 29
In Table C6A: 1 3 5 8 13 18 30
In Table C7A: 3 5 8 14 18 29 44 68 89 116
In Table C8A: 3 5 8 14 19 31 44 68 91 118 185 267
In Table C9A: 1 3 6 11 15 26 37 59 79 103 163 234
In Table C10A: 2 4 7 13 18 30 43 66 89 115 181 261
In Table C11A: 3 6 10 16 21 33 50 75 98 125
In Table C12A: 35 79 104 132 203 288

SUBSTANTIATION: Acceptance of Proposal 6-47 requires that these changes be made in the Code.
PANEL ACTION: Reject.
PANEL STATEMENT: CMP 8 does not have jurisdiction of Table 5 and therefore no action has been taken on the recommendation to change Table 5. The panel cannot accept the recommendation to revise the tables in Appendix C to increase the wire fills. By reducing the required insulation thickness for these wire types without changing the designation, there exists a possibility that installers may unknowingly permit the greater wire fill numbers using wire with the heavier insulation thickness. This would result in exceeding the permitted wire fills for the raceway per Chapter 9, Table 1. The panel refers this action to CMP-6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #1255)

6- 216 - (Chapter 9, Table 5A): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 5A of Chapter 9 as shown to add SI units:
(Table shown on following page)
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
A "soft" conversion is necessary to conform to U.S. Industry practice and applicable product standards.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

Table 5A. Compact Aluminum Building Wire Nominal Dimensions * and Areas

Size (AWG or kcmil)	Bare Conductor			Types THW and THHW				Type THHN				Type XHHW				Size (AWG or kcmil)
	Number of Strands	Diameter		Approximate Diameter		Approximate Area		Approximate Diameter		Approximate Area		Approximate Diameter		Approximate Area		
		mm	(in.)	mm	(in.)	mm^2	($in.^2$)	mm	(in.)	mm^2	($in.^2$)	mm	(in.)	mm^2	($in.^2$)	
8	7	3.404	0.134	6.477	0.255	32.90	0.0510	—	—	—	—	5.690	0.224	25.42	0.0394	8
6	7	4.293	0.169	7.366	0.290	42.58	0.0660	6.096	0.240	29.16	0.0452	6.604	0.260	34.19	0.0530	6
4	7	5.410	0.213	8.509	0.335	56.84	0.0881	7.747	0.305	47.10	0.0730	7.747	0.305	47.10	0.0730	4
2	7	6.807	0.268	9.906	0.390	77.03	0.1194	9.144	0.360	65.61	0.1017	9.144	0.360	65.61	0.1017	2
1	19	7.595	0.299	11.81	0.465	109.5	0.1698	10.54	0.415	87.23	0.1352	10.54	0.415	87.23	0.1352	1
1/0	19	8.534	0.336	12.70	0.500	126.6	0.1963	11.43	0.450	102.6	0.1590	11.43	0.450	102.6	0.1590	1/0
2/0	19	9.550	0.376	13.84	0.545	150.5	0.2332	12.57	0.495	124.1	0.1924	12.45	0.490	121.6	0.1885	2/0
3/0	19	10.74	0.423	14.99	0.590	176.3	0.2733	13.72	0.540	147.7	0.2290	13.72	0.540	147.7	0.2290	3/0
4/0	19	12.07	0.475	16.38	0.645	210.8	0.3267	15.11	0.595	179.4	0.2780	14.99	0.590	176.3	0.2733	4/0
250	37	13.21	0.520	18.42	0.725	266.3	0.4128	17.02	0.670	227.4	0.3525	16.76	0.660	220.7	0.3421	250
300	37	14.48	0.570	19.69	0.775	304.3	0.4717	18.29	0.720	262.6	0.4071	18.16	0.715	259.0	0.4015	300
350	37	15.65	0.616	20.83	0.820	340.7	0.5281	19.56	0.770	300.4	0.4656	19.30	0.760	292.6	0.4536	350
400	37	16.74	0.659	21.97	0.865	379.1	0.5876	20.70	0.815	336.5	0.5216	20.32	0.800	324.3	0.5026	400
500	37	18.69	0.736	23.88	0.940	447.7	0.6939	22.48	0.885	396.8	0.6151	22.35	0.880	392.4	0.6082	500
600	61	20.65	0.813	26.67	1.050	558.6	0.8659	25.02	0.985	491.6	0.7620	24.89	0.980	486.6	0.7542	600
700	61	22.28	0.877	28.19	1.110	624.3	0.9676	26.67	1.050	558.6	0.8659	26.67	1.050	558.6	0.8659	700
750	61	23.06	0.908	29.21	1.150	670.1	1.0386	27.31	1.075	585.5	0.9076	27.69	1.090	602.0	0.9331	750
1000	61	26.92	1.060	32.64	1.285	836.6	1.2968	31.88	1.255	798.1	1.2370	31.24	1.230	766.6	1.1882	1000

*** Dimensions are from industry sources.**

(Log #1301)

6- 217 - (Chapter 9, Table 5A): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 5A as follows.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis.

In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 6-216.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

SEE tables on the following (2 pages)

Table 5A. Compact Aluminum Building Wire Nominal Dimensions* and Areas

	Bare Conductor			Types THW and THHW				
Size AWG or kcmil	Number of Strands	Approximate Diameter (mm)	Approximate Diameter In.	Approximate Diameter (mm)	Approximate Diameter In.	Approximate Area (mm^2)	Approximate Area Sq. In	Size AWG or kcmil
8	7	3.4	0.134	6.5	0.255	33	0.0510	8
6	7	4.3	0.169	7.4	0.290	43	0.0660	6
4	7	5.4	0.213	8.5	0.335	57	0.0881	4
2	7	6.8	0.268	9.9	0.390	77	0.1194	2
1	19	7.6	0.299	11.8	0.465	110	0.1698	1
1/0	19	8.5	0.336	12.7	0.500	127	0.1963	1/0
2/0	19	9.6	0.376	13.8	0.545	150	0.2332	2/0
3/0	19	10.7	0.423	15.0	0.590	176	0.2733	3/0
4/0	19	12.1	0.475	16.4	0.645	211	0.3267	4/0
250	37	13.2	0.520	18.4	0.725	266	0.4128	250
300	37	14.5	0.570	19.7	0.775	304	0.4717	300
350	37	15.7	0.616	20.8	0.820	341	0.5281	350
400	37	16.7	0.659	22.0	0.865	379	0.5876	400
500	37	18.7	0.736	23.9	0.940	448	0.6939	500
600	61	20.7	0.813	26.7	1.050	559	0.8659	600
700	61	22.3	0.877	28.2	1.110	624	0.9676	700
750	61	23.1	0.908	29.2	1.150	670	1.0386	750
1000	61	26.9	1.060	32.6	1.285	837	1.2968	1000

*Dimensions are from industry sources.

Table 5A. Compact Aluminum Building Wire Nominal Dimensions* and Areas (continued)

	Bare Conductor			Type THHN				Type XHHW				
Size AWG or kcmil	Number of Strands	Approximate Diameter (mm)	Approximate Diameter In.	Approximate Diameter (mm)	Approximate Diameter In.	Approximate Area (mm^2)	Approximate Area ($in.^2$)	Approximate Diameter (mm)	Approximate. Diameter In.	Approximate Area (mm^2)	Approximate. Area ($in.^2$)	Size AWG or kcmil
8	7	3.4	0.134	—	—	—	—	5.7	0.224	25	0.0394	8
6	7	4.3	0.169	6.1	0.240	29	0.0452	6.6	0.260	34	0.0530	6
4	7	5.4	0.213	7.7	0.305	47	0.0730	7.7	0.305	47	0.0730	4
2	7	6.8	0.268	9.1	0.360	66	0.1017	9.1	0.360	66	0.1017	2
1	19	7.6	0.299	10.5	0.415	87	0.1352	10.5	0.415	87	0.1352	1
1/0	19	8.5	0.336	11.4	0.450	103	0.1590	11.4	0.450	103	0.1590	1/0
2/0	19	9.6	0.376	12.6	0.495	124	0.1924	12.4	0.490	122	0.1885	2/0
3/0	19	10.7	0.423	13.7	0.540	148	0.2290	13.7	0.540	148	0.2290	3/0
4/0	19	12.1	0.475	15.1	0.595	179	0.2780	15.0	0.590	176	0.2733	4/0
250	37	13.2	0.520	17.0	0.670	227	0.3525	16.8	0.660	221	0.3421	250
300	37	14.5	0.570	18.3	0.720	263	0.4071	18.2	0.715	259	0.4015	300
350	37	15.6	0.616	19.6	0.770	301	0.4656	19.3	0.760	293	0.4536	350
400	37	16.7	0.659	20.7	0.815	337	0.5216	20.3	0.800	324	0.5026	400
500	37	18.7	0.736	22.5	0.885	397	0.6151	22.4	0.880	392	0.6082	500
600	61	20.7	0.813	25.0	0.985	492	0.7620	24.9	0.980	487	0.7542	600
700	61	22.3	0.877	26.7	1.050	558	0.8659	26.7	1.050	559	0.8659	700
750	61	23.1	0.908	27.3	1.075	586	0.9076	27.7	1.090	602	0.9331	750
1000	61	26.9	1.060	31.9	1.255	798	1.2370	31.2	1.230	767	1.1882	1000

*Dimensions are from industry sources.

(Log #1256)

6- 218 - (Chapter 9, Table 8): Accept in Principle
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise Table 8 of Chapter 9 as shown:

See TABLE 8 on the following (2 pages)

Table 8. Conductor Properties

Size AWG / kcmil	Area		Conductors							DC Resistance at 75°C (167°F)					
			Stranding			Overall				Copper				Aluminum	
				Diameter		Diameter		Area		Uncoated		Coated			
	mm^2	Cir. Mills	Quantity	mm	in.	mm	in.	mm^2	in^2	ohm/km	ohm/kFT	ohm/km	ohm/kFT	ohm/km	ohm/kFT
18	0.823	1620	1	-	-	1.02	0.040	0.823	0.001	25.5	7.77	26.5	8.08	42.0	12.8
18	0.823	1620	7	0.39	0.015	1.16	0.046	1.06	0.002	26.1	7.95	27.7	8.45	42.8	13.1
16	1.31	2580	1	-	-	1.29	0.051	1.31	0.002	16.0	4.89	16.7	5.08	26.4	8.05
16	1.31	2580	7	0.49	0.019	1.46	0.058	1.68	0.003	16.4	4.99	17.3	5.29	26.9	8.21
14	2.08	4110	1	-	-	1.63	0.064	2.08	0.003	10.1	3.07	10.4	3.19	16.6	5.06
14	2.08	4110	7	0.62	0.024	1.85	0.073	2.68	0.004	10.3	3.14	10.7	3.26	16.9	5.17
12	3.31	6530	1	-	-	2.05	0.081	3.31	0.005	6.34	1.93	6.57	2.01	10.45	3.18
12	3.31	6530	7	0.78	0.030	2.32	0.092	4.25	0.006	6.50	1.98	6.73	2.05	10.69	3.25
10	5.261	10380	1	-	-	2.588	0.102	5.26	0.008	3.984	1.21	4.148	1.26	6.561	2.00
10	5.261	10380	7	0.98	0.038	2.95	0.116	6.76	0.011	4.070	1.24	4.226	1.29	6.679	2.04
8	8.367	16510	1	-	-	3.264	0.128	8.37	0.013	2.506	0.764	2.579	0.786	4.125	1.26
8	8.367	16510	7	1.23	0.049	3.71	0.146	10.76	0.017	2.551	0.778	2.653	0.809	4.204	1.28
6	13.30	26240	7	1.56	0.061	4.67	0.184	17.09	0.027	1.608	0.491	1.671	0.510	2.652	0.808
4	21.15	41740	7	1.96	0.077	5.89	0.232	27.19	0.042	1.010	0.308	1.053	0.321	1.666	0.508
3	26.67	52620	7	2.20	0.087	6.60	0.260	34.28	0.053	0.802	0.245	0.833	0.254	1.320	0.403
2	33.62	66360	7	2.47	0.097	7.42	0.292	43.23	0.067	0.634	0.194	0.661	0.201	1.045	0.319
1	42.41	83690	19	1.69	0.066	8.43	0.332	55.80	0.087	0.505	0.154	0.524	0.160	0.829	0.253
1/0	53.49	105600	19	1.89	0.074	9.45	0.372	70.41	0.109	0.399	0.122	0.415	0.127	0.660	0.201
2/0	67.43	133100	19	2.13	0.084	10.62	0.418	88.74	0.137	0.3170	0.0967	0.329	0.101	0.523	0.159
3/0	85.01	167800	19	2.39	0.094	11.94	0.470	111.9	0.173	0.2512	0.0766	0.2610	0.0797	0.413	0.126
4/0	107.2	211600	19	2.68	0.106	13.41	0.528	141.1	0.219	0.1996	0.0608	0.2050	0.0626	0.328	0.100

Table 8. Conductor Properties (continued)

Size AWG / kcmil	Area		Conductors						DC Resistance at 75°C (167°F)					
			Stranding			Overall			Copper				Aluminum	
									Uncoated		Coated			
	mm^2	Cir. Mills	Quantity	Diameter mm	Diameter in.	Diameter mm	Diameter in.	Area mm^2	Area in^2	ohm/km	ohm/kFT	ohm/km	ohm/kFT	ohm/km	ohm/kFT
250	-	127	37	2.09	0.082	14.61	0.575	168	0.260	0.1687	0.0515	0.1753	0.0535	0.2778	0.0847
300	-	152	37	2.29	0.090	16.00	0.630	201	0.312	0.1409	0.0429	0.1463	0.0446	0.2318	0.0707
350	-	177	37	2.47	0.097	17.30	0.681	235	0.364	0.1205	0.0367	0.1252	0.0382	0.1984	0.0605
400	-	203	37	2.64	0.104	18.49	0.728	268	0.416	0.1053	0.0321	0.1084	0.0331	0.1737	0.0529
500	-	253	37	2.95	0.116	20.65	0.813	336	0.519	0.0845	0.0258	0.0869	0.0265	0.1391	0.0424
600	-	304	61	2.52	0.099	22.68	0.893	404	0.626	0.0704	0.0214	0.0732	0.0223	0.1159	0.0353
700	-	355	61	2.72	0.107	24.49	0.964	471	0.730	0.0603	0.0184	0.0622	0.0189	0.0994	0.0303
750	-	380	61	2.82	0.111	25.35	0.998	505	0.782	0.0563	0.0171	0.0579	0.0176	0.0927	0.0282
800	-	405	61	2.91	0.114	26.16	1.030	538	0.834	0.0528	0.0161	0.0544	0.0166	0.0868	0.0265
900	-	456	61	3.09	0.122	27.79	1.094	606	0.940	0.0470	0.0143	0.0481	0.0147	0.0770	0.0235
1000	-	507	61	3.25	0.128	29.26	1.152	673	1.042	0.0423	0.0129	0.0434	0.0132	0.0695	0.0212
1250	-	633	91	2.98	0.117	32.74	1.289	842	1.305	0.0338	0.0103	0.0347	0.0106	0.0554	0.0169
1500	-	760	91	3.26	0.128	35.86	1.412	1011	1.566	0.02814	0.00858	0.02814	0.00883	0.0464	0.0141
1750	-	887	127	2.98	0.117	38.76	1.526	1180	1.829	0.02410	0.00735	0.02410	0.00756	0.0397	0.0121
2000	-	1010	127	3.19	0.126	41.45	1.632	1349	2.092	0.02109	0.00643	0.02109	0.00662	0.0348	0.0106

These resistance values are valid ONLY for the parameters as given. Using conductors having coated strands, different stranding type, and, especially, other temperatures changes the resistance.

Formula for temperature change: $R2 = R1 [1 + \alpha(T2 - 75)]$ where: $\alpha_{cu} = 0.00323$, $\alpha_{AL} = 0.00330$ at 75° C.

Conductors with compact and compressed stranding have about 9 percent and 3 percent, respectively, smaller bare conductor diameters than those shown. See Table 5A for actual compact cable dimensions.

The IACS conductivities used: bare copper = 100%, aluminum = 61%.

Class B stranding is listed as well as solid for some sizes. Its overall diameter and area is that of its circumscribing circle.

(FPN): The construction information is per NEMA WC8-1988 or ANSI/UL 1581-1998. The resistance is calculated per National Bureau of Standards Handbook 100, dated 1966, and Handbook 109, dated 1972.

These resistance values are valid ONLY for the parameters as given. Using conductors having coated strands, different stranding type, and, especially, other temperatures changes the resistance.

Formula for temperature change: $R2 = R1 [1 + \alpha(T2 - 75)]$ where: $\alpha_{cu} = 0.00323$, $\alpha_{AL} = 0.00330$ at 75° C.

Conductors with compact and compressed stranding have about 9 percent and 3 percent, respectively, smaller bare conductor diameters than those shown. See Table 5A for actual compact cable dimensions.

The IACS conductivities used: bare copper = 100%, aluminum = 61%.

Class B stranding is listed as well as solid for some sizes. Its overall diameter and area is that of its circumscribing circle.

(FPN): The construction information is per NEMA WC8-1988 or ANSI/UL 1581-1998. The resistance is calculated per National Bureau of Standards Handbook 100, dated 1966, and Handbook 109, dated 1972.

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

A "soft" conversion is necessary to conform to U.S. Industry practice and applicable product standards.

PANEL ACTION: Accept in Principle.

PANEL STATEMENT: The notes to the table must be numbered as in the existing code. In note 2 add "at 75 degree C" at the end of the sentence. In FPN add "or ANSI/UL 1581-1998" after "NEMA WC8-1988". The NEMA reference should be the 1992 edition not the 1988 edition.

In column title area change "Cir. Mills" to "Cir. Mils".

In the second page of the table, the numbers shown under "Cir. Mills" should be moved to be shown under "mm2".

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #1257)

6- 219 - (Chapter 9, Table 9): Accept

SUBMITTER: Technical Correlating Committee National Electrical Code

RECOMMENDATION: Revise Table 9 of Chapter 9 as shown to add SI units.

(Table shown on following pages)

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.

A "soft" conversion is necessary to conform to U.S. Industry practice and applicable product standards.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

(Log #3207)

16- 371 - (Chapter 9, Tables 11(a) and (b)): Reject

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: Delete the "Over 30 and through 150" columns in Tables 11(a) and Table 11(b).

SUBSTANTIATION: Chapter 9, Tables 11(a) and (b) each have a column which permits Class 2 power supplies to have an output of 150 VDC, .005 Amps, max. This requirement was put in the NEC in 1968, based on a proposal from GT&E Corporation, NY, NY. The 1968 edition of the NEC provided the voltage, current, and VA requirements, but did not require the Class 2 source to be listed. The present edition of the NEC requires Class 2 sources to be listed. UL has not listed power supplies to meet the voltage and current range permitted by the "Over 30 and through 150" column in Chapter 9, Tables 11(a) and 11(b).

PANEL ACTION: Reject.

PANEL STATEMENT: No substantiation was submitted to show that these voltages pose either shock or fire hazards. These columns should remain to provide guidance for the listing of these supplies.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 22

VOTE ON PANEL ACTION:

AFFIRMATIVE: 22

(Log #3212)

16- 372 - (Chapter 9, Table 12(b)): Reject

SUBMITTER: S. E. Egesdal, Honeywell Inc.

RECOMMENDATION: Delete the "Over 100 and through 250" column in Chapter 9, Table 12(b).

SUBSTANTIATION: This voltage range and low current requirement was put in the NEC to accommodate a smoke detector that required a supply voltage of over 200 volts. These smoke detectors have not been sold for over 20 years. There is no reason to retain this special exception to the voltage ranges permitted by Table 12.

PANEL ACTION: Reject.

PANEL STATEMENT: The products using these voltages are still in use and the information should be retained.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 21

VOTE ON PANEL ACTION:

AFFIRMATIVE: 20

NEGATIVE: 1

EXPLANATION OF NEGATIVE:

MOORE: The provisions of the NEC are not retroactive. The panel statement that "The products using these voltages are still in use and the information should be retained", is not correct. Nothing in the NEC would prevent the continued use of products already in service. However since there are no products currently manufactured that need this Exception, retention of the Exception serves no useful purpose.

Table 9. Alternating-Current Resistance and Reactance for 600-Volt Cables, 3-Phase, 60 Hz, 75°C (167°F) — Three Single Conductors in Conduit

Size (AWG or kcmil)	Ohms to Neutral per kilometer Ohms to Neutral per 1000 feet XL (Reactance) for All Wires		Alternating-Current Resistance for Uncoated Copper Wires			Alternating-Current Resistance for Aluminum Wires			Effective Z at 0.85 PF for Uncoated Copper Wires			Effective Z at 0.85 PF for Aluminum Wires			Size (AWG or kcmil)
	PVC, Aluminum Conduits	Steel Conduit	PVC Conduit	Aluminum Conduit	Steel Conduit	PVC Conduit	Aluminum Conduit	Steel Conduit	PVC Conduit	Aluminum Conduit	Steel Conduit	PVC Conduit	Aluminum Conduit	Steel Conduit	
14	0.190	0.240	10.2	10.2	10.2	—	—	—	8.9	8.9	8.9	—	—	—	14
	0.058	0.073	3.1	3.1	3.1	—	—	—	2.7	2.7	2.7	—	—	—	
12	0.177	0.223	6.6	6.6	6.6	10.5	10.5	10.5	5.6	5.6	5.6	9.2	9.2	9.2	12
	0.054	0.068	2.0	2.0	2.0	3.2	3.2	3.2	1.7	1.7	1.7	2.8	2.8	2.8	
10	0.164	0.207	3.9	3.9	3.9	6.6	6.6	6.6	3.6	3.6	3.6	5.9	5.9	5.9	10
	0.050	0.063	1.2	1.2	1.2	2.0	2.0	2.0	1.1	1.1	1.1	1.8	1.8	1.8	
8	0.171	0.213	2.56	2.56	2.56	4.3	4.3	4.3	2.26	2.26	2.30	3.6	3.6	3.6	8
	0.052	0.065	0.78	0.78	0.78	1.3	1.3	1.3	0.69	0.69	0.70	1.1	1.1	1.1	
6	0.167	0.210	1.61	1.61	1.61	2.66	2.66	2.66	1.44	1.48	1.48	2.33	2.36	2.36	6
	0.051	0.064	0.49	0.49	0.49	0.81	0.81	0.81	0.44	0.45	0.45	0.71	0.72	0.72	
4	0.157	0.197	1.02	1.02	1.02	1.67	1.67	1.67	0.95	0.95	0.98	1.51	1.51	1.51	4
	0.048	0.060	0.31	0.31	0.31	0.51	0.51	0.51	0.29	0.29	0.30	0.46	0.46	0.46	
3	0.154	0.194	0.82	0.82	0.82	1.31	1.35	1.31	0.75	0.79	0.79	1.21	1.21	1.21	3
	0.047	0.059	0.25	0.25	0.25	0.40	0.41	0.40	0.23	0.24	0.24	0.37	0.37	0.37	
2	0.148	0.187	0.62	0.66	0.66	1.05	1.05	1.05	0.62	0.62	0.66	0.98	0.98	0.98	2
	0.045	0.057	0.19	0.20	0.20	0.32	0.32	0.32	0.19	0.19	0.20	0.30	0.30	0.30	
1	0.151	0.187	0.49	0.52	0.52	0.82	0.85	0.82	0.52	0.52	0.52	0.79	0.79	0.82	1
	0.046	0.057	0.15	0.16	0.16	0.25	0.26	0.25	0.16	0.16	0.16	0.24	0.24	0.25	
1/0	0.144	0.180	0.39	0.43	0.39	0.66	0.69	0.66	0.43	0.43	0.43	0.62	0.66	0.66	1/0
	0.044	0.055	0.12	0.13	0.12	0.20	0.21	0.20	0.13	0.13	0.13	0.19	0.20	0.20	
2/0	0.141	0.177	0.33	0.33	0.33	0.52	0.52	0.52	0.36	0.36	0.36	0.52	0.52	0.52	2/0
	0.043	0.054	0.10	0.10	0.10	0.16	0.16	0.16	0.11	0.11	0.11	0.16	0.16	0.16	
3/0	0.138	0.171	0.253	0.269	0.259	0.43	0.43	0.43	0.289	0.302	0.308	0.43	0.43	0.46	3/0
	0.042	0.052	0.077	0.082	0.079	0.13	0.13	0.13	0.088	0.092	0.094	0.13	0.13	0.14	
4/0	0.135	0.167	0.203	0.220	0.207	0.33	0.36	0.33	0.243	0.256	0.262	0.36	0.36	0.36	4/0
	0.041	0.051	0.062	0.067	0.063	0.10	0.11	0.10	0.074	0.078	0.080	0.11	0.11	0.11	
250	0.135	0.171	0.171	0.187	0.177	0.279	0.295	0.282	0.217	0.230	0.240	0.308	0.322	0.33	250
	0.041	0.052	0.052	0.057	0.054	0.085	0.090	0.086	0.066	0.070	0.073	0.094	0.098	0.10	
300	0.135	0.167	0.144	0.161	0.148	0.233	0.249	0.236	0.194	0.207	0.213	0.269	0.282	0.289	300
	0.041	0.051	0.044	0.049	0.045	0.071	0.076	0.072	0.059	0.063	0.065	0.082	0.086	0.088	
350	0.131	0.164	0.125	0.141	0.128	0.200	0.217	0.207	0.174	0.190	0.197	0.240	0.253	0.262	350
	0.040	0.050	0.038	0.043	0.039	0.061	0.066	0.063	0.053	0.058	0.060	0.073	0.077	0.080	
400	0.131	0.161	0.108	0.125	0.115	0.177	0.194	0.180	0.161	0.174	0.184	0.217	0.233	0.240	400
	0.040	0.049	0.033	0.038	0.035	0.054	0.059	0.055	0.049	0.053	0.056	0.066	0.071	0.073	

Table 9. (Continued)

Size (AWG or kcmil)	Ohms to Neutral per kilometer Ohms to Neutral per 1000 feet														Size (AWG or kcmil)
	XL (Reactance) for All Wires		Alternating-Current Resistance for Uncoated Copper Wires			Alternating-Current Resistance for Aluminum Wires			Effective Z at 0.85 PF for Uncoated Copper Wires			Effective Z at 0.85 PF for Aluminum Wires			
	PVC, Aluminum Conduits	Steel Conduit	PVC Conduit	Aluminum Conduit	Steel Conduit	PVC Conduit	Aluminum Conduit	Steel Conduit	PVC Conduit	Aluminum Conduit	Steel Conduit	PVC Conduit	Aluminum Conduit	Steel Conduit	
500	0.128	0.157	0.089	0.105	0.095	0.141	0.157	0.148	0.141	0.157	0.164	0.187	0.200	0.210	500
	0.039	0.048	0.027	0.032	0.029	0.043	0.048	0.045	0.043	0.048	0.050	0.057	0.061	0.064	
600	0.128	0.157	0.075	0.092	0.082	0.118	0.135	0.125	0.131	0.144	0.154	0.167	0.180	0.190	600
	0.039	0.048	0.023	0.028	0.025	0.036	0.041	0.038	0.040	0.044	0.047	0.051	0.055	0.058	
750	0.125	0.157	0.062	0.079	0.069	0.095	0.112	0.102	0.118	0.131	0.141	0.148	0.161	0.171	750
	0.038	0.048	0.019	0.024	0.021	0.029	0.034	0.031	0.036	0.040	0.043	0.045	0.049	0.052	
1000	0.121	0.151	0.049	0.062	0.059	0.075	0.089	0.082	0.105	0.118	0.131	0.128	0.138	0.151	1000
	0.037	0.046	0.015	0.019	0.018	0.023	0.027	0.025	0.032	0.036	0.040	0.039	0.042	0.046	

Notes:

1. These values are based on the following constants: UL-type RHH wires with Class B stranding, in cradled configuration. Wire conductivities are 100 percent IACS copper and 61 percent IACS aluminum, and aluminum conduit is 45 percent IACS. Capacitive reactance is ignored, since it is negligible at these voltages.
These resistance values are valid only at 75°C (167°F) and for the parameters as given, but are representative for 600-volt wire types operating at 60 Hz.

2. Effective Z is defined as R cos(q) + X sin(q), where q is the power factor angle of the circuit. Multiplying current by effective impedance gives a good approximation for line-to-neutral voltage drop. Effective impedance values shown in this table are valid only at 0.85 power factor.

For another circuit power factor (PF), effective impedance (Ze) can be calculated from R and XL values given in this table as follows:

Ze = R x PF + XL sin[arccos(PF)].

APPENDIX A

(Log #3290)

1- 315 - (Annex A): Accept
SUBMITTER: James T. Pauley, Square D Co.
RECOMMENDATION: Add a new Annex A to read as follows:
Annex A (informative) - Product Safety Standards
This informative annex is intended to provide a list of product safety standards that are utilized for product listing where that listing is required by this Code. It is recognized that this list is current at the time of development, but new standards or modifications to existing standards can occur at any time while this Code is adopted.
This list does not form a mandatory part of the requirements of this Code, but is intended to only provide Code users some informational guidance on the product characteristics on which Code requirements have been based.

Product Standard Name	Product Standard Number
Antenna-Discharge Units	UL 452
Armored Cable	UL 4
Attachment Plugs and Receptacles	UL 498
Audio / Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use	UL 6500
Audio-Video Products and Accessories	UL 1492
Busways and Associated Fittings	UL 857
Cables - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables	UL 493
Cables - Thermoplastic-Insulated Wires and Cables	UL 83
Cables - Thermoset-Insulated Wires and Cables	UL 44
Cables for Non-Power-Limited Fire-Alarm Circui ts	UL 1425
Cables for Power-Limited Fire-Alarm Circuits	UL 1424
Cellular Metal Floor Raceways and Fittings	UL 209
Class 2 Power Units	UL 1310
Commercial Audio Equipment	UL 813
Communication Circuit Accessories	UL 1863
Communications Cables	UL 444
Community-Antenna Television Cables	UL 1655
Conduit - Type EB and A Rigid PVC Conduit and HDPE Conduit	UL 651A
Continuous Length High Density Polyethylene Conduit	UL 651B
Control Centers for Changing Message Type Electric Signs	UL 1433
Cord Sets and Power-Supply Cords	UL 817
Data-Processing Cable	UL 1690
Dead-Front Switchboards	UL 891
Electric Signs	UL 48
Electric Spas, Equipment Assemblies, and Associated Equipment	UL 1563
Electric Water Heaters for Pools and Tubs	UL 1261
Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations	UL 2279
Electrical Metallic Tubing	UL 797
Electrical Nonmetallic Tubing	UL 1653
Electric-Battery-Powered Industrial Trucks	UL 583
Electrode Receptacles for Gas-Tube Signs	UL 879
Enclosed and Dead-Front Switches	UL 98
Enclosures for Electrical Equipment	UL 50
Energy Management Equipment	UL 916
Fire Pump Controllers	UL 218
Fittings for Cable and Conduit	UL 514B
Flexible Cord and Fixture Wire	UL 62
Flexible Metal Conduit	UL 1
Fluorescent Lighting Fixtures	UL 1570
Fluorescent-Lamp Ballasts	UL 935
Gas-Tube-Sign and Ignition Cable	UL 814
General-Use Snap Switches	UL 20
Ground-Fault Circuit-Interrupters	UL 943
Ground-Fault Sensing and Relaying Equipment	UL 1053
Grounding and Bonding Equipment	UL 467
High Intensity Discharge Lighting Fixtures	UL 1572
High-Intensity-Discharge Lamp Ballasts	UL 1029
Incandescent Lighting Fixtures	UL 1571
Industrial Battery Chargers	UL 1564
Industrial Control Equipment	UL 508
Instrumentation Tray Cable	UL 2250
Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations	UL 486D
Intermediate Metal Conduit	UL 1242
Isolated Power Systems Equipment	UL 1047
Junction Boxes for Swimming Pool Lighting Fixtures	UL 1241
Liquid-Tight Flexible Nonmetallic Conduit	UL 1660
Liquid-Tight Flexible Steel Conduit	UL 360
Low Voltage Landscape Lighting Systems	UL 1838
Low-Voltage Fuses - Part 1: General Requirements	UL 248-1
Low-Voltage Fuses - Part 10: Class L Fuses	UL 249-10
Low-Voltage Fuses - Part 11: Plug Fuses	UL 248-11
Low-Voltage Fuses - Part 12: Class R Fuses	UL 248-12
Low-Voltage Fuses - Part 15: Class T Fuses	UL 248-15
Low-Voltage Fuses - Part 2: Class C Fuses	UL 248-2
Low-Voltage Fuses - Part 3: Class CA and CB Fuses	UL 248-3
Low-Voltage Fuses - Part 4: Class CC Fuses	UL 248-4
Low-Voltage Fuses - Part 5: Class G Fuses	UL 248-5
Low-Voltage Fuses - Part 6: Class H Non-Renewable Fuses	UL 248-6
Low-Voltage Fuses - Part 7: Class H Renewable Fuses	UL 248-7
Low-Voltage Fuses - Part 8: Class J Fuses	UL 248-8
Low-Voltage Fuses - Part 9: Class K Fuses	UL 248-9
Machine-Tool Wires and Cables	UL 1063
Manufactured Wiring Systems	UL 183
Medical and Dental Equipment	UL 544
Medium-Voltage Power Cables	UL 1072
Metal-Clad Cables	UL 1569
Metal-Clad Cables and Cable-Sealing Fittings for Use in Hazardous (Classified) Locations	UL 2225
Metallic Outlet Boxes	UL 514A
Mobile Home Pipe Heating Cable	UL 1462

Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures	UL 489
Molded-Case Switches	UL 1087
Neon Transformers and Power Supplies	UL 2161
Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers	UL 514C
Nonmetallic Surface Raceways and Fittings	UL 5A
Nonmetallic Underground Conduit with Conductors	UL 1990
Office Furnishings	UL 1286
Optical Fiber Cable	UL 1651
Optical Fiber Cable Raceway	UL 2024
Panelboards	UL 67
Personal Protection Systems for Electric Vehicle Supply Circuits: General Requirements	UL 2231-1
Personal Protection Systems for Electric Vehicle Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems	UL 2231-2
Portable Electric Lamps	UL 153
Potting Compounds for Swimming Pool, Fountain, and Spa Equipment	UL 676A
Power Outlets	UL 231
Power Units Other Than Class 2	UL 1012
Power-Limited Circuit Cables	UL 13
Professional Video and Audio Equipment	UL 1419
Protectors for Coaxial Communications Circuits	UL 497C
Protectors for Data Communication and Fire Alarm Circuits	UL 497B
Protectors for Paired Conductor Communications Circuits	UL 497
Radio Receivers, Audio Systems, and Accessories	UL 1270
Reference Standard for Electrical Wires, Cables, and Flexible Cords	UL 1581
Reinforced Thermosetting Resin Conduit (RTRC) and Fittings	UL 1684
Residential Pipe Heating Cable	UL 2049
Rigid Metal Conduit	UL 6
Roof and Gutter De-Icing Cable Units	UL 1588
Safety of Information Technology Equipment, Including Electrical Business Equipment	UL 1950
Schedule 40 and 80 Rigid PVC Conduit	UL 651
Secondary Protectors for Communications Circuits	UL 497A
Service-Entrance Cables	UL 854
Smoke Detectors for Fire Protective Signaling Systems	UL 268
Specialty Transformers	UL 506
Splicing Wire Connectors	UL 486C
Static Inverters and Charge Controllers for use in Photovoltaic Power Systems	UL 1741
Strut-Type Channel Raceways and Fittings	UL 5B
Surface Metal Raceways and Fittings	UL 5
Surface Raceways and Fittings for Use with Data, Signal and Control Circuits	UL 5C
Surge Arresters - Gapped Silicon-Carbide Surge Arresters for AC Power Circuits	IEEE C62.1
Surge Arresters - Metal-Oxide Surge Arresters for AC Power Circuits	IEEE C62.11
Swimming Pool Pumps, Filters, and Chlorinators	UL 1081
Telephone Equipment	UL 1459
Transfer Switch Equipment	UL 1008
Underfloor Raceways and Fittings	UL 884
Underwater Lighting Fixtures	UL 676
Vacuum Cleaners, Blower Cleaners, and Household Floor Finishing Machines	UL 1017
Wire Connectors and Soldering Lugs for Use with Copper Conductors	UL 486A
Wire Connectors for Use with Aluminum Conductors	UL 486B
Wireways, Auxiliary Gutters, and Associated Fittings	UL 870

SUBSTANTIATION: The relationship between the Code and the product standards is well known to the participants of the code process. Requirements in product standards are continually used as justification for specific code requirements and the code-making panels rely, in many cases, on the fact that products will be designed and manufactured to those standards in order to allow application of a specific code rule.

However, in a global environment, we can no longer afford to assume that everyone is aware of the importance of the connection of the standards to the code. This proposal serves to more directly indicate that interdependence through an informative annex.

The proposed list for the Annex was developed by reviewing all of the present requirements for product listing in the NEC. In each of these cases, the appropriate product standard was identified and added to the list. It is not the objective to indicate the specific standards reference by Section of the Code, but to simply have a list of standards that indeed include the appropriate standard for that particular section. The proposed list is in alphabetical order by product.

It is recognized that there are products covered by a standard that is not on the list. It is intentional to limit the list at this time to only those products that are affected by a listing requirement in the NEC. The list could indeed expand in future NEC editions to include products covered by a standard where listing is not explicitly indicated.

This proposal is critical to maintaining the consistency in our US Electrical Safety System. Everyone involved in the process realizes that the code cannot be properly applied without having products that are designed to standards compatible with those code requirements. See the attached paper on the US Electrical Safety System which discusses this interrelationship.

Note: Supporting Material is available for review at NFPA headquarters.

PANEL ACTION: Accept.

NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 13

VOTE ON PANEL ACTION:

AFFIRMATIVE: 11

NEGATIVE: 1

NOT RETURNED: 1 Macias

EXPLANATION OF NEGATIVE:

PRICHARD: The proposal to include Annex A was originally submitted to Panel 6 whose panel action was to reject the inclusion of the Annex. Panel 1 did not have the opportunity to discuss or review the contents of the Annex. It is not a complete list of product standards.

COMMENT ON AFFIRMATIVE:

FISKE: We are voting affirmatively on the subject proposal, and wish to register the following comments.

Proposed Informative Annex A is extensive, and clearly required considerable effort on the submitter's part; however, it is incomplete. There are many electrical product safety standards to which the NEC refers, in Fine Print Notes, that are not included in the proposal. If the NEC is to include such an informative annex - as we believe it should - it should include the expressed standards as well as the implied ones. We have taken the liberty of compiling the electrical product safety standards named in the 1999 NEC Fine Print Notes. The list follows.

ANSI A17.5	Elevator and Escalator Electrical Equipment
ANSI B30	Overhead and Gantry Cranes
ANSI/IEEE C37.23	Guide for Metal-Enclosed Bus and Calculating Losses inIsolated-Phase Bus
ANSI/IEEE C57.12.00	Liquid-Immersed Distribution, Power, and Regulating Transformers
ANSI/ISA S12.12	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
ANSI/ISA S12.23.01	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Encapsulation “m”
ANSI/ISA S12.24.01	Recommended Practice for Classification of Locations for Electrical Installations Classified as Class I, Zone 0, Zone 1, or Zone 2
ANSI/NEMA 250	Enclosures for Electrical Equipment (100 Volts Maximum)
ANSI/NFPA 79	Electrical Standard for Industrial Machinery
ANSI/NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment
ANSI/SAE J1284	Blade Type Electric Fuses
ANSI/SAE J554	Electric Fuses (Cartridge Type)
ANSI/UL 1581	Electrical Wires, Cables, and Flexible Cords
ANSI/UL 1666	Flame Propagation Height of Electrical and Optical-Fiber CableInstalled Vertically in Shafts
ANSI/UL 275	Automotive Glass-Tube Fuses
IEC 60079-1	Electrical Apparatus for Explosive Gas Atmospheres Part 1: Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus
IEC 60079-6	Electrical Apparatus for Explosive Gas Atmospheres - Part 6: Oil-Immersion “o”
IEC 60079-7	Electrical Apparatus for Explosive Gas Atmospheres - Part 7: Increased Safety “E”
IEC 60079-11	Electrical Apparatus for Explosive Gas Atmospheres Part 11: Intrinsic Safety “i”
IEC 60079-15	Electrical Apparatus for Explosive Gas Atmospheres Part 15: Electrical Apparatus with Type of Protection “N”
IEC 60079-18	Electrical Apparatus for Explosive Gas Atmospheres Part 18: Encapsulation “m”
IEEE C57.12.01	Dry-Type Distribution and Power Transformers Including Those With Solid-Cast and/or Resin-Encapsulated Windings
ISA 12.0.01	Electrical Apparatus for Use in Class I, Zones 0 & 1 Hazardous (Classified) Locations: General Requirements
ISA S12.16.01	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Increased Safety “e”
ISA S12.22.01	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Flameproof “d”
ISA S12.25.01	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations: Type of Protection - Powder Filling “q”
ISA S12.26.01	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Oil-Immersion “O”
NFPA 262	Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
SAE J1127	Battery Cable
SAE J1128	Low Tension Primary Cable
UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
UL 2200	Stationary Engine Generator Assemblies

Standards that are identified in Fine Print Notes should be identified as American National Standards, where applicable. This would indicate that it is intended for standards' references to include ANSI designations, as indicated in 2-6.2 of NFPA Manual of Style. According to the information available to us, the following standards from proposed annex A are American National Standards.

UL 452	Antenna-Discharge Units
UL 4	Armored Cable
UL 498	Attachment Plugs and Receptacles
UL 6500	Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use
UL 857	Busways and Associated Fittings
UL 493	Cables - Thermoplastic-Insulated Wires and Cable
UL 1425	Cables for Non-Power-Limited Fire-Alarm Circuits
UL 1310	Class 2 Power Units
UL 651A	Conduit - Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 817	Cord Sets and Power-Supply Cords
UL 1690	Data-Processing Cable
UL 891	Dead-Front Switchboards
UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
UL 2279	Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations
UL 797	Electrical Metallic Tubing
UL 583	Electric-Battery-Powered Industrial Trucks
UL 98	Enclosed and Dead-Front Switches
UL 50	Enclosures for Electrical Equipment
UL 62	Flexible Cord and Fixture Wire
UL 20	General-Use Snap Switches
UL 943	Ground-Fault Circuit-Interrupters
UL 1053	Ground-Fault Sensing and Relaying Equipment
UL 467	Grounding and Bonding Equipment
UL 1029	High-Intensity-Discharge Lamp Ballasts
UL 1564	Industrial Battery Chargers
UL 1047	Isolated Power Systems Equipment
UL 248-1	Low-Voltage Fuses - Part 1: General Requirements
UL 248-10	Low-Voltage Fuses - Part 10: Class L Fuses
UL 248-11	Low-Voltage Fuses - Part 11: Plug Fuses
UL 248-12	Low-Voltage Fuses - Part 12: Class R Fuses
UL 248-15	Low-Voltage Fuses - Part 15: Class T Fuses
UL 248-2	Low-Voltage Fuses - Part 2: Class C Fuses
UL 248-3	Low-Voltage Fuses - Part 3: Class CA and CB Fuses
UL 248-4	Low-Voltage Fuses - Part 4: Class CC Fuses
UL 248-5	Low-Voltage Fuses - Part 5: Class G Fuses
UL 248-6	Low-Voltage Fuses - Part 6: Class H Non-Renewable Fuses
UL 248-7	Low-Voltage Fuses - Part 7: Class H Renewable Fuses
UL 248-8	Low-Voltage Fuses - Part 8: Class J Fuses

UL 248-9	Low-Voltage Fuses - Part 9: Class K Fuses
UL 1063	Machine-Tool Wires and Cable
UL 183	Manufactured Wiring Systems
UL 1072	Medium-Voltage Power Cables
UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 1087	Molded-Case Switches
UL 1286	Office Furnishings
UL 1651	Optical Fiber Cable
UL 67	Panelboards
UL 153	Portable Electric Lamps
UL 231	Power Outlets
UL 1012	Power Units Other Than Class 2
UL 497	Protectors for Paired Conductor Communications Circuits
UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
UL 1950	Safety of Information Technology Equipment, Including Electrical Business Equipment
UL 651	Schedule 40 and 80 Rigid PVC Conduit
UL 497A	Secondary Protectors for Communications Circuits
UL 854	Service-Entrance Cables
UL 506	Specialty Transformers
UL 486C	Splicing Wire Connectors
UL 5B	Strut-Type Channel Raceways and Fittings
UL 1459	Telephone Equipment
UL 1008	Transfer Switch Equipment
UL 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 870	Wireways, Auxiliary Gutters, and Associated Fittings

MINICK: Editorially revise the proposed language to read as suggested by CMP-1 member Brooke Stauffer.

I understand the revised language by Mr. Stauffer to read as follows:

Annex A (~~informative~~ informational) – Product Safety Standards

This ~~informative~~ informational annex ~~is intended to provide~~ provides a list of product safety standards ~~that are utilized~~ used for product listing where that listing is required by this Code. It is recognized that this list is current at the time of ~~development~~ publication, but that new standards or modifications to existing standards can occur at any time while this edition of the Code is ~~adopted~~ in effect.

This ~~list~~ Annex does not form a mandatory part of the requirements of this Code, but is intended ~~to only~~ only to provide Code users ~~some~~ with informational guidance ~~on~~ about the product characteristics on which Code requirements have been based.

STAUFFER: Editorially revise the proposed language to read as follows. ~~Strikeout~~ and underline format is used for the convenience of CMP-1 members reviewing these suggested changes:

Annex A (~~informative~~ informational) – Product Safety Standards

This ~~informative~~ informational annex ~~is intended to provide~~ provides a list of product safety standards ~~that are utilized~~ used for product listing where that listing is required by this Code. It is recognized that this list is current at the time of ~~development~~ publication, but that new standards or modifications to existing standards can occur at any time while this edition of the Code is ~~adopted~~ in effect.

This ~~list~~ Annex does not form a mandatory part of the requirements of this Code, but is intended ~~to only~~ only to provide Code users ~~some~~ with informational guidance ~~on~~ about the product characteristics on which Code requirements have been based.

APPENDIX B

(Log #1170)

6- 221 - (Appendix B): Reject
SUBMITTER: Harvey L. Williams, Pensacola, FL
RECOMMENDATION: Delete Appendix B.
SUBSTANTIATION: Removal of information that cannot be considered mandatory, should be included in the NECH commentary.
PANEL ACTION: Reject.
PANEL STATEMENT: The information in Appendix B is useful. Not all users of the Code have a copy of the NEC Handbook available.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3836)

6- 222 - (Appendix B): Accept
SUBMITTER: Rik Oldefest, Riviera Electric
RECOMMENDATION: In Appendix B, I recommend moving Table B-310-11 behind Table B-310-10. Follow this with Figures B-310-1 through B-310-5.
SUBSTANTIATION: I feel this change would improve the flow and make the tables and figures more user friendly.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3109)

6- 5 - (Table B-310-1): Accept in Principle

NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panels 8 and 12 for correlation. This action will be considered by Panels 8 and 12 as a Public Comment.

SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the third and sixth columns of the table heading.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept in Principle.
Delete "RH" throughout the code.
PANEL STATEMENT: The submitter's reference to Table 310-1 is incorrect. Type RH insulated conductor is no longer produced. This action will also correlate with Proposals 6-16, 6-45, 6-101, 6-107, 6-111, and 6-215.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #3143)

6- 6 - (Table B-310-1): Accept in Principle

NOTE: It was the action of the Technical Correlating Committee that this Proposal be reconsidered and correlated with the action on Proposal 6-5. The Technical Correlating Committee directs the Panel to correct the text in 310-15(b) to include the table. The Technical Correlating Committe directs that the Panel clarify the Panel Action of this Proposal relative to Table 310-16. This action will be considered by the Panel as a Public Comment.

SUBMITTER: Brandon Bender, Sand Beach Electric
RECOMMENDATION: Move Table B-310-1 to Section 15 of Article 310 as Table 310-22.
SUBSTANTIATION: Electrical cables consisting of insulated conductors with an overall outer covering are frequently installed in raceways for lengths greater than 10 ft where the conductors required physical protection. Electricians are not permitted to use Appendix B so they are generally not aware that conductor ampacity under these conditions cannot be determined using Table 310-16. There needs to be a table available to electricians and inspectors to determine the allowable ampacity of multiconductor cables when installed in raceways for distances greater than 10 ft to reduce the chances of overheating and fires.
PANEL ACTION: Accept in Principle.
Change existing Table 310-21 to Table 310-23. Replace the existing note below the existing Table B-310-1 with "See 240-3(d)". Relocate and renumber Table B-310-1 to Table 310-21. Delete all of the existing asterisks. Delete wire size 14 from column 8. Add asterisks to columns number 1 and 8 for wire sizes 14,12, and 10.
PANEL STATEMENT: To correlate and maintain consistency of placing insulated conductor ampacity tables ahead of the bare covered ampacity tables. These tables should be formatted to be consistent with Tables 310-16 and 310-17.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2009)

6- 223 - (B-310-15(b)(1)): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "scientific" before "ampacities" on the second line.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #24)

6- 224 - (Tables B-310-1, B-310-3, B-310-5 and through B-310-10): Accept in Principle
NOTE: The following proposal consists of Comment 6-90 on Proposal 6-58 in the 1998 Annual Meeting National Electrical Code Committee Report on Proposals. This comment was held for further study during the processing of the 1999 NATIONAL ELECTRICAL CODE. The recommendation in Proposal 6-58 was:

Change the line directly above the columns to refer users to Table 310-13 for insulation temperature ratings and use of conductors: For Temperature Rating and Use of Conductor See Table 310-13.
Replace the right-hand column of AWG/kcmil information with two columns listing nominal metric wire sizes and Standard metric wire gages.
Eliminate the alphabet soup letters at the head of each column.
(Table shown below)
SUBMITTER: Bob Macfarlane, McLean, VA
RECOMMENDATION: Add the following title at the top of the second table in the above referenced tables: "Ambient Temperature Adjustment Factors".
SUBSTANTIATION: This addition will make the format for the presentation of the referenced tables consistent with ROP 6-58. Presently, the two tables contained in each of the referenced tables are run together, and the second tables have no title, as do the tables in Section 310-16 and beyond. Another suggestion submitted with this group of suggestions recommends that the present title in the tables at 310-16 and beyond be changed from the present "Correction Factors" to "Adjustments for Ambient Temperature", which is the term I propose to use in the referenced tables.
PANEL ACTION: Accept in Principle.
In the recommendation, replace "Ambient Temperature Adjustment Factors" with "Correction Factors".
PANEL STATEMENT: The portion of the heading addressed in the recommendation for Table 310-20 should match the similar portion of the heading for Tables 310-16 through 310-19.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

Table 310-16 Allowable Ampacities of Insulated Conductors Rated 0 through 2000 Volts, 60°to 90°C (140° to 194°F) Not More Than Three Current-Carrying Conductors in Raceway or Cable or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F)

Size	For Temperature Rating and Use of Conductor See Table 310-13						Size	
	60C (140F)	75C (167F)	90C (194F)	60C (140F)	75C (167F)	90C (194F)	Nominal mm^2	Standard mm^2
AWG kcmil	COPPER			ALUMINUM OR COPPER-CLAD				
18	....	....	14	....	....	....	0.82	1.0
16	....	....	18	....	....	....	1.31	1.5
14	20*	20*	25*	....	....	....	2.08	2.5
12	25*	25*	30*	20*	20*	25*	3.31	4
10	30	35*	40*	25	30*	35*	5.26	6
8	40	50	55	30	40	45	8.37	10
6	55	65	70	40	50	60	13.3	16
4	70	85	95	55	65	75	21.2	25
3	85	100	110	65	75	85	26.7	35
2	95	115	130	75	90	100	33.6	35
1	110	130	150	85	100	115	42.4	50
1/0	125	150	170	100	120	135	53.5	70
2/0	145	175	195	115	135	150	67.4	70
3/0	165	200	225	130	155	175	85.0	95
4/0	195	230	260	150	180	205	107	120
250	215	255	290	170	205	230	127	150
300	240	285	320	190	230	255	152	185
350	260	310	350	210	250	280	177	185
400	280	335	380	225	270	305	203	240
500	320	380	430	260	310	350	253	300
600	355	420	475	285	340	385	304	400
700	400	475	535	310	375	420	355	400
750	400	475	535	320	385	435	380	400
800	410	490	555	330	395	450	405	500
900	435	520	585	355	425	480	456	500
1000	455	545	615	375	445	500	507	630
1250	495	590	665	405	485	545	633	800
1500	528	625	705	435	520	585	760	800
1750	545	650	735	455	545	615	887	1000
2000	560	665	750	470	560	630	1010	.....

Correction Factors

Ambient Temp. °C	For Ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below						Ambient Temp.°C
21-25	1.08	1.05	1.04	1.08	1.05	1.04	70-77
26-30	1.00	1.00	1.00	1.00	1.00	1.00	78-86
31-35	.91	.94	.96	.91	.94	.96	87-95
36-40	.82	.88	.91	.82	.88	.91	96-104
41-45	.71	.82	.87	.71	.82	.87	105-113
45-50	.58	.75	.82	.58	.75	.82	114-122
51-55	.41	.67	.76	.41	.67	.76	123-131
56-60	....	.58	.71	....	.58	.71	132-140
61-70	....	.33	.58	....	.33	.58	141-158
71-80	....	....	.41	....	....	.41	159-176

*** Unless otherwise specifically permitted elsewhere in this *Code*, the overcurrent protection for conductor types marked with an asterisk (*) shall not exceed 15 amperes for No. 14, 20 amperes for No. 12 and 30 amperes for No. 10 copper; or 15 amperes for No. 12 and 25 amperes for No. 10 aluminum and copper-clad aluminum after any correction factors for ambient temperatures and number of conductors have been applied.**

VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1123)

6- 225 - (Table B-310-1): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise footnote as follows:
*Unless otherwise specifically permitted elsewhere in this Code, the overcurrent protection for these conductor types shall not exceed 15 amperes for ~~No. 14~~ 14 AWG, 20 amperes for ~~No. 12~~ 12 AWG, and 30 amperes for ~~No. 10~~ 10 AWG copper; or 15 amperes for ~~No. 12~~ 12 AWG and 25 amperes for ~~No. 10~~ 10 AWG aluminum and copper-clad aluminum.
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement on Proposal 6-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2011)

6- 226 - (Table B-310-1): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1297)

6- 227 - (B-310-15(b)(2)): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Revise as follows:
Appendix B
B310-15 (b) (2)
B-310-15(b)(2). Typical Applications Covered by Tables.
Typical ampacities for conductors rated 0 through 2000 volts are shown in Tables B-310-1 through B-310-10. Underground electrical duct bank configurations, as detailed in Figures B-310-3, B-310-4, and B-310-5, are utilized for conductors rated 0 through 5000 volts. In Figures B-310-2 through B-310-5, where adjacent duct banks are used, a separation of 1.5 m (5 ft) ~~(1.52 m)~~ between the centerlines of the closest ducts in each bank or 1.2 m (4 ft) ~~(1.22 m)~~ between the extremities of the concrete envelopes is sufficient to prevent derating of the conductors due to mutual heating. These ampacities were calculated as detailed in the basic ampacity paper, The Calculation of the Temperature Rise and Load Capability of Cable Systems, by J. H. Neher and M. H. McGrath, AIEE Paper 57-660. For additional information concerning the application of these ampacities, see Power Cable Ampacities, IEEE/ICEA Standard S-135/P-46-426 and IEEE Standard 835-1994, Standard Power Cable Ampacity Tables.
B310-15 (b) (3)
B-310-15(b)(3). Criteria Modifications.
Where values of load factor and Rho are known for a particular electrical duct bank installation and they are different from those shown in a specific table or figure, the ampacities shown in the table or figure can be modified by the application of factors derived from the use of Figure B-310-1.
Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity can be used beyond the point of transition, a distance equal to 3 m (10 ft) ~~(3.05 m)~~ or 10 percent of the circuit length figured at the higher ampacity, whichever is less.
Where the burial depth of direct burial or electrical duct bank circuits are modified from the values shown in a figure or table, ampacities can be modified as shown in (1) and (2) as follows.
1. Where burial depths are increased in part(s) of an electrical duct run to avoid underground obstructions, no decrease in ampacity of the conductors is needed, provided the total length of parts of the duct run increased in depth to avoid obstructions is less than 25 percent of the total run length.
2. Where burial depths are deeper than shown in a specific underground ampacity table or figure, an ampacity derating factor of 6 percent per increased 300 mm (foot) ~~(305 mm)~~ of depth for all values of Rho can be utilized. No rating change is needed where the burial depth is decreased.
B310-15 (b) (5) (1)
B-310-15(b)(5). Tables B-310-6 and B-310-7.
1. To obtain the ampacity of cables installed in two electrical ducts in one horizontal row with 191 mm (7.5-in.) ~~(191 mm)~~ center-to-center spacing between electrical ducts, similar to Figure B-310-2, Detail 1, multiply the ampacity shown for one duct in Tables B-310-6 and B-310-7 by 0.88.
2. To obtain the ampacity of cables installed in four electrical ducts in one horizontal row with 191 mm (7.5-in.) ~~(191 mm)~~ center-to-center spacing between electrical ducts, similar to Figure B-310-2, Detail 2, multiply the ampacity shown for three electrical ducts in Tables B-310-6 and B-310-7 by 0.94.
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA 1M Manual of Style Section 4.1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the (inch-pound units) immediately following in parenthesis. In accordance with NFPA 1M Manual of Style Section 4.1, a hard conversion is proposed wherever safety would not be compromised. In accordance with NFPA 1M Manual of Style Section 4.1, a soft conversion is proposed wherever safety could be compromised by using a hard conversion.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2010)

6- 228 - (B-310-15(b)(2)): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "scientific" before "ampacities" on the second line.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1252)

6- 229 - (Figures B-310-2; B-310-3; B-310-4 and B-310-5): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Change dimensions in Figures B-310-2, B-310-3, B-310-4, and B-310-5 to read as follows:
In Figure B-310-2:
~~7.5 in~~ 190 mm (7.5 in)
~~11.5 in. x 11.5 in.~~290 x 290 mm (11.5 in. x 11.5 in.)
~~19 in. x 19 in.~~ 475 x 475 mm (19 in. x 19 in.)
~~19 in. x 27 in.~~ 475 x 675 mm (19 in. x 27 in.)
~~27 in. x 27 in.~~ 675 x 675 mm (27 in. x 27 in.)
~~27 in. x 11.5 in.~~ 675 x 290 mm (27 in. x 11.5 in.)
~~27 in. x 19 in.~~ 675 x 475 mm (27 in. x 19 in.)
~~24 in.~~ 600 mm (24 in.)
Change dimensions in Note 1 in Figure B-310-2 to read as follows:
~~30 in.~~ 750 mm (30 in.)
~~36 in.~~ 900 mm (36 in.)
Delete Note 3 in Figure B-310-2.
Figure B-310-3:

~~6 in.~~ 150 mm (6 in.)
~~7.5 in.~~ 190 mm (7.5 in.)
~~24 in.~~ 600 mm (24 in.)
~~27 in.~~ 675 mm (27 in.)
~~30 in.~~ 750 mm (30 in.)

Under design criteria in Figure B-310-3:

Change "6 in." to "150 mm (6 in.)", change "3 to 5 in." to "75 to 125 mm (3 to 5 in.)", and delete "For SI Units: 1 in. = 25.4 mm".

In Figure B-310-4:

~~6 in.~~ 150 mm (6 in.)
~~10 in.~~ 250 mm (10 in.)
~~24 in.~~ 600 mm (24 in.)
~~38 in.~~ 950 mm (38 in.)
~~44 in.~~ 1.1 m (44 in.)

Under design criteria in Figure B-310-4: Change "6 in." to "150 mm (6 in.)", change "3 in." to "75 mm (3 in.)".

Under Notes to Figure B-310-4: Delete Note 1.

In Figure B-310-5:

~~6 in.~~ 150 mm (6 in.)
~~10 in.~~ 250 mm (10 in.)
~~24 in.~~ 600 mm (24 in.)
~~38 in.~~ 950 mm (38 in.)
~~54 in.~~ 1.4 m (44 in.)

Under design criteria in Figure B-310-5: Change "6 in." to "150 mm (6 in.)", change "3 in." to "75 mm (3 in.)".

Under Notes to Figure B-310-5: Delete Note 1.

SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4-1 with respect to the placement of units, i.e., to show the SI units as the preferred unit and the inch-pound units immediately following in parenthesis.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1124)

6- 230 - (Table B-310-3): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise footnote as follows:

*Unless otherwise specifically permitted elsewhere in this Code, the overcurrent protection for these conductor types shall not exceed 15 amperes for ~~No. 14~~ 14 AWG, 20 amperes for ~~No. 12~~ 12 AWG, and 30 amperes for ~~No. 10~~ 10 AWG copper; or 15 amperes for ~~No. 12~~ 12 AWG and 25 amperes for ~~No. 10~~ 10 AWG aluminum and copper-clad aluminum.

SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement on Proposal 6-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2012)

6- 231 - (Table B-310-3): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2013)

6- 232 - (Table B-310-5): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2014)

6- 233 - (Table B-310-6): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2015)

6- 234 - (Table B-310-7): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2016)

6- 235 - (Table B-310-8): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2017)

6- 236 - (Table B-310-9): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #2018)

6- 237 - (Table B-310-10): Reject
SUBMITTER: John E. Conley, Stratford, CT
RECOMMENDATION: Insert "Scientific" before "Ampacities" in the heading.
SUBSTANTIATION: See the substantiation for proposal on "Ampacity" definitions.
PANEL ACTION: Reject.
PANEL STATEMENT: Ampacity values provided in the tables (which utilize ampacities versus allowable ampacities) are no less or no more scientific than the calculated ampacity in accordance with 310-15(c). Substantiation, provided with the proposed definition in Proposal 1-101, does not provide any evidence of the problem with the use of ampacity values provided in various tables (which utilize ampacities versus allowable ampacities) or calculated in accordance with 310-15(c).
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #1125)

6- 238 - (Table B-310-11): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Example No. 1 - change "No. 14" to "14 AWG"
Example No. 2 - change "No. 14" to "14 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.
AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.
This is one of a series of proposals to make this change throughout the Code.
PANEL ACTION: Accept.
PANEL STATEMENT: See panel statement on Proposal 6-7.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11

(Log #4423)

6- 239 - (B-310-15(b)(2)): Reject
SUBMITTER: Craig M. Wellman, Newark, DE
RECOMMENDATION: Revise paragraph as marked:
B310-15(b)(2) Typical...
Typical ampacities for conductors rated 0-2000 volts are shown in Tables B...
Underground...B-310-5, are utilized for conductors rated 0-5000 volts. Refer to Table B-310-15(b)(2) to select the appropriate table.
Shift remaining material in this section to a new paragraph. No new number is needed.
SUBSTANTIATION: Finding the correct table consistently is difficult. The proposed change will reduce code application errors by improving usability of the code.
PANEL ACTION: Reject.
PANEL STATEMENT: The proposed recommendation does not add to the usability of the various ampacity tables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 10
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
PETTIGREW: See my Explanation of Negative Vote on Proposal 6-48.

APPENDIX C

(Log #1172)

8- 459 - (Appendix C): Reject
SUBMITTER: Gary L. Jones, Alberta, AL
RECOMMENDATION: Convert Appendix C into a mandatory rule and relocate into Chapter 3 as a separate Article 344.
SUBSTANTIATION: This information presently not part of the Code and should be deleted now or revised to become a mandatory rule.
PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 8-463 that addressed not relocating Appendix C. The mandatory rules for raceway fill are contained in Table 1, Chapter 9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

Table B-310-15(b)(2) Selection of Ampacity Tables

0-2000 Volts Above Ground	Reference
Multiconductor cable with 2 or 3 conductors in raceway in free air	Table B-310-1
Multiconductor cables with not more than 3 insulated conductors in free air	Table B-310-3
0-35,000 Volts Above Ground	
Bare or covered conductors	Table B-310-4
0-2000 Volts Directly Buried or in Electrical Ducts	
Single insulated conductors in nonmagnetic ducts (one conductor per duct)	Table B-310-5
Three insulated conductors within an overall covering (3/C cable) in ducts (1 cable per duct)	Table B-310-6
Three single insulated conductors in electrical ducts (3 conductors per duct)	Table B-310-7
Two or three insulated conductors cabled within an overall covering directly buried in earth	Table B-310-8
Three triplexed single insulated conductors directly buried in earth	Table B-310-9
Three single insulated conductors directly buried in earth	Table B-310-10
Interpolation chart for cables in a duct bank based on load factor and rho	Figure B-310-1
Cable installation dimensions for use with Tables B-5 through B-10	Figure B-310-2
0-5000 Volts Single Insulated Conductors in Underground Electrical Ducts	
Three conductors per duct, 9 single-conductor cables per phase	Figure B-310-3
Nonmagnetic ducts, 1 conductor per duct, 4 single-conductor cables per phase	Figure B-310-4
Nonmagnetic ducts, 1 conductor per duct, 5 single-conductor cables per phase	Figure B-310-5

See also Section 310-15(b) and Appendix B-310-15(b)(1) to (7)
For adjustment factors — more than 3 current carrying conductors in a raceway or cable — see Table 310 Note 8
For adjustment factors — more than 3 current-carrying conductors in a raceway or cable with load diversity — see Table B-310-11

(Log #1689)

8- 460 - (Appendix C): Accept
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: Appendix C Conduit and tubing fill table - All tables.
Add two new rows at the top as follows:

Metric Designator
16, 21, 27, 35, 41, 53, 63, 78, 91, 103

After Trade size, delete (in.)
SUBSTANTIATION: The proposed revision complies with the NFPA 1M Manual of Style Section 4 with respect to the placement of units and values of measurements.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 2
NOT RETURNED: 1 Corry
EXPLANATION OF NEGATIVE:
LINDSAY: See my Explanation of Negative Vote on Proposal 8-11.
LOYD: See my Explanation of Negative Vote on Propoosal 8-11.

(Log #3017)

8- 461 - (Appendix C): Accept
SUBMITTER: Robert H. Keis, Dover, DE
RECOMMENDATION: In Tables C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, and C11 change the following wording:
Maximum Number of Conductors ~~and~~ or Fixture Wires in... (conduit/raceway types–remain the same as present).
SUBSTANTIATION: It seems that the correct word would be "or" not "and." Since Section 402-11 prohibits using fixture wires as branch-circuit conductors, it seems that there would be one or the other in a raceway, but usually not both together so it should be "or" not "and."
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3018)

8- 462 - (Appendix C): Reject
SUBMITTER: Robert H. Keis, Dover, DE
RECOMMENDATION: In Tables C1(A), C2(A), C3(A), C4(A), C5(A), C6(A), C7(A), C8(A), C9(A), C10(A), C11(A), and C12(A), add the word "Aluminum" between Compact Conductors. Table title would then read:
Maximum Number of Compact Aluminum Conductors in... (conduit/raceway types–remain the same as present).
SUBSTANTIATION: I submitted this same type proposal for the 1993 Code (and the panel accepted) to clarify that "compact conductors" were "compact aluminum conductors" and no others. The Codes before 1993 used the term compact conductors and it is confusing to those who are just beginning to use the Code. The words were changed in the 1993 Code and then for some reason reverted back to the old wording in the 1999 Code. Please help clarify what the Code means when it says "compact conductors." If this book is to be the least bit "user friendly," this will help. For example, Table 5A, Chapter 9, has the correct wording.
PANEL ACTION: Reject.
PANEL STATEMENT: Not all compact conductors are aluminum. Compact copper conductors are manufactured.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3189)

8- 463 - (Appendix C): Reject
SUBMITTER: Tim Andrassy, Steel Tube Inst.
RECOMMENDATION: Delete Appendix C.
SUBSTANTIATION: At the time these tables were placed in the NEC it appeared they would be helpful to the user. Many users prefer not to take up all the space required in the NEC. With the advent of more metrication of the NEC it appears another 25 pages would be needed to convert to metric. This is unrealistic. In addition, it has become apparent that there are instances where the computed number of conductors will not actually fit into the conduit due to configuration and only conductors of the same size are computed. This detracts from their usefulness. Table 4 of Chapter 9 will still be available and it is more complete than in the past.
PANEL ACTION: Reject.
PANEL STATEMENT: Appendix C is provided for the information and application of the user. It is not mandatory Code.
The two FPN's for Table 1 of Chapter 9 alert the user of situations that may result in difficulty when installing conductors in raceways. Eliminating Appendix C will not affect the problems associated with installing the conductors as the number of conductors will still be computed per Tables 1 and 4 of Chapter 9.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3950)

8- 464 - (Appendix C): Accept in Principle
SUBMITTER: Daniel J. Thomas, Jr., City of Durham, NC
RECOMMENDATION: Add a "Table of Contents" for Appendix C, listing the type raceway for each table and the page number for each. This "Table of Contents" should be the first page of Appendix C.
Appendix C
Table of Contents
(A) Where this is used in conjunction with Tables C1 through C12, the conductors installed, must be of the compact type.

SUBSTANTIATION: It is very difficult to find a specific type raceway being used, without going through each table until you find the particular table needed for your raceway.
PANEL ACTION: Accept in Principle.
Add the correct acronyms from the proposed article revisions after each table title.
PANEL STATEMENT: Panel action is editorial.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4310)

8- 465 - (Appendix C): Accept in Principle
SUBMITTER: J. Kevin Vogel, Crescent Electrical Supply
RECOMMENDATION: Provide a table of contents for Appendix C immediately before Table C1, following Appendix B.
SUBSTANTIATION: Appendix C is cumbersome to use. A table of contents would make this section of the Code more "user friendly."
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 8-464.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4464)

8- 466 - (Tables C1 through C12): Accept in Principle
SUBMITTER: Charles M. Williams, Stealth Electric
RECOMMENDATION: The table headings in these tables should have the raceway types more easily identified. This could be done with bold face type or larger print, as is done in the tables in Chapter 9.
SUBSTANTIATION: One of the driving forces in the last Code change was to enhance the "usability" of the NEC. Making these tables more easily identified would seem to compliment this effort.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The submitter's concerns are addressed by the panel's action on Proposal 8-457.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3110)

8- 467 - (Appendix C Table C1): Accept
Note: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP 6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #4309)

8- 468 - (Appendix C, Table C1(a)): Reject
SUBMITTER: J. Kevin Vogel, Crescent Electrical Supply
RECOMMENDATION: For 350 kcmil XHHW, XHHW-2 compact conductors in 3-inch EMT: ~~8~~ 7.
SUBSTANTIATION: Eight conductors exceeds the 40 percent fill maximum allowed by Chapter 9, Table 1.
PANEL ACTION: Reject.
PANEL STATEMENT: Chapter 9, Table 4 lists the 40% fill square inch area of 3-inch EMT as 3.538. Chapter 9, Table 5A lists the approximate square inch area of 350 Type XHHW insulated conductor as .4536. (3.538 / .4536 = 7.7998236)
Utilizing a standard round-up method the result is a total of 7.8. Note (7) of Chapter 9, Notes to Tables states "(7) When calculating the maximum number of conductors permitted in a conduit or tubing, all of the same size (total cross-sectional area including insulation), the next higher whole number shall be used to determine the maximum number of conductors permitted when the calculation results in a decimal of 0.8 or larger." Because the number achieved by the above calculation is 7.8 the number can be increased to 8.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3114)

8- 469 - (Appendix C Table C2): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP 6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3115)

8- 470 - (Appendix C Table C3): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP 6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3116)

8- 471 - (Appendix C Table C4): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP 6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #437)

8- 472 - (Appendix C Table C5): Accept in Principle
SUBMITTER: Mike Theisen, St. Cloud, MN
RECOMMENDATION: Revise as follows:
Table C5. Maximum Number of Conductors and Fixture Wires in Liquidtight Flexible Nonmetallic Conduit (Type ~~FNMC~~LFNC-B*
(Based on Table 1, Chapter 9)
SUBSTANTIATION: In Sections 351-22(2), the Liquidtight Flexible Nonmetallic Conduit is designated as Type LFNC-B. This change will make for consistent use of LFNC-B as the correct terminology for this particular type of conduit.
PANEL ACTION: Accept in Principle.

The panel directs staff to make the same correction to Tables C5A, C6 and C6A.
PANEL STATEMENT: The panel's action provides the necessary corrections to all applicable tables.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3117)

8- 473 - (Appendix C Table C5): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP-6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #438)

8- 474 - (Appendix C Table C6): Accept in Principle
SUBMITTER: Mike Theisen, St. Cloud, MN
RECOMMENDATION: Revise as follows:
Table C6. Maximum Number of Conductors and Fixture Wires in Liquidtight Flexible Nonmetallic Conduit (Type ~~FNMC~~LFNC-A*) (Based on Table 1, Chapter 9)
SUBSTANTIATION: In Section 351-22(1), the Liquidtight Flexible Nonmetallic Conduit is designated as Type LFNC-A. This change will make for consistent use of LFNC-A as the correct terminology for this particular type of conduit.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: The panel's action on Proposal 8-472 addresses the submitter's concern.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3118)

8- 475 - (Appendix C Table C6): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP-6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3119)

8- 476 - (Appendix C Table C7): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP-6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3390)

8- 477 - (Appendix C, Tables C7 and C7(A)): Reject
SUBMITTER: Will Dockham, Gilmanton Iron Works, NH
RECOMMENDATION: Add a 3/8 in. column to Tables C7 and C7(A). The conductor fill for the new 3/8 in. column of Tables C7 and C7(A) should be the same as the 3/8 in. column of Tables C4 and C4(A) because the internal diameter of 3/8 in. liquidtight flexible metal conduit is the same as the internal diameter of 3/8 in. liquidtight flexible nonmetallic conduit.
SUBSTANTIATION: Confusion is caused when applying Table 350-12, to 3/8 in. liquidtight flexible metal conduit because it is unclear as to which column - "Fitting Inside Conduit" or "Fitting Outside Conduit", should be used. Liquidtight flexible metal conduit fittings typically have a component that installs inside the liquidtight flexible metal conduit, however, I doubt that it is intended that the "Fitting Inside Conduit" column is the appropriate column to use. Also, 3/8 in. liquidtight flexible nonmetallic conduit, Type-B, has the same internal diameter per Chapter 9, Table 4, as 3/8 in. liquidtight flexible metal conduit, therefore the sizing criteria for both raceways should be the same.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel does not agree that it is necessary to add new columns to these tables based on the action taken on Proposal 8-334.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3120)

8- 478 - (Appendix C Table C8): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP-6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3111)

8- 479 - (Appendix C Table C10): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP 6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3112)

8- 480 - (Appendix C Table C11): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP 6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

(Log #3113)

8- 481 - (Appendix C Table C12): Accept
NOTE: It was the action of the Technical Correlating Committee that this Proposal be referred to Code-Making Panel 6 for information.
SUBMITTER: Larry F. Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Type RH from the first column of the table in two places.
SUBSTANTIATION: Underwriters Laboratories canvassed subscribers of Thermoset-Insulated Wires and Cables, UL 44. It was determined that Type RH insulated conductor is no longer being produced.
PANEL ACTION: Accept.
PANEL STATEMENT: The panel refers this action to CMP 6 for information.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 14
VOTE ON PANEL ACTION:
AFFIRMATIVE: 13
NOT RETURNED: 1 Corry

APPENDIX D

(Log #CP1209)

12- 122a - (Annex D): Accept
SUBMITTER: CMP 12
RECOMMENDATION: Add title to Figure D9: "Generator Field Control."
Add title to Figure D10: "Adjustable Speed Drive Control."
SUBSTANTIATION: The proposal addresses NEC Style Manual issues.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 19
VOTE ON PANEL ACTION:
AFFIRMATIVE: 17
NOT RETURNED: 2 Kelly, Laney

(Log #3832)

2- 310 - (Appendix D): Accept in Principle
SUBMITTER: Kevin Starkie, Riviera Electric
RECOMMENDATION: Revise text to read as follows:
"Laundry facilities on premises are available to all tenants. Add no circuit to individual dwelling unit. Add 1500 VA for each laundry circuit to have load and an example as a "house load" (code reference)."
SUBSTANTIATION: No where in the code book is there a reference for this modification to computing laundry circuits for laundry facilities. Add this example to code not just in the example.
PANEL ACTION: Accept in Principle.
In Examle D4(a), delete the last sentence of the existing text beginning with "Add 1500 VA for laundry circuit...".
PANEL STATEMENT: This revision corrects the problem as presented by the submitter.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1196)

2- 311 - (Appendix D, Examples No. D1 through D4): Reject
SUBMITTER: Technical Correlating Committee National Electrical Code
RECOMMENDATION: 1. In Example D1(a), first paragraph, replace "1500 ft^2" with "139.5 m^2 (1500 ft^2)"
2. In Example D1(a), Computed Load, replace "1500 ft^2 at 3 VA per ft^2 with 139.5 m^2 at 33 VA per m^2 (1500 ft^2 at 3 VA per ft^2)"
3. In Example No. D2(a), first paragraph, replace "1500 ft^2" with "139.5 m^2 (1500 ft^2)"
4. In Example No. D2(a), Feeder Neutral Load per Section 220-22, replace "1500 ft^2 at 3VA per ft^2 with "139.5 m^2 at 33 VA per m^2 (1500 ft^2 at 3 VA per ft^2)"
5. In Example No. D2(b), first paragraph, replace "1500 ft^2" with "139.5 m^2 (1500 ft^2)"
6. In Example No. D2(b), General Load, replace "1500 ft^2 at 3 VA per ft^2" with "139.5 m^2 at 33 VA per m^2 (1500 ft^2 at 3 VA per ft^2)"
7. In Example No. D2(b), Feeder Neutral Load per Section 220-22, replace "1500 ft^2 at 3 VA per ft^2" with "139.5 m^2 at 33 VA per m^2 (1500 ft^2 at 3VA per ft^2)"
8. In Example No. D2(c), first paragraph, replace "2000 ft^2" with "186 m^2 (2000 ft^2)"
9. In Example No. D2(c), General Load, replace "2000 ft^2 at 3 VA" with "186 m^2 at 33 VA (2000 ft^2 at 3 VA)"
10. Example No. D3, first paragraph, replace "...50 by 60 ft, or 3000 ft^2, has 30 ft ..." with "...15 m (50 ft) by 18 m (60 ft), or 270 m^2 (3000 ft^2), has 9.0 m (30 ft)..."
11. In Example No. D3, Continuous Loads, replace "3000 ft^2 at 3 VA per ft^2 with "270 m^2 at 33 VA per m^2 (3000 ft^2 at 3 VA per ft^2)"
12. In Example No. D3, Continuous Loads, replace "30 ft at 200 VA per ft" with "9.0 m at 656 VA per m (30 ft at 200 VA per ft)"
13. In Example No. D4(a), 4th paragraph, replace "840 ft^2" with "78.12 m^2 (840 ft^2)"
14. In Example No. D4(a), Computed Load for Each Dwelling Unit, replace "...840 ft^2 at 3VA per ft^2" with "(78.12 m^2 at 33 VA per m^2 (840 ft^2 at 3 VA per ft^2)..."
15. In Example No. D4(b), 5th paragraph, replace "840 ft^2" with "78.12 m^2 (840 ft^2)"
16. In Example No. D4(b), Computed Load for Each Dwelling Unit, replace "840 ft^2 at 3 VA per ft^2" with "78.12 m^2 at 33 VA per m^2 (840 ft^2 at 3 VA per ft^2)"
SUBSTANTIATION: The proposed revision is intended to comply with the NFPA No. 1M Manual of Style Section 4.1 with respect to the placement of units and values of measurement, i.e., show SI units as the preferred and inch-pound units immediately following in parenthesis. A soft conversion was generally used for area numbers to maintain consistency with the existing examples although the Panel may elect to use a hard conversion.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel recommends that the examples remain in inch-pound units for clarity. Using the conversions supplied by the Metrication Task Group, will result in two different electrical load calculations for the exact same example.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #1019)

2- 312 - (Appendix D Example No.s D1(a) and D2(a)): Accept
SUBMITTER: Dan Leaf, Palmdale, CA
RECOMMENDATION: Revise Example D1(a) to read as follows:
~~Net computed load exceeds 10 kVA Section 230-42(b)(2) would require service conductors to be 100 amperes.~~ Sections 230-42(b) and 230-79 require service conductors and disconnecting means rated not less than 100-amperes.
D2(a) Therefore, the minimum service rating ~~size~~ would be 100-amperes in accordance with Sections 230-42 and 230-79.
SUBSTANTIATION: Editorial. There is no Section 230-42(b)(2). Sections 230-42 and 230-79 are sections requiring a 100 ampere "rating" which is more appropriate than "size".
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #3831)

2- 313 - (Appendix D Example No. D1(a)): Accept in Principle
SUBMITTER: Clint Bonham, Riviera Electric
RECOMMENDATION: Change Section 230.42(b) reference to Section 230.79(e).
SUBSTANTIATION: In example No. D1(a) net computed load for 120/240 volt, 3-wire, single-phase service or feeder, Section 230.42(b) is referenced. This reference is not accurate, it does not give the information required.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 2-312.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4338)

2- 314 - (Appendix D, Example No. D1(a)): Accept in Principle
SUBMITTER: Leo F. Martin, Martin Electrical & Technical Training Services
RECOMMENDATION: Delete: "Net computed load exceeds 10 kVA. Section 230-42(b) would require service conductors to be 100 A."
Replace with see Section 230-42(b).
SUBSTANTIATION: Statement mandates that 100 ampere rated service conductors are required only if the net computed load exceeds 10 kVA. Section 230-42(b) makes reference to 230-79 which requires a minimum of 100 amperes for all one-family dwellings, regardless of load calculation.
PANEL ACTION: Accept in Principle.
PANEL STATEMENT: See panel action on Proposal 2-312.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4072)

2- 315 - (Appendix D, Example No. D2(c)): Reject
SUBMITTER: David P. Brown, Baltimore Gas and Electric Co./Rep. Edison Electric Inst./Electric Light & Power Group
RECOMMENDATION: This is a companion proposal to change Section 220.30(c).
Revise parts of Appendix D, Example No. D2(c) as follows:
20.76 kVA x ~~100%~~ 65% = ~~20.76 kVA~~ 13.49 kVA
Totals
Net general load 19,280 VA
Heat pump and supplementary heat 13,490 VA ~~20,760 VA~~
Total 32,770 VA ~~40,040 VA~~
Calculated Load for Service
~~40.04 kVA~~ 32.77 kVA x 1000) 240 V = ~~166.8 A~~ 136.5 A
This dwelling unit would be permitted to be served by a ~~175 A~~ 150 A Service.
SUBSTANTIATION: This example was changed in conjunction with a text change in Section 220.30 for the 1999 NEC method of counting central electric space heat at 100 percent back to 65 percent as it has been since 1971.
In the 1999 NEC a major change was made in calculations without adequate technical substantiation. This change impacts load calculations for single family dwellings with heat pumps when the compressor and supplemental heating is operating at the same time (normal installation) by counting the central space heat at 100 percent rather than at 65 percent as had been done by the Optional Method since the 1971 NEC. This change was made with no historical load data to justify the change. It significantly increases the main panel size and service entrance conductors on many homes and apartments thus increasing the cost with no improvements in safety. Also, the 1999 calculations are very erratic depending on whether or not the heat pump can be on at the same time as the supplementary heat. Based on the NFPA 70 A98 ROP Proposal 2-319 was rejected because it did not further clarify the present wording. See the NFPA 70 A98 ROC for Comments 2-164 and 2-165 that were accepted in principle as editorial revision to enhance clarity. In Proposal 2-319, the submitter stated that "These changes have no impact on the result of the calculation, only on the format of this section". In reality the example for the Optional Calculation using 220-30 in the 1996 and 1999 NEC is identical except for counting the central electric space heating at 100 percent in the 1999 NEC!
Numerous load surveys have been submitted by various utility companies throughout the years to verify the diversified demand of electric heat. Going back to the 1971 NEC and following codes as well, the key statement was, "Use the larger of the air conditioning load or the diversified demand of the heating load." Using 100 percent for the air conditioning and cooling, including heat pump compressors (from 1971 to 1996) meant that a heat pump could be used for cooling with or without supplemental electric heat and that the summer load could thus be greater than the winter load. Central Electric Space Heating, which was calculated at 65 percent, could include a heat pump compressor as well as integral supplemental heat, i.e., "strip" or electric resistance heat. All of the authors writing books on calculations have included resistance heat at 65 percent. A heat pump is more efficient (lower demand, higher heat output) than straight resistance heat. Also, heat pump systems are designed to turn off the heat pump if the outdoor temperature drops too low preventing continuous operation of the heat pump and the full backup resistance heat. Therefore the diversified demand for a residence would be less if the heat pump and strip heat were on at the same time. This is exactly opposite to the 1999 changes!! Appendix D Example No. 2(c) of the 1996 NEC added the heat pump load of 5.76 kVA and the 15 kVA and multiplied the total by 65 percent for a total of 13.49 kVA. However, example D2(c) of the 1999 NEC uses a total of 20.76 kVA. The statement that "If supplementary heat is not on at the same time as heat pump, heat pump kVA need not be added to total." would mean that one would use 65 percent of 15 kVA which would be 9.75 kVA. It is reasonable to assume that the winter heat diversified demand is based on the heat loss of the home with a particular thermostat setting. If more electric heat is installed than needed (or it is not divided into two or more stages) then it will just cycle more often, but essentially have the same electrical demand. However, look at the differences in calculations for the 1999 NEC when using a 5 kW heat pump and various amounts of supplemental heat.

Assume:	Heat Pump plus Supplemental Heat	Supplemental Heat Only	Diversified Demand 1971-96 NEC	1999 NEC
	5 + 15 = 20 kVA		13.0 kVA	20.0 kVA
		15 kVA	9.75 kVA	9.75 kVA
		20 kVA	13.0 kVA	13.0 kVA
	5 + 20 = 25 kVA		16.25 kVA	25 kVA
		20 kVA	13.0 kVA	13 kVA
		25 kVA	16.25 kVA	16.25 kVA

Thus, based on the 1999 NEC if one uses a 25 kVA central electric heating system with a heat pump, the load is 25 kVA, but if one uses 5 kVA of supplemental heat to replace the heat pump, then the diversified demand drops to 16.25 kVA. If one has 20 kVA of supplemental heat the demand is 13 kVA, but if a 5 kW heat pump is added, the demand jumps to 25 kVA. If one has a 15 kVA system calculated at 9.75 kVA, the demand more than doubles to 20 kVA if a 5 kVA heat pump is added. The 25 kVA heat pump system could actually have a lower demand than the 25 kVA supplemental heat only system that is calculated at 16.25 kVA!!

Note: Supporting material is available for review at NFPA Headquarters.

PANEL ACTION: Reject.
PANEL STATEMENT: See panel action and statement on Proposal 2-289.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 11
NEGATIVE: 1
EXPLANATION OF NEGATIVE:
MOORE: See my Explanation of Negative Vote on Proposal 2-289.

(Log #1126)

2- 316 - (Appendix D, Example No.s D4(a), D4(b), D5(a), and D5(b)): Accept
SUBMITTER: James M. Daly, BICC General
RECOMMENDATION: Revise Appendix D as follows:
Example No. D4(a)
Minimum Number of Branch Circuits Required for Each Dwelling Unit
Small Appliance Load - change "No. 12" to "12 AWG"
Range Circuit - change "No. 8" to "8 AWG" and "No. 10" to "10 AWG"
Example No. D4(b)
Minimum Number of Branch Circuits Required for Each Dwelling Unit
Small Appliance Load - change "No. 12" to "12 AWG"
Range Circuit - change "No. 10" to "10 AWG"
Example No. D5(a)
Minimum Number of Branch Circuits Required for Each Dwelling Unit
Change "No. 8" to "8 AWG" and "No. 10" to "10 AWG"
Example No. D5(b)
Minimum Number of Branch Circuits Required for Each Dwelling Unit
Change "No. 8" to "8 AWG", "No. 10" to "10 AWG", and "No. 12" to "12 AWG".
SUBSTANTIATION: To provide consistency throughout the Code. The term "No." is not used in any of the Tables in Chapter 3.

AWG and kcmil are trade size designators specifically authorized for use with the SI system of units in North America. Also, industry practice is to use AWG or kcmil only.

This is one of a series of proposals to make this change throughout the Code.

PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4362)

2- 317 - (Appendix D, Example No. D4(b)): Reject
SUBMITTER: J. Kevin Vogel, Crescent Electrical Supply
RECOMMENDATION: One page 612, in the second column, following the calculation for the "size of each feeder" at 78A, add:
(Note: NEC Section 220-30(a) requires the use of conductors to each dwelling unit to have an allowable ampacity of not less than 100.)
SUBSTANTIATION: The proposed note will clarify the intent of Section 220-30(a) that the optional calculations of Part C of Article 220 may only be used where the conductors to each dwelling unit have an ampacity of not less than 100.
PANEL ACTION: Reject.
PANEL STATEMENT: Example D4(b) does not use the optional calculation from Section 220-30 for the individual dwelling units.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

(Log #4308)

2- 318 - (Appendix D, Example No. D5(a)): Accept
SUBMITTER: J. Kevin Vogel, Crescent Electrical Supply
RECOMMENDATION: Revise formula to read:
64,740 VA ÷ (208 V) (1.732) = ~~179.6 A~~ 179.7A
SUBSTANTIATION: None.
PANEL ACTION: Accept.
PANEL STATEMENT:
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON PANEL ACTION:
AFFIRMATIVE: 12

APPENDIX E

(Log #1838)

5- 317 - (Appendix E): Reject
SUBMITTER: Willard Homes, City of Orlando, FL
RECOMMENDATION: Keep Appendix E in the next NEC for another cycle.
SUBSTANTIATION: This information is very helpful. Thank you CMP 5 for this cross-reference.
PANEL ACTION: Reject.
PANEL STATEMENT: The panel concludes the cross reference is no longer necessary.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16

(Log #4346)

5- 318 - (Appendix E): Accept
SUBMITTER: Larry Miller, Nat'l Electrical Mfrs Assn. (NEMA)
RECOMMENDATION: Delete Appendix E.
SUBSTANTIATION: This cross-reference to the 1996 Code is no longer needed.
PANEL ACTION: Accept.
NUMBER OF PANEL MEMBERS ELIGIBLE TO VOTE: 16
VOTE ON PANEL ACTION:
AFFIRMATIVE: 16
